BOOK 3
DETAILED
SPECIFICATIONS PART 1 OF 3
(Divisions 00 thru 14)

DAMEN GREEN LINE STATION

CDOT PROJECT NO.: D-7-135

SPECIFICATION NO.: 1186934

CITY OF CHICAGO

LORI LIGHTFOOT
Mayor

Prepared by
DEPARTMENT OF TRANSPORTATION
Contracts Section

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Issued by the
DEPARTMENT OF PROCUREMENT SERVICES

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Chief Procurement Officer

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All Signatures To Be Sworn To Before A Notary Public

Any contract entered into as a result of this bid process is governed by the terms and conditions set forth in Book 1 "Terms and Conditions for Construction" for CDOT projects funded by the City, as amended and incorporated as if fully set forth here by this reference; and by Book 2, Book 3 (if applicable), plans, drawings, exhibits, and attachments as appropriate.

DOCUMENT NO. 00 01 10
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The complete Project Manual for this project consists of this entire bound volume which is not to be separated for any reason. The Commissioner will not be responsible for any assumptions made by a Contractor or Subcontractor who does not receive a complete bound Project Manual containing all sections and documents listed in the Table of Contents.

The following listed documents comprise the Project Manual for the Damen Green Line Station. Where numerical sequence of Sections or Divisions is interrupted, such interruptions are intentional.

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ADDITIONAL SPECIAL CONDITIONS
DIVISION OF ENGINEERING

September, 2019

1. AUTHORITY OF THE COMMISSIONER

A. All work will be done under the supervision of the Commissioner or his or her authorized representative. The Commissioner will decide all questions that arise as to the quality and acceptability of materials furnished, work performed, manner of performance, rate of progress of the work, interpretation of the Contract and compensation and mutual rights between Contractor and all subcontractors. The Commissioner will determine the amount and quality of work performed and materials furnished and the estimates thereof. The estimate will be a condition precedent to the right of the Contractor to receive money due him or her under the Contract.

B. In case of failure on the part of the Contractor to execute work ordered by the Commissioner, the Commissioner may, at the expiration of a period of 48 hours, request the Chief Procurement Officer to give notice in writing to the Contractor, and proceed to execute such work as may be deemed necessary, and the cost thereof will be deducted from compensation due or which may become due the Contractor under the Contact.

2. REFERENCE SPECIFICATION

A. Reference made in these Specifications and Drawings to reference specifications, codes or test methods of ASTM, ACI, AISC, and other similar organizations and associations is intended to refer to the latest revision of such standard in effect 30 calendar days prior to the date of the ADVERTISEMENT FOR BIDS, unless specifically indicated to the contrary.

3. MATERIAL SPECIFICATIONS

A. Materials specified in the Specifications with an ASTM designation will meet all the requirements of the materials with the corresponding AASHTO designation as a tabulated in the "Standard Specifications for Highway Materials and Methods of Sampling and Testing", Latest Edition, Part 1, page WITHHOLDING and XVII. In case of any conflict between ASTM and AASHTO designations, the ASTM designations will govern.

4. QUALITY OF MATERIALS

A. This section supplements the provisions of Book 1 of the Contract Documents.

(1) Since the equipment specified herein is to be an integral part of an installation where external appearance is important, the equipment will be in accordance with design, workmanship and material, and have the same dimensions, as that of specified manufacturers. The Commissioner reserves the right to reject equipment if the design does not meet specifications or detail requirements. Standard shop practices for the purpose of improving fabrication, assembly, and finish, but not affecting the external design, will be given consideration.

5. MATERIAL AND WORKMANSHIP STANDARDS

A. All material and workmanship must meet or exceed the national and the Chicago construction codes. Where conflicts exist between the Chicago and other codes listed, the more stringent provisions must apply. In situations where doubt between codes exists, the Commissioner will determine which to follow.

B. All equipment and materials for which Underwriters' Laboratory labeling services is provided will be UL labeled.

C. Wherever applicable, the following list of codes must be obeyed:

(1) Chicago Construction and Electrical Code.
(2) Underwriter's Laboratories (UL).
(3) Insulated Power Cable Engineers Association (IPCEA).
(4) National Electrical Code (NEC).
(5) National Electrical Manufacturers Association (NEMA).
(6) American National Standards Institute (ANSI)
(7) Institute of Electrical and Electronic Engineers (IEEE).

D. Materials specified in the Detail Specifications with an ASTM Designation will meet all requirements of the materials with the corresponding AASHTO Designation as tabulated in the Standard Specifications for Highway Materials and Methods of Sampling and Testing, Latest Edition, Part 1, page XVII and XVIII. In case of any conflict between ASTM and AASHTO Specification, the AASHTO Specifications will govern.

6. TIME SCHEDULE AND PROSECUTION OF THE WORK

A. In addition to the requirements of Book 1 of the Contract Documents, the Contractor further understands and agrees that as soon as possible after being awarded the Contract, he or she will submit the Progress or Time Schedule to the Commissioner for approval, within a maximum of fourteen (14) days after Notice to Proceed is issued.

B. The Schedule will be in the form of a bar chart in sufficient detail or in such other form as approved by the Commissioner that clearly defines the contemplated progress of the work. The schedule will show the contemplated starting and completion dates for each trade, subcontract or major phase of the work, with all items so scheduled as to complete the entire project within the time specified.

C. The construction progress schedule will be used as a guide for verifying monthly estimates off work completed, for which payment is requested.

D. The Contractor will promptly notify the Commissioner of any difficulty in securing material or any other circumstance that could delay the progress of the work and the time of completion.

7. PRECONSTRUCTION MEETING

A. This section supplements the provisions of Book 1 of the Contract Documents:

(1) Prior to the Contractor starting work a joint conference will be held between all interested parties, at which time a final schedule of operations will be adopted. No deviations by the Contractor will be allowed without written approval of the Commissioner. However, as the job progresses the Commissioner may direct revisions to these requirements so as to expedite the project or as may be required by job conditions.

8. ADDITION TO CONTRACT FOR WORK - GENERAL CONDITIONS

A. This section supplements the provisions of Book 1 of the Contract Documents:

(1) The Contractor will keep himself/herself informed at all times as to the details and progress of the work, both at the premises and in shops where materials for the work are being manufactured and he or she will be responsible for all delays that may result from his or her failure to furnish and install his or her work or the work of any of his or her subcontractors at the proper time.

9. GENERAL SAFETY PROVISIONS

A. The Contractor will conduct his or her operations in a manner that will provide maximum protection from damage to adjacent structures, utilities or services, to traffic adjacent to his operations, and to adjoining and adjacent public or private properties utilized or otherwise involved in the prosecution of the work. The Contractor's plans to provide the aforementioned protection will be subject to approval of the Commissioner. Approval by the Commissioner will not relieve the Contractor from full responsibility for all damage resulting from his or her operations.

10. SITE CONDITIONS

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. The Contractor will satisfy himself/herself prior to bidding, by such methods as he or she may prefer, as to the nature of conditions, including any obstructions, which may be encountered during the work. No allowance will be made to the Contractor for any extra labor and/or materials required because of site conditions of discrepancies which might have been foreseen by a thorough and proper inspection of the site.

11. OCCUPANCY INTERFERENCES

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. Work will be carried on in such manner as to interfere as little as possible with the normal conduct of business in or around the portions of the station platform.

C. The Contractor will serve written notification to the Commissioner of any anticipated interruption in facilities at least two (2) weeks prior to disruption of services, allowing for temporary relocation of personnel, operations and equipment during the program of the work, and will be for such periods, as designated and approved by the Commissioner.

D. At no time will vehicle, pedestrian, or CTA train traffic be interrupted or blocked by the Contractor without the prior written consent of the Commissioner.

E. Storage of all material and/or equipment will be located in areas as designated and approved by the Commissioner, with protective metal and concrete barriers and gates as required by the Commissioner.

12. CARE OF EXISTING STRUCTURES AND PROPERTY AND CONTRACTOR'S LIABILITY

A. This section supplements the provisions of Book 1 of the Contract Documents:

(1) Liability for Damages to City-Owned Property: The extent of the liability of the Contractor for damages to City owned property is dependent upon the kind of city-owned structure and the character of the work to be performed under the Contract as follows:

a. The Contractor will not be permitted to perform work on City-owned water mains, connections and appurtenances or on any City-owned electrical conduit, cables vaults and appurtenances unless any such structure has been abandoned by the City and work on such abandoned structure is required by the Contract or ordered by the Commissioner.

b. Wherever in the performance of the work under the Contract, it will be necessary because of the nature of the work required by the Contract or because of the Contractor's method of performing the work to support, remove, replace, relocate, rearrange, adjust or repair such City owned structures located entirely outside of said excavations. The Contractor will notify the appropriate City Department to perform such work, and will cooperate with such department in preserving service in or through the same. The Contractor will reimburse the appropriate City Department for the cost of performing such work, and such cost will be included in the various Contract prices.

13. EXISTING UTILITIES. SPECIAL PROVISIONS

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. In the event that existing utilities are not shown on the Drawings and are encountered within the site of the work to be done under this Contract, it is suggested that the bidder consult the Board of Underground Work of Public Utilities of Chicago, the City of Chicago, and the Illinois Department of Transportation, and determine for himself/herself whether or not the utility owners plan to abandon or maintain the utilities in service during the work. It is to be understood, however, that there is no expressed implied guarantee by the City of Chicago, or by the Board of Underground Work of Public Utilities of Chicago or their respective representatives, as to the accuracy or completeness of any such information.

C. The following utility companies or agencies are known to have facilities within the limits of this improvement:

- ComEd
- AT&T
- Comcast
- Ameritech
- RCN
- CTA

- Negative Street Car Rails
- Level 3
- Adesta
- Peoples Gas Light & Coke Co.
- City of Chicago Department of Streets and Sanitation, Bureau of Electricity
- City of Chicago Department of Water Management
- City of Chicago, Office of Emergency Management and Communication

D. The Contractor will make his or her own investigation to determine the existence, nature and exact location of all utility lines and appurtenances within the limits of this improvement. The cost of this work will be considered incidental to the Contract.

E. Due care should be exercised by the Contractor to avoid damaging any power, telephone, gas, water or sewer lines near the construction operations. Any utility damaged by the Contractor during construction of the improvement will be repaired at the Contractor's expense and to the satisfaction of the utility company(s) and the Commissioner.

14. FIELD CHECK OF DIMENSIONS, CUTTING AND PATCHING

A. This section supplements the provisions of Book 1 of the Contract Documents:

(1) "Unless shown or specified to the contrary, new work will match corresponding existing work in all respects. New work which engages with existing work will be joined therewith in a careful and workmanlike manner, properly aligned with existing work, and finished so as to leave no evidence of patching. Execute removals, replacement, and repairs in existing work that are required or necessary to make such engagements in a manner satisfactory to the Commissioner."

15. TEMPORARY SERVICES AND UTILITIES

A. This section supplements the provisions of Book 1 of the Contract Documents:

(1) General:

a. The Contractor will be responsible for arranging and providing all general services and temporary facilities as specified herein and as required for the proper and expeditious prosecution of the work. The Contractor will pay all costs for such general services and temporary facilities, until date of occupancy by the City.

b. Temporary connections for water, electricity and heat including installation, maintenance and removal of such facilities will be at the Contractor's expense. The Contractor will pay the cost of all water, gas, telephone, and electricity service during the construction period.

(2) Temporary Toilets:

a. The Contractor will provide chemical toilet facilities for all workmen employed on the project as soon as operations commence. Toilet facilities will be serviced twice weekly, which will include draining the tank and refilling and disinfecting the interior of each unit, and keeping each unit stocked with toilet paper. Toilet facilities will be maintained during the term of the construction period and removed upon completion of the work. The chemical toilets will be located in an area approved by the Commissioner.

(3) Electrical Services:

a. In addition to the requirements under Book 1 of the Contract Documents, the Contractor will be permitted to use the existing electrical service for power and lighting as required by all workmen. Using trades will furnish their own extension cords, lights, generators, or pumps where other current characteristics are required. The Contractor will pay all energy costs generated, for power and lighting, when using existing service.

b. If subcontractors, or separate contractors, require special electric power for facilities beyond that provided for herein for such items as large pumps, welding machines, special hoists, etc., they will arrange and pay for the installation of such facilities and arrange with the Contractor for the payment of any additional cost thereof.

c. It is understood that when the permanent electric power and lighting systems are used for temporary power and lighting for construction purposes, the Contractor will (1) obtain the approval of the Commissioner; (2) assume full responsibility for the power and lighting systems used and (3) pay all costs for restoring electrical facilities to existing condition upon completion of the work.

d. At the completion of the construction work all temporary wiring, lighting and other temporary electrical equipment and devices will be removed by the Contractor and those of his subcontractors. Any damage to existing facilities will be restored as required.

(4) Temporary Heat:

a. The Contractor will be responsible for temporary heating as required during construction to protect the work from frost damage; also to ensure suitable working conditions for the construction operations of all trades. In areas of the station where work is being conducted, the temperature will be maintained as specified in various Sections of the Specifications but not less the 45º F.

b. The Contractor will provide adequate ventilation to prevent the accumulation of excess moisture in the area of work.

c. It is understood that when the permanent heating system is used for temporary heat for construction purposes, the Contractor will (1) obtain the approval of the Commissioner; (2) assume responsibility for the use of the existing system and (3) pay all costs for restoring heating system to existing condition upon completion of the work.

d. Upon conclusion of the temporary heating period, the Contractor will remove all temporary piping and facilities, and recondition those parts of the permanent heating system used for temporary service.

(5) Water:

a. The Contractor will provide temporary water connections as required for drinking and construction purposes. It is understood that the Contractor will be fully responsible for the parts of the permanent water system used as temporary facilities and that such facilities will be maintained in working order during the construction period and cleaned and restored to original condition upon completion of the Work.

b. The Contractor will note that the Commissioner reserves the right to regulate the use of water and may impose restrictions on the use in the event water is being used carelessly by the Contractor.

16. TEMPORARY CONSTRUCTION FACILITIES

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. Temporary Field Office:

It is hereby understood and agreed to that the Contractor will furnish and maintain a heated and air conditioned space for the duration of the project starting thirty (30) days after Construction Notice to Proceed is issued to thirty (30) calendar days after the completion of the "Punch List" (including all time extensions) the following equipment for the sole use of City personnel. All equipment is to be installed and fully operational at least seven (7) days prior to the start of construction at the site. Submit catalogue cuts for approvals.

(1) Office Trailer:

The Contractor will provide a temporary field office for the sole use of City personnel (see section C for size requirements).

(2) Office Equipment:

The Contractor is to provide all labor, material, and equipment necessary to install and operate the following equipment in locations as directed by the City representative. Catalogue cuts are to be submitted for all items for Commissioners approval prior to purchase and installation.

a. Copying Machine (rented with service contract):

The copier will be acceptable to *Canon Image Runner 550 or approved equal.* An independent copier stand will also be provided. The Contractor will provide legal letter and tabloid size paper and cartridges as required throughout the duration of construction up to 30 calendar days after the completion of "Punch List". Legal and letter trays are to be provided. A maintenance contract will be provided for the machine and will include monthly servicing and repair as required. In the event the copier is not operational for a period of more than three days it will be replaced with an equal unit.

b. Computer and Printer(s):

A service contract will be provided for all computers and will include installation (including software) and repair/replacement as required. In the event a computer or peripheral equipment is not operational for a period of more than three days it will be replaced with an equal unit. The Contractor will supply all computer paper and/or cartridges in sizes as required. The Contractor will pay for 4-year extended service plan. All cell phones, computer

and camera hardware and software will become the property of the City of Chicago.

1.) (2) Laptop computer(s):

Lenovo ThinkPad X1 Carbon Gen 7 (14”) laptop or approved equal. Provide product data for approval prior to purchase

2.) Printer(s):

(1)HP Color LaserJet 5000 Printer or approved equal. Provide product data for approval prior to purchase

3.) (1) Double Printer Stand(s):

Holds two printers
Two separate heavy gauge steel paper catch baskets
Paper Feed Trays Included
Overall Dimensions 22" W X 41-3/4" H X 35" D
Color: Putty, Bretford E4-UNI5-PB.

4.) Software (latest version available):

Provide product data for approval prior to purchase
All software licenses must be of the individual stand-alone user type.

(2) Adobe Creative Suite (latest version)

5.) Provide broadband Internet with Wi-Fi and minimum download speed of 500 Mbps for field office with local provider for project duration up to 30 calendar days after completion of all ‘Punch List’ work.

6.) Miscellaneous:

a.) Provide all cables and connections as required to provide an operational system.

b.) Provide heavy vinyl dust covers for all equipment.

c.) Provide security cables for all equipment.

d.) All computers are to be networked together using an ethernet switching box. The Contractor is to provide all labor, material

and equipment as required for a complete installation.

e.) (150) CD-R Disks w/ covers
(50) CD-RW Disks w/ covers
(50) DVD-R Disks w/ covers

c. (1) Plan Table:

3'-6" X 6'-0" minimum; all surfaces are to be laminate finished. Make-shift plywood tables will not be accepted.

d. Modular Work Station and Office Equipment:

1.) Basic Construction:

10" tubular web angle bases with 1" X 1" tubular reinforcements.
20 gauge web and full width steel modesty panels.
1-3/8" radius corners.
1-1/4" non-glare, high pressure laminated tops.
Adjustable leveling guides.
Color: Putty with oak laminate.
Global "Premium Series,".

2.) Units to be Provided:

a.) (1) Drafting Table(s):

14 Tilt positions from 0^{o} - 60^{o}
Automatically lock in place
48" Lower Shelf with 48" Parallel Rule
Overall Dimensions
48" W X 30" D X 27- 30" H

b.) (2) Corner Workstation(s):

Roll-out Keyboard Platform
Overall Dimensions
26-1/2" W X 39-3/4" D X 27-30" H

c.) (2) Studio Workstation Type #1:

[Components for Each Workstation]
(1) Workstation (Overall Dimensions 60" x 30")
(1) Box-Drawer Pedestal (Dimensions 15" W x 19" D x 17 " H)
(1) File/Pencil Pedestal (Dimensions 15" W x 19" D x 17 " H)
(1) Workstation Organizer (Dimensions 60" x 15" x 31-1/2" H)

d.) (1) Studio Workstation Type #2:

[Components for Each Workstation]
(1) Workstation (Overall Dimensions 48" x 30")
(1) File/Pencil Pedestal (Dimensions 15" W x 19" D x 17 " H)
(1) 48" Shelf

e.) Fire-rated File Cabinets:

(2) 6-drawer fire-rated legal size lateral file cabinets with locks.
Overall Dimensions
36" W X 75-7/8" H X 16-3/4" D
Locking doors.
Color: Putty
Six (6) sets hanging file racks
Three (3) sets shelf dividers
Fire-rated equivalent of HON E4-626CN-Q.

f.) Plan Racks:

1.) (30) Hanging Clamps:
Extruded aluminum clamps allowing 1" minimum opening.
20 lb. minimum holding weight.
Clear plastic label holders and black end caps. 36" length. Safco E4-5004-6.

2.) (3) Wall Racks:

Bolts to wall and extends 12".
Holds up to 12 hanging clamps.
Color: Sand. Safco E4-5030.

g.) (1) Water Cooler(s) with Integral Refrigerator:

The Contractor will rent a combined water cooler and refrigerator with a minimum usable space of 2 cubic feet, and a separate hot and cold water tap. The Contractor will have a service contract with a bottled water supplier to provide water as needed. In the event the cooler becomes nonoperational for more than three (3) days it will be replaced with an equal unit.

h.) (1) Storage Cabinet(s):

Overall Dimensions
78" H X 36" W X 24" D. Color: Putty
Lock included. HARPERS E4-7824 GY.

i.) Wall Clock(s):

1.) (3) Standard:

Quartz movement / battery operated
Overall Dimensions:
12-3/4" DIA X 2-1/4" D.
Color: Black case, white face with black numerals. Howard Miller K4-622-819.

j.) Bulletin Board(s):

1.) (3) 24" X 36"
Aluminum framed.
1/16" cork facing
Quartet.

2.) (0) 48" X 96"
Aluminum framed.
1/16" cork facing.
Quartet.

k.) (1) Mark and Wipe Board(s):

6' W x 4' H.
Aluminum Frame.
(1) Dry erase kit per board (including 4 fine point markers, 4 chisel point markers, eraser, and cleaner).
Quartet J4-S537.

l.) (3) Adjustable Lamp(s):

Adjustable arm with 9-1/2" diameter shade, inner reflector and porcelain socket.
Combination lamp with 22 watt fluorescent tube and 60 watt incandescent bulb.
Clamp on bracket. (1) floor stand for lamp & (2) replacement fluorescent lamps for each fixture. Color: Black
Luxo Ledu K4-LC1A-BK.

m.) Conference Table and Chairs:

1.) (10) Chairs:
Scuff resistant color molded polypropylene seat and back with anti-static additive.
5/8" steel tube framing, stackable.
Overall Dimensions 21" W X 30-3/4" H X 17" D. Color: Blue Samsonite E4-2306-02-95.

2.) (1) Table(s):
Pedestal leg folding table. 5/8" thick abrasion resistant laminated top. Plastic Floor Guides.
Overall Dimensions 36"W X 96" L.
Color: Brown Samsonite 4-7211-01-66.

n.) (4) Desk Chair(s):

High Back Swivel-Tilt Chairs:
Overall Dimensions: Seat 20" W X 18"D; Back 20-1/2" W X 19" H. Color: Black frame with Gray fabric.
HON E4-4001-GG16T.

o.) (1) Drafting Stool(s):

Mid-Back Swivel Stool
Overall Dimensions:
Seat 19"W X 18"D; Back 15-3/4"X15"H
Seat Height: 19" to 27"
Color: Gray
Vogel Peterson VOG-55234.

p.) (5) Waste Basket(s):

Molded in-color plastic.
Overall Dimensions:
14-1/4" W X 15" H X 10-1/4" D
Color: Putty
Rubbermaid K6-R2956-82.

q.) Telephones:

The Contractor is to provide the following telephone equipment and services. The Contractor will pay for all billings. Cellular type telephones will become property of the City

1.) (4) Telephone for Three Line installation:

Panasonic KX-T3170.

2.) Telephone Services:
a.) touch tone service
b.) conference calling
c.) Voicemail for (4) persons
d.) Broadband connection (DSL)

3.) Phone Lines:
(3) Independent phone lines; one line is to be a dedicated fax line.

r.) (1) Fax Machine:

The Contractor is to provide an *HP Office Jet* plain paper fax machine. The Contractor will supply all paper in sizes as requested and toner cartridges as required. The Contractor will pay for all rental and maintenance fees. In the event the fax machine is not operational for a period of more than three days it will be replaced with an equal unit.

s.) (2) External Hard Drives

The Contractor is to provide two external Hard-drives of type Western Digital 4TB Elements Portable External Hard Drive or approved equal for project file storage Contractor to provide product data for approval prior to purchase. Hard drives will become property of the City.

t.) (0) Plan Files and (0) Bases

Flat File. Steel five-drawer with dust covers for 36" x 48" sheets. Steel flush bases for 36" x 48" size files. Mayline MA7869D-1 Files and MA7869W-1 Bases.
Plan files and bases will become the property of the City of Chicago

(3) Security/Fire Alarm System:

The Contractor will provide an independent security/fire alarm system for the City representative's trailer. Local sensing devices will be installed at all doors and windows and motion detectors will be installed in each main room of the trailer. In addition, smoke and heat detectors will be

installed in each main room. In the event of a break-in or fire, a local alarm will sound and, at the same time, a central security station (police or independent) will be notified via an independent phone line. All keys for the system will be transmitted to the City's representative. The Contractor will have a service/maintenance contract with the installer and pay for all billings.

C. Office Trailer Space Requirements:

The space requirement of the city's field office use is to be a minimum of 1200 Sq. Ft.. The City has final approval as to the size, location and quality of the field office space to be provided. Office equipment and space is to be provided for the exclusive use of City personnel as noted herein.

D. Parking:

The Contractor will provide for (2) reserved parking spaces for the exclusive use of City's representatives. The spaces will be conveniently located in the vicinity of the City representative's office. The Contractor will provide a total of (2) leased parking spaces in a parking garage. The parking spaces must be approved by the resident engineer before renting. The space(s) will be leased for the time beginning seven (7) days prior to the start of construction at the site until thirty (30) days after the completion of the "Punch List" (including all time extensions). The City will have final approval as to the location and quality of the leased parking spaces.

E. Moving of City Equipment:

The Contractor will provide labor to pick up, load, transport, and unload City personnel files and equipment at the start and completion of the project. Pick up and drop off locations and dates will be determined by the City.

17. TEMPORARY STAIRS, LADDERS, ETC.

A. This section supplements the provisions of Book 1 of the Contract Documents, no hoist, scaffolding or other equipment will be erected at such location as will interfere with or affect street or pedestrian traffic, CTA trains or passengers unless previously approved by the Commissioner.

18. TEMPORARY BARRICADES, ENCLOSURES, ETC.

A. This section supplements the provisions of Book 1 of the Contract Documents, the Contractor will provide temporary barricades or enclosures as required during the progress of the work to protect the

public and Contractor's personnel as directed or deemed necessary, at street level and/or track level. Barricades must be maintained in “new” condition.

B. Temporary work screens or enclosures will be provided, erected and maintained by the Contractor, to separate pedestrian and vehicle traffic, building areas, CTA passengers and trains free of debris, dirt, etc. resulting from this work, including provisions of all required covered canopy protection for passerby and station occupant against all danger of injury, as approved by the Commissioner, especially from falling objects.

C. All protective measures will be erected and maintained in accordance with the requirements of City, State, and Federal authorities and as directed by the Commissioner. All lumber will be AC grade and fire rated.

D. Existing building entrances in the area of work will be secured and protected by temporary barricades with canopies in accordance with IDOT Standards.

E. All graffiti that appears on any portion of the project exposed to the public will be removed immediately upon discovering of such graffiti. Failure to remove graffiti within 24 hours of written notice by the City, the City will take action to remove graffiti and all costs will be borne by the Contractor.

F. The Contractor will be responsible for graffiti removal and maintenance within contract limit lines from the time of Notice to Proceed to completion of Final Punch List.

19. WELDING

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. No welding, flame cutting, or other operations involving use of flame, arcs, or sparking devices, will be allowed without adequate protection, subject to approval of the Commissioner, and without prior notification to CDOT and CTA.

C. All combustible or flammable material will be removed from immediate working area. If removal is impossible all flammable or combustible materials will be protected with an asbestos fire blanket or suitable non-combustible shield to prevent sparks, flames, or hot metal from reaching flammable or combustible materials.

D. The Contractor will provide necessary personnel and equipment to control incipient fires resulting from welding, flames cutting, or other sources involving use of flame, arcs, or sparking devices.

E. The Contractor will protect the public and vehicular traffic from any overhead welding being performed.

20. WELDER'S CERTIFICATIONS

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. All welders for any portion of the project, whether field or shop, will be recertified specifically for this project. There will be no exceptions to this requirement unless so authorized by the City.

21. PAYMENT FOR CONTRACT CHANGES

A. Any proposed changes in this Construction Contract will be submitted to the Commissioner for his/her prior written approval. Additional work on this contract will be performed either on a proposal, unit price or force account basis.

B. All claims for contract changes in this Construction Contract will be submitted to the Commissioner within thirty (30) days of the Contract Completion date as defined in the Time of Completion section in the Proposal Pages. Claims not submitted within thirty (30) days will not be accepted.

22. CERTIFIED PAYROLLS - CONSTRUCTION PROJECTS

A. The Commissioner will obtain for each Contractor and subcontractor a certified copy of each weekly payroll within seven days after the regular payroll date. Following a review by the Commissioner for compliance with State and Federal labor laws, the payroll copy will be retained at the project site for later review. A Contractor may use the Department of Labor Form WH-347, "Optional Payroll Form", which provides for all the necessary payroll information and certifications. This Department of Labor form may be purchased at nominal cost from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. However, the Contractor may use his own payroll form provided it includes the same information and certifications as the Department of Labor Form WH-348, "Statement of Compliance".

23. SAMPLES

A. The Contractor will submit, to the Commissioner, samples of all materials, equipment, fixtures, appliances and other fittings, as required in the various sections of the specifications, with such promptness as to cause no delay in the work, allowing sufficient time for review and approval. The Commissioner will review and check such samples, but only for conformance with the design concept of the project. The Commissioner's determination will be final and binding.

B. Unless otherwise specified, all samples will be submitted in triplicate, of adequate size showing quality, type, color range, finish, texture, etc. The contractor will label each sample with material name and other pertinent data.

C. Where specifications require manufacturer's printed installation directions, the Contractor will submit to the Commissioner four (4) copies of such directions submitted with samples for approval. Duplicate signed transmittal letter requesting approval off samples will be submitted with all samples.

D. All transactions with manufacturers, material providers, dealers will be only through the Contractor and the Contractor will secure the Commissioner's written approval prior to ordering any materials. All materials furnished for the project must be as represented by the approved samples. All

delivery or other charges will be prepaid before acceptance by the Commissioner for approval.

24. ADJUSTMENT OF EQUIPMENT

A. Before the work is turned over to the City, the Contractor will furnish necessary instruments, test equipment, services and personnel required to adjust and balance each piece of equipment in order to leave the work as a smoothly functioning, well integrated system complying with the letter and intent of the Contract Documents.

25. OPERATION AND MAINTENANCE INSTRUCTION

A. The Contractor will provide the service of competent engineers or certified trained installation and maintenance personnel to adequately train the City and CTA's employees in proper operation and maintenance of all systems.

B. Instructors will devote their full time to a training program as required. Observation of construction by the City or CTA personnel will not be construed as instruction time. Ratio of time involved will be approximately 25% classroom and 75% on-the-job instruction, except that ratio may be reversed for control systems. Manufacturer's literature and copies of approved posted instructions will be used as a basis for training.

C. The Contractor will submit proposed scope of material and instruction schedule to the Commissioner for review and approval approximately 90 days before completion of the work. Mutually agreeable dates for receiving this training by employees will be arranged through the Commissioner.

26. OPERATION AND MAINTENANCE MANUALS

A. Not less than 30 days before completion of the work, the Contractor will furnish a complete list of equipment actually installed, especially of the type having nameplate data. List will include a copy of pertinent nameplate data, name and address of local representative who stocks or furnishes repair or replacement parts, and name, address, and telephone number of the subcontractor responsible for the equipment under the

guarantee.

B. The Contractor will submit suitable operating instructions for each major component of equipment and its controls. Instructions will include a schematic system or riser diagram accurately showing equipment and controls as installed. Included with diagram will be a set of simple operating instructions stating how system will be stopped and started, what adjustments are to be made by the operator, and what to do in case of emergency. Sequence of operation designated in the Contract Documents will be used as basis for operating instructions. Valves, switches, operators, and control points will be clearly numbered or labeled and these numbers or labels reflected in the instructions. Two copies of proposed instructions will be submitted to the Commissioner for approval. Upon approval, the Contractor will post applicable instructions.

C. The Contractor will submit maintenance data prepared by the manufacturer of each major component of equipment and its controls.

Data will include complete parts listed, itemized list of common purchase items of materials, such as bearings, packing, connectors, sealing devices, and other standard items indicated by their standard trade designation, recommended routine and inspection maintenance, including testing recommendations to evaluate efficiency of performance, list of special tools and gauges, lubricating instructions, and recommended spare parts list, important tolerances and clearances required for maintenance, and troubleshooting guides prepared in a simple format to indicate complaint or problem, probable cause and remedy.

D. The Contractor will submit 12 copies of approved operating instructions and maintenance data to the Commissioner. Material will be bound neatly in identical vinyl-covered loose-leaf binders with appropriate index tabs.

27. PROJECT SIGN

A. The Contractor will provide, erect and maintain a sign satisfactory to the Commissioner identifying the project (photo image provided by CDOT) and indicating federal, state and/or city participation.

B. One sign will be erected at each major entrance to the project (minimum of 2 locations) for maximum public identification of the work and will be maintained in good condition until completion of the project. Upon project completion, the signs will be removed.

C. Signs are to be cut from standard 4' x 8' waterproof plywood sheets, or other suitable material with Plexiglas protective cover.

D. No information will be included on the project signs except that approved.

E. The Contractor will also provide and erect and maintain City of Chicago, Department of Transportation signs satisfactory to the Commissioner of Transportation which meets all the requirements in paragraphs B thru D (inclusive) above. Examples are at current CDOT Transit construction sites.

F. The Contractor to remove any graffiti within 24 hours.

28. SOILS AND SUBSURFACE INFORMATION

A. Where soil borings, test pits, or other sub surfaces information are included in the Contract documents, the information pertaining thereto is believed to be reasonably correct, but the City does not guarantee the accuracy of completeness of such information. Additional information or data on the subsurface conditions may subsequently become available. Upon the request of the Contractor, such information which may be on file will be made available for inspection at the CDOT; however, while the information pertaining thereto is believed to be reasonably correct, the City does not guarantee the accuracy or completeness of such information.

B. The subsurface information represents only that encountered within the relatively small area of subsurface actually investigated and may not be indicative of the subsurface conditions which will be encountered during construction. This information was prepared as an aid to the designers of the project and is only included or made available for the convenience of the Contractor. This information is not intended to reflect subsurface conditions as they may affect actual construction procedures. The Contractor will interpret this information according to his/her own judgement and not rely upon it as accurately descriptive of subsurface conditions as they are and/or which may be found to exist.

C. The City does not take any responsibility in regard to the nature of the subsurface conditions which may be encountered during construction. The Contractor will satisfy himself prior to bidding, by such methods as he or she may prefer, as to the nature of the subsurface conditions, including any obstructions, which may be encountered during construction.

29. SALVAGED MATERIAL

A. Prior to demolition, the Contractor will inventory all items to be removed. From this inventory, CDOT will list all items the Contractor will salvage and deliver to CTA West Shop. Care will be taken by the Contractor to prevent damage in his/her handling of these items and appurtenances.

30. PUBLIC CONVENIENCE

A. The Contractor will be required to notify the Commissioner in writing a minimum of four working days before beginning any construction stage that will require a change in street traffic patterns. This notification is necessary to allow sufficient time for the City to notify the public

B. Copies of all notifications to the various agencies not submitted directly to the Commissioner will be forwarded to the Commissioner.

31. WEEKLY CONSTRUCTION PROGRESS MEETING

A. There will be a weekly construction progress meeting at the Contractor's

temporary field office to review the project's progress and to discuss any problems or concerns. The Contractor will submit and explain his/her two week work schedule. There will be in attendance on regular basis appropriate representatives from the public sector, Contractor, CDOT and its Consultant, and other representatives, and on an as-needed basis others, including Design Engineers and Construction assistance personnel when requested by CDOT.

32. CONTRACTOR'S RESPONSIBILITY FOR WORK

A. The Contractor's responsibility for the work prior to final acceptance by the Commissioner. Since the roadway; are open to traffic, it will be the Contractor's responsibility to restore, rebuild, or repair any damage to his or her work caused by such traffic without additional cost to the Commissioner. No extra compensation will be allowed for these provisions and any work performed hereunder will be considered incidental to the Contract.

B. All materials or plant used in the construction of the work will be so placed as to safeguard traffic on streets and alleys adjacent to the site of the work, and so as to allow free access to all fire hydrants, water valves, manholes that are a part of electric, telegraph and telephone conduit lines, and all fire alarm and police call boxes in the vicinity.

33. FINAL ACCEPTANCE

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. At substantial completion, completion of punch list, and prior to final acceptance the Contractor will clean (3) three times all areas within the contract limits. This will include removal of graffiti, debris, and stains.

C. Final acceptance by CDOT will be contingent on the work (including punchlist items) and record documentation (As-Built Drawings) being completed in every respect. In addition to the normal contract closeout documents required as stated in the Contract Documents, the Contractor will employ must submit record documentation (As-Built Drawings) of the project as described below:

1. The As-Built Drawings must be a complete set of drawings in the same format of the Bid Drawings with all disciplines and sheets represented. The As- Built Drawings must be entirely generated by the contractor and subcontractors depicting exactly how the project was built. Markup’s on bid drawings will NOT be accepted as part of an As-Built drawing.

2. Contractor must submit One (1) set of full size print outs As-Built Drawings.

3. Contractor must submit Two (2) flash drives containing CAD (AutoCAD) files of each sheet of the As-Built Drawing set. Each sheet of

the set must be an individual CAD file with all external references and attachments included such that the sheet can be printed directly from the disc.

4. Contractor must submit Two (2) flash drives containing PDF (Adobe) files of each sheet of the As-Built Drawing set. Each sheet of the set must be an individual PDF. The disc should also contain a file which is contains all sheets combined in a single file.

5. The Contractor is required to submit monthly in-progress as-built drawings to the Commissioner for review depicting work completed in that calendar month.

34. TIME SCHEDULE PROSECUTION OF THE WORK

A. The Contractor will submit a progress schedule in the form commonly known as the "Critical Path Method".

B. General Factors in the Preparation of the "Critical Path Method" (CPM):

(1) The activities noted on the CPM will be the same as those items noted on the payment breakdown. The schedule will be used in conjunction to determine status of payment.

(2) J Node Numbers will correspond to the succeeding I Node Numbers.

(3) The schedule will take into account all official union holidays which pertain to the trades performing the work.

(4) The Contractor will incorporate into the schedule all utility relocations which may be performed by other contractors or utilities. The Contractor is responsible for verifying the duration required for each utility relocation.

(5) The Contractor will take into account the seasonal availability of a product and/or the temperature and humidity restrictions of a product when preparing the schedule.

(6) It is further understood and agreed to that no work is to begin at the site until a schedule has been submitted and approved by the City.

C. Submittals:

(1) For all submittals, the Contractor will take into account all scheduled City of Chicago holidays. A list of these holidays may be obtained from the Commissioner.

(2) Submittals will be reviewed by the City in a timely fashion but the time frames for each review will vary depending on the complexity

of the submittal.

(3) The Contractor will allocate time for each submittal to allow for the possibility of rejection and resubmittal.

D. CPM Chart:

The Contractor will submit a Critical Path Schedule in a bar chart format with time frames delineated. The chart will be color delineated (using different colors for each) to show "Critical" activities, "Next-to-Critical" activities, and "Normal" activities. The following information is to be visually noted on the CPM chart.

(1) Activity Name.

(2) I Node Numbers for Each Activity or Predecessors for Each Activity.

(3) J Node Numbers for Each Activity or Successors for Each Activity
(4) Critical Activities.

(5) Next-to-Critical Activities.

(6) Dependent Activities Connected by "Dependency Lines".

(7) Manpower for Each Activity (Including Trade Designation).

E. CPM Spreadsheet:

The Contractor will submit a Critical Path Schedule Spreadsheet indicating the following information for each activity. The spreadsheet will be color delineated (using different colors for each) to show "Critical" activities, "Next-to-Critical" activities, and "Normal" activities.

(1) I Node Number.

(2) J Node Number.

(3) Activity Description.

(4) Percent Completed.

(5) Duration.

(6) Early Start Date.

(7) Early Finish Date.

(8) Late Start Date.

(9) Late Finish Date

(10) Manpower for (Including Trade Designation).

(11) Preceding Activities.

(12) Succeeding Activities.

F. Submittal of CPM Chart and Spreadsheet:

(1) The CPM Chart and Spreadsheet will be submitted to the Commissioner within 14 calendar days AFTER NOTICE TO PROCEED. The Contractor will not be allowed to commence site operations until an acceptable CPM chart and spreadsheet have been submitted.

(2) The Contractor is to submit an updated CPM Chart and Spreadsheet to the Commissioner as follows:

a. For Projects with Contract Durations of 90 Calendar/Working Days or Less: Submit an updated CPM Chart and Spreadsheet at 40% completion and 80% completion (based on the payment voucher).

b. For Projects with Contract Durations of More than 90 Calendar/Working Days but Less than 180 Calendar/Working Days:

Submit an updated CPM Chart and Spreadsheet at 25% completion, 50% completion and 75% completion (based on the payment voucher).

c. For Projects with Contract Durations of More than 180 Calendar/Working Days:

Submit an updated CPM Chart and Spreadsheet monthly.

d. With each "Request for Time Extension" as noted below.

e. As requested by the City of Chicago.

f. Partial payment may be withheld at the discretion of the Commissioner if the updated CPM Chart and Spreadsheet has not been submitted as specified in (2) above.

G. Request for Time Extensions:

In the event the Contractor considers that the project has been delayed due to actions initiated by the City of Chicago then a "Request for Time Extension" is to be submitted in writing to the Commissioner. The request is to specifically indicate the activities which the Contractor considers to have delayed the project and indicate all preceding and succeeding events for each activity which was affected. In addition, the Contractor is

to submit a revised and updated CPM Chart and Spreadsheet including any new activities which the Contractor considers to have caused the delay. If the Contractor considers a duration of an existing activity to have been extended due to the City of Chicago then the delay is to be indicated on the chart and the spreadsheet as a new activity. Submittal of a time extension request after the ten (10) day period as noted in the contract will result in the request being waived and voided.

35. PUNCH LIST TIME OF COMPLETION

It is also understood and agreed that TIME IS OF THE ESSENCE IN CLOSING OUT THE JOB SITE WORK OF THIS CONTRACT, and the Contractor agrees to begin work immediately after receipt of formal comprehensive list of minor miscellaneous or finishing work also known as "Punch List" work.

A. Request for "Substantial Completion":

Upon completion of the contract work, the Contractor will submit a written notice to the City requesting "Inspection for Substantial Completion". If the City considers the project to be at an acceptable state of completion a "Substantial Completion" review will be scheduled and conducted. The City will compile and issue a formal Punch List and a "Date of Substantial Completion" letter to the Contractor. From the day of receipt of the Punch List the Contractor will have five (5) calendar days (excluding Saturday and Sunday) to issue the Punch List to the subcontractors and to respond to the City regarding any disputed items as noted in Paragraph D.2 below.

B. Time of Completion:

It is further understood and agreed to that the Contractor has (30) calendar days to complete the Punch List. Failure to complete the designated Punch List work within the thirty day calendar day time frame will result in the assessment of liquidated damages as herein stated. The thirty calendar day time frame will begin after the third day after the issuance of the Punch List to the Contractor

For the Punch List time frame, "calendar days" are to be defined as noted in the Contract. It will be noted that Saturdays, Sundays, and Holidays will be charged as calendar days.

C. Deficient Work Found After Issuance of Punch List:

It is further understood and agreed that the issuance of the Punch List in no way relieves the Contractor from guarantee/warranty work or from incomplete or deficient contract work which may be found after the issuance of the Punch List.

D. Exceptions to Thirty Calendar Days:

1. Revision Work:

In the event the City issues revision work and the time to complete

said work, due to delivery times or duration of the work, exceeds the established thirty calendar days an independent "Time of Completion" is to be determined for that specific work. If the Contractor fails to meet the independent completion date, then liquidated damages will be assessed as herein stated.

2. Disputes:

In the event the Contractor interprets work indicated on the Punch List as "change work" the City is to be so notified in writing and no later than five (5) calendar days after the issuance of the Punch List. If the City acknowledges that the work in question is "change work" then an independent completion date will be determined as noted in Paragraph 1 above. If the City considered the work in question to be "Punch List" work, then the Contractor is to complete the work within the established thirty calendar day time frame.

3. Completion of Construction Prior to Completion Date:

If the Contractor completes all construction and requests a "Substantial Completion Review" and can complete the issued Punch List and, if issued, revision work, within the originally established "Time of Completion" or formally extended completion dates (time extensions) then the thirty calendar day time frames and associated liquidated damages as noted in Paragraph A above will be voided.

E. Submittal of Documentation:

It is further understood and agreed to that all warranties, guaranties, operating and maintenance manuals, final certified payrolls, and all as-built drawings will be submitted within sixty (60) calendar days from the date of substantial completion (Saturdays and Sundays included). Failure to submit all the documentation within the specified time frame will result in the assessment of liquidated damages as herein stated.

36. SUBSTITUTIONS OF MATERIALS, EQUIPMENT OR PROCESS

A. The Contract executed here under requires the use of the materials, equipment or processes specifically named in the Contract Documents except as otherwise provided herein. The word "processes" as used herein includes methods or systems of construction.

(1) When two or more products are specified for an item of work, anyone thereof is acceptable and the choice is left up to the Contractor.

(2) When only one product is specified, the Contractor may offer for approval a substitute product which will completely accomplish the

purpose of the Contract Documents.

(3) When a specific process is specified as well as a guarantee of the results, the Contractor will, if in the Contractor's judgment the process may not produce the required result, submit for approval an alternative process which can be guaranteed. All such materials, equipment or processes substitutions will be made in writing in accordance with the following procedures:

a. Where several materials are specified by name for one use, select for use any of those specified.

b. Whenever an item or class of material are specified exclusively by trade name, manufacturers name, or by catalogue reference, use only such item, unless written approval for a substitution is secured.

c. Should the Contractor desire to substitute a product for one or more specified by name, the Contractor will request the substitution in writing with supporting data and, as required, samples. If the substitution affects other products or trades the Contractor will pay any and all direct or indirect additional costs (or submit a credit) to the City. The request will clearly state if there are additional costs or a credit involved with the substitution. The Commissioner reserves the right to approve or reject substitution requests.

d. Requests for approval of substitutions of materials, equipment or processes other than those specified will be accompanied by proof satisfactory to the City that:

1.) They are equal in quality and serviceability to the specified products.

2.) Their use will not entail changes in details and construction of related work.

3.) They are acceptable in consideration of the required design and the aesthetic appearance.

4.) There will be a cost and/or time advantage to the City.

B. The Contractor will furnish in writing with the substitution submittal all pertinent technical and cost data. Including complete data on the proposed substitution substantiating compliance with the Contract Documents, such as product identification and description, performance and test data, references and samples where applicable, and an itemized comparison of the proposed substitution with the products specified, with

data relating to contract time schedule, design and artistic effect where applicable and other information as may be required to assist the City in determining whether the proposed substitution is acceptable. The burden of proof will be solely the Contractor's responsibility.

C. All proposed substitutions will be submitted to the City in ample time to permit proper consideration by the City. Failure to submit the substitution as noted above will result in its automatic rejection.

37. SUBMITTAL OF COST AND CREDIT PROPOSALS

In additional to the 10 day notification period as described in the Contract, the Contractor is to submit all cost and credit proposals in accordance with the following time frames:

A. Proposals:

(1) Force Account Basis (Time and Material):

Proposals will be submitted in full within 30 calendar days after the completion of the work (last signed Time and Material). If the proposal has not been submitted within the 30 calendar day time frame then the proposal will be considered waived and voided. Late submittal of a proposal after the 30 calendar day time frame will not be entertained.

(2) Proposal Basis:

Proposals will be submitted in full within 30 calendar days after the issuance of a revision. If the proposal has not been submitted within the 30 calendar day time frame then the proposal will be considered waived and voided. Late submittal of a proposal after the 30 calendar day time frame will not be entertained.

B. Claims:

Claims are hereby defined as costs which the Contractor has determined to have resulted from an action by the Commissioner which was not formally issued as a revision to the Contract. Claims will be submitted within 30 calendar days after the occurrence of the event on which the Contractor is basing the additional costs. If the proposal has not been submitted within the 30 calendar day time frame then the claim will be considered waived and voided. Late submittal of a claim after the 30 calendar day time frame will not be entertained.

C. Credit Proposals:

In the event the Commissioner requests a credit for a portion or portions of the work which have been deleted from the Contract, the Contractor will submit a credit proposal within 30 calendar days after the written request has been issued. Failure to submit the credit proposal within the

30 day time frame will result in an estimated amount determined by the Commissioner being withheld from the next issued pay request.

D. Extensions to Time Frames for Proposals and Credits:

The Commissioner may grant extensions to the submittal time frames as noted above if the complexity of a proposal or credit so merits. The Contractor will request the extension in writing within the first five days of the noted time frames (excluding Saturdays and Sundays). The decision made by the Commissioner as to the acceptance or rejection of an extension is final. Requests for extensions will not be entertained for claims against the Contract.

38. VALUE ENGINEERING INCENTIVE

A. This clause applies to those Value Engineering Change Proposals (VECPs) which are initiated and developed by the Contractor to change the drawings, specifications, or other requirements of this Contract. In order to be accepted under this Section each VECP will:

(1) Be identified by the Contractor at the time of submission to the Commissioner as submitted pursuant to this Section;

(2) Be an original proposal by the Contractor, not one that is equivalent to another proposal already under consideration by the City, obtained from a source other than the Contractor;

(3) Require a change to this Contract;

(4) Decrease the contract price; and

(5) Maintain the items required functions such as service life, reliability, economy of operation, ease of maintenance, and necessary standardized features and appearance, and not require an unacceptable extension of contract time.

B. Any VECP the Contractor submits will be in sufficient detail to clearly define the proposed change including:

(1) A description of the difference between the existing and the proposed contract requirements, and the comparative advantages and disadvantages of each;

(2) Contract requirements recommended to be changed if the proposal is accepted;

(3) A detailed estimate of the amount of the savings as defined in paragraph E that will result from acceptance of the proposal;

(4) A prediction of any effects the proposed change would have on costs of maintenance and operations; and

(5) A statement of the time by which the proposal must be accepted so as to obtain the maximum price reduction, noting any effect upon the contract completion time.

C. The Commissioner may accept or reject part or all of any VECP by giving the Contractor written notice thereof. Until such notice is issued the Contractor will remain obligated to perform in accordance with the terms of the Contract. VECPs will be processed expeditiously, however, the City will not be liable for any delay in action upon any proposal submitted pursuant to this Section. The decision of the Chief Procurement Officer as to acceptance or rejection of any such proposal will be final and will not be subject to the "Disputes" section of this Contract.

D. The Contractor has the right to withdraw past or all of any VECP at any time prior to final acceptance. Such withdrawal will be made in writing to the Commissioner and the Chief Procurement Officer. Each VECP submitted by the Contractor will remain valid for a period of 60 days from date submitted. If the Contractor desires to withdraw the proposal prior to the expiration of this period he will be liable for the cost incurred by the City in reviewing the proposal.

E. When a VECP submitted pursuant to this Section is accepted:

(1) An equitable adjustment in the Contract price and in any other affected provisions of the Contract will be made and the Contract modified in accordance with this Section and the "Changes" or other applicable sections of this Contract;

(2) The gross savings resulting from the change will be shared between the Contractor and the City on the basis of 50 percent for the Contractor and 50 percent for the City. Only the contract savings from this Contract will be subject to the 50 percent sharing, not the savings from any concurrent or future contracts, nor any savings from collateral costs such as operations or maintenance of the facility. Estimate gross savings will include Contractor's labor, material, equipment, overhead, profit and bond. The contract unit price will be reduced by the sum of the City's share of the gross savings;

(3) The Contractor is entitled to share in contract savings only to the full extent provided for in this Section, and will not include any supplemental agreements to or other modifications of this Contract, executed subsequent to acceptance of the particular VECP, by which the City increases or decreases the quantity of any item, or adds or deletes any item.

F. The Contractor will use his best efforts to include Value Engineering arrangements in any subcontract, which in his judgment, appears to offer sufficient value engineering potential.

G. The Contractor may restrict the City's right to use any VECP data by marking it with the following statement:

This data, furnished pursuant to the Value Engineering section of this Contract, will not be duplicated used or disclosed in whole or in part for any purpose except to evaluate the VECP, unless the proposal is accepted by the City. This restriction does not limit the City's right to use information contained in this data if it is or has been obtained or is otherwise available from the Contractor or from another source, without limitations. When this proposal is accepted by the City, the City will have the right to duplicate, use, and disclose any data in any manner and for any purpose whatsoever, and have others do so whether under this or any other City contract.

39. TRAFFIC CONTROL / TRAFFIC PLAN

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. In the event the Contractor must close traffic lanes or sidewalks to complete the Contract work a "traffic plan" will be submitted indicating the following information:

1. Dates and times of intended closures.
2. A scale plan indicating where vehicular and pedestrian traffic is to be rerouted.
3. Locations and types of traffic control signage.
4. Locations and types of barricades to be used.
5. Positioning of Contractor flagperson(s).
6. Location and types of heavy equipment to be used during the closure.

C. It is further understood and agreed to that the Commissioner may instruct the Contractor to provide one or more of the additional items at no additional cost to the City:

1. Temporary handicapped ramps.
2. Flagperson(s) to direct pedestrian and/or vehicular traffic.
3. Traffic control signage of varying types and sizes.
4. Barricades of varying types and lengths.

D. Upon approval of the submitted traffic plan by the City the Contractor may apply for the appropriate lane closure permit. It is further understood and agreed to that the City may revoke the Contractor's closure permit if it is found that the approved traffic plan is not being adhered to. All traffic lanes are to be submitted at least fourteen calendar days before the intended date of closure.

1. Flagperson(s) for pedestrian traffic are to be provided whenever traffic is forced into the adjacent curb lane. At least one flagperson will be required at each end of the closure.

2. The use of plastic warning tape in lieu of barricades will not be permitted.

3. When the path of a pedestrian reroute is next to or under areas where equipment or material will be lifted, or where overhead work is occurring, then covered canopies (with approved lighting) will be provided. The Contractor will submit the design and configuration of the canopies to the City for review.

4. Temporary provisions will be made for disabled pedestrians as required.

40. ADMINISTRATION AND SUPERVISION OF THE WORK

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. Project Manager and Office Support Staff

1. The Contractor will furnish a competent and adequate staff for the proper administration, coordination, and supervision of the work. Prior to the date of the Notice to Proceed, the Contractor will designate a Project Manager who will direct the project for the Contractor. A resume, including three references from the Project Manager's last three projects, will be submitted to the City for review and approval. The City reserves the right to reject any proposed personnel due to lack of experience and/or unfavorable past performances.

2. The Project Manager will be responsible for the prosecution of the work, with full authority to act in all matters as necessary for the proper coordination, direction and technical administration of the work. The Project Manager will attend all meetings at such place or places as will be decided by the City in order to render reports on the progress of the work.

C. Superintendent and Field Engineering Staff

1. The Contractor will keep on the job throughout its duration a competent Superintendent and any necessary field engineering staff, all of whom must be satisfactory to the City. Resumes, including references from their last three projects, of the Superintendent and any field engineering staff are to be submitted to the City for review and approval. The City reserves the right to reject any proposed personnel due to lack of experience and/or unfavorable past performances.

2. The Superintendent will not be changed without the consent of the City unless the Superintendent proves to be unsatisfactory to the Contractor. In the event the Superintendent is changed the Contractor will submit the resume of a replacement for approval by the City as noted above.

3. In the event the Superintendent or a member of the field engineering staff becomes unsatisfactory to the City during the course of the project the individual or individuals will be dismissed by the Contractor. The resumes of replacements will be submitted to the City for approval as noted above.

4. The Superintendent will represent the Contractor in his or her absence and all directions given to the Superintendent will be as binding as if given to the Contractor.

41. SITE AVAILABILITY

A. The City does not give any assurance to the Contractor that the entire work site will be available at one time, nor that any particular item or items of work, regardless of whether it is performed by the General Contractor or any of his subcontractors, can be performed in a continuous, optimum and efficient manner. The Contractor will assume that individual items of work may be interrupted, delayed or may have to be performed in several steps requiring his workmen and equipment, and workmen and equipment of any of his subcontractors, to leave and later return to the work site. The City will not honor any claims for inefficient performance of work. The Contractor will inform all of his/her subcontractors of this condition. The Contractor will also not be compensated for any delays caused by railroad companies.

42. CONFLICT BETWEEN DRAWINGS AND/OR SPECIFICATIONS

A. It is hereby understood and agreed to that in the event there is a conflict between the Contract Drawings or between the Contract Specifications, the Contractor will bid on the most expensive product or process and notify the City in writing that the conflict exists.

43. CHICAGO DEPARTMENT OF TRANSPORTATION GENERAL GUIDELINES FOR TRANSIT PROJECTS CONTRACTOR'S QUALITY PROGRAM

1.0 DEVELOPMENT, SUBMITTAL, AND APPROVAL OF CONTRACTOR'S QUALITY PROGRAM

1.1 SCOPE

Quality is the responsibility of the Contractor. This guide defines the roles and responsibilities of the Contractor in the management of quality in the construction of Chicago Department of Transportation (CDOT) Projects.

It serves to achieve end items conforming to a level of quality consistent with the Contract Documents. A descriptive guide to the major elements considered necessary to develop an adequate quality plan along with pertinent quality procedures is detailed in the following. Any Quality Program developed by the Contractor must be consistent with the guidelines advocated by the Federal Transit Administration (FTA) in FTA-MA-06-0189-92-1, Quality Assurance and Quality Control Guidelines (March 1992), which is available from the National Technical Information Service, Springfield, Virginia, 22161. A copy of the CDOT QA/QC Program will be provided to the Contractor. In the course of the work, the Contractor's Quality Program (CQP) is subject to continual monitoring to assess effectiveness of the quality processes employed. Quality elements employed in the CQP are subject to surveillance and audit by the Commissioner.

1.2 CONTRACTOR'S QUALITY PROGRAM

The Contractor will establish, implement, and maintain an effective quality program to manage, control, and document the work and to ensure that the work conforms to the requirements of the Contract Documents. The quality program will consist of policies, plans, procedures, work instructions, and the organization necessary to provide adequate control and assurance of quality. It will cover materials, equipment, workmanship, fabrication, and operations furnished both on and off site by the Contractor.

Organization of the quality functions and activities for the project are subject to the organizational needs and management structure of the Contractor's firm. CDOT's QA/QC Program and each of the FTA's fifteen elements outlined in the following are potentially applicable to the Contractor's work scope and should be considered in the development of a quality program. The choice and level of application of quality elements within the program may vary depending on the complexity and maturity of project design, construction, safety, and budget. Generally, a less extensive program may be implemented for simpler projects where design and construction methods are fairly standard, where risks of safety failures are low, and where project budgets are small. However, a reduced quality program implementing only essential elements and acceptance activities still obliges the Contractor to do whatever is necessary to substantiate conformance to specified requirements. Achievement of quality encompasses many functions and activities and extends to all levels within the construction effort; therefore, responsibility for quality will be fully acknowledged by all from the Contractor's top management to the construction worker. Participating Subcontractors, Suppliers, Technical Laboratories, and Consultants employed or contractually bound to the Contractor will also bear the commitments specified herein and the approved CQP as required for their efforts. Material and equipment supplier's quality programs will be consistent with the project's quality program.

1.3 SUBMITTAL OF QUALITY PROGRAM

Within 30 days after the Notice to Proceed, the Contractor will submit for approval to the Commissioner 7 copies of a proposed Quality Program. The CQP will include a matrix that correlates the program's provisions with the fifteen FTA elements. The CQP will be signed by a management representative of the Contractor and will carry a revision number and/or an approval or effective date. The CQP will also include a written endorsement of the program by the Contractor's Quality Representative (QR), attesting that the program satisfies the requirements of the FTA guidelines.

Should the Contractor fail to submit an acceptable Quality Program within the allotted time the Commissioner may choose to suspend work until the Contractor furnishes an acceptable interim plan addressing all of the quality assurance and control requirements. Such an interim plan will only be acceptable for 60 days after the Notice to Proceed.

1.4 APPROVAL OF CONTRACTOR'S QUALITY PROGRAM (CQP)

Approval of the CQP is always conditional and will be based on satisfactory performance during construction. As work progresses, the Contractor may be required to revise the CQP to maintain a quality of construction consistent with the Contract Documents. Should this occur, reapproval of the CQP may be required.

1.5 PROPOSED CHANGES TO THE CONTRACTOR'S QUALITY PROGRAM

The Contractor will notify the Commissioner, in writing, of any proposed change to the CQP. Any changes to an approved CQP will be subject to the same approval process outlined in paragraph 1.4.

2.0 ELEMENTS OF CONTRACTOR'S QUALITY PROGRAM

2.1 FTA GUIDELINE ELEMENTS

The CQP will address the following major quality elements which are contained in the FTA guidelines:

1. Management Responsibility (Responsibility, Accountability, Authority: Organizational and Technical Interfaces)
2. Documented Quality System
3. Design Control
4. Document Control (Submittal Management and Control of Documents and Document Changes)
5. Purchasing Control
6. Receiving Handling, Storage, and Control of Materials and Equipment
7. Control of Work Processes
8. Inspection and Testing Plan
9. Control of Measuring and Testing Equipment
10. Inspection and Test Status
11. Identification and Control of Nonconforming Conditions

12. Corrective Action
13. Documentation by Quality Records
14. Surveillance/Internal Audit
15. Certification and Training

2.2 GENERAL ELEMENT REQUIREMENTS

2.2.1 MANAGEMENT RESPONSIBILITY (RESPONSIBILITY, ACCOUNTABILITY, AUTHORITY: ORGANIZATIONAL AND TECHNICAL INTERFACES)

A. The CQP will contain a description of the Contractor's quality assurance and control organization including an organization chart illustrating lines of authority and the interrelationship of those involved in managing and directing the project. The names, qualifications, duties, responsibilities, and functions of active participants will be furnished. The Contractor will develop and maintain all management and technical functions in an effective management team directed toward achieving the specified quality.

B. The Contractor will designate and individual as the representative of executive management who has the responsibility to ensure the continuing suitability and effectiveness of the Contractor's quality system. Records of such reviews will be maintained.

C. The Contractor will assign a Quality Representative (QR) to this project who will manage and have the authority to act in all quality matters for the Contractor. The QR will ensure that performance and verification requisites are complied with and not subordinated to others. This will be accomplished by defining authority for resolving quality matters and access to management procedures. The QR and staff will be fully qualified by experience and technical training to perform the QC and QA activities and establish and maintain the CQP. The qualifications of the QR must include a description of duties, responsibilities, and previous quality assignments for a period sufficient to establish the appointee's quality management experience. Larger projects, in excess of $5 million, will require a Certified Quality Engineer (CQE) or a certifiable individual as recognized by the American Society of Quality Control (ASQC), or an individual who possesses other trade-related quality experience acceptable to the Commissioner.

D. A staff of sufficient size and composition will be maintained under the direction of the QR to perform all quality control and assurance activities to ensure contract compliance whether the work is performed by the Contractor's own forces or by Subcontractors. The Contractor's quality control organization may vary as the project progresses; however, at all times it must be compatible with the level of effort and capability required by the Contract Documents.

E. Personnel responsible for the quality program will be suitably

trained and proficient in performing activities that affect and assure quality. They will bear and maintain appropriate credentials to support the quality activities to which they are assigned. Persons assigned responsibility for quality verification must be given the necessary authority and independence to perform their roles effectively.

F. The Contractor will plan and define construction activities in a manner to accommodate quality objectives. Construction sequences will be defined so that activities are performed in the appropriate order to ensure proper quality interaction. All elements of the CQP will be documented in procedures and work instructions.

2.2.2 DOCUMENTED QUALITY SYSTEM

A. The CQP will evolve from the Contractor's Quality System established and maintained to ensure that project quality objectives are satisfied. The structure of the Quality System will identify those construction activities that must be performed to ensure that requirements are met and incorporated to achieve constructed facilities capable of performing designed functions.

B. The Quality System will be structured to achieve a more efficient operation at less cost. The Quality System will achieve its objectives through the performance of mutually supportive activities recognizing the interrelatedness of all activities. Quality System requirements will extend to all Subcontractors, as appropriate.

C. Policies, procedures, and instructions necessary to achieve satisfactory construction will be documented. Written policies, procedures, and work instructions will address pertinent areas within the construction activity to maintain and improve quality.

D. The Quality System will establish the controls and responsibilities for the development, review, verification, approval, validation, and revision of documented procedures. Documented procedures are those following a specified format and showing current revision level, approval or effective date, and approval signature. The format for documented procedures will be as follows:

(1) **1.0 Purpose:** Reason why the procedure is being initiated.

(2) **2.0 Scope:** Boundaries of the procedure; i.e., to whom or to what the procedure applies.

(3) **3.0 References:** Documents referred to for standards to be followed in relation to the procedure as well as for informational facts and

background.

(4) **4.0 Definitions:** Explanation of words or terms used in the procedure which are not self-explanatory.

(5) **5.0 Procedure:** Describes the sequence of required actions to be performed and indicates the person responsible for performing those actions.

(6) **6.0 Attachments:** Documents and/or related materials that are needed for the procedural process such as transmittal letters, forms, and flowcharts.

(7) **7.0 Provisions:** Items of information, instructions, or special conditions to the procedure.

E. The Quality System will:

(1) Use a uniform procedure numbering system.

(2) Establish quality record capture statements within each applicable procedure that identify the quality records generated by the procedure.

(3) Establish systems for the control of procedures.

(4) Ensure that procedures contain qualitative and quantitative acceptance criteria when applicable.

(5) Establish requirements to prepare, approve, and distribute prior to their need or initial use.

(6) Provide a mechanism for a quick change or issuance of a procedure under specific Emergency-related conditions or circumstances.

(7) Identify procedures that are controlled documents.

(8) Require the periodic review of procedures to ensure current usability and compatibility with interfacing procedures.

F. System controls will be adequate to cover all construction operations, including both onsite and offsite manufacturing and fabrication; will be keyed to the Schedule Document; and will provide written records indicating that the results obtained for the various phases described below are documented and maintained. The controls will include at least three phases of control for all

definable features of work as follows:

(1) **Preparation Phase** - Prior to beginning construction on any definable feature of work.
A definable feature of work is a task which is separate and distinct from other tasks and has separate control requirements. It will include the following:

(a) Review of the contract requirements
(b) Verification that all materials and/or equipment have been tested, submitted, and approved
(c) Examination of the work areas to ascertain that all preliminary work has been Completed
(e) Physical examination of materials, equipment, and sample work to assure that they conform to approved shop drawings or submitted data and that all materials and/or equipment are on hand

(2) **Initial Phase**-Must be accomplished at the beginning of a definable feature of work and will include the following:

(a) Check of work performed in preparation phase
(b) Verification of full compliance
(c) Establishment of level of workmanship
(d) Resolution of all differences

(3) **Follow-Up Phase-** Daily checks will be performed to assure continuing compliance with contract requirements, including control testing, until the completion of the particular feature of work.

2.2.3 DESIGN CONTROL

A. Design activities are not normally within the Contractor's work scope. This element should be included, however, if any design activity is necessary. If no design activity is necessary, the CQP should include a statement of non-applicability of this element.

2.2.4 SUBMITTAL MANAGEMENT AND CONTROL OF DOCUMENTS AND DOCUMENT CHANGES.

A. The Contractor will develop documented procedures for scheduling and managing submittals, including those of Subcontractors and Suppliers, and for document control, which defines the responsibility and authority for preparing, reviewing, approving, issuing, recording, revising and distributing documents for activities affecting the quality of the work.

B. All changes to documents will be processed in writing and records will reflect all changes as generated.

C. A document control system will be established which provides

assurance that the latest approved documents, drawings, and/or specifications were available through the course of the project and that the work was in fact performed to the latest approved documents.

2.2.5 PURCHASING CONTROL

A. A control system to assure that purchased or procured items and services comply with the Contract Documents will be implemented. Contractor's personnel responsible for procurement will interface with the quality function to permit control, evaluation, and assurance that procured items and services comply with contractual requirements. The Contractor will assure that items and services procured are only from sources that are capable of meeting the requirements of the Contract Documents and that all Subcontractors and Suppliers comply with the CQP. The Contractor will review the Subcontractor/Supplier agreements to ensure the inclusion of applicable quality requirements.

B. Source inspection will be performed at the Supplier/Subcontractor's plant. Those quality characteristics which cannot or will not be verified during subsequent processing should be subject to source inspection. Source inspection may not be necessary when the quality of the item can be fully and adequately verified by review of test reports, inspection on receipt, or other means. Source inspection plans will include mandatory hold points where Owner or Contractor will verify compliance with the contract requirements.

2.2.6 RECEIVING, HANDLING, STORAGE, AND CONTROL OF MATERIALS AND EQUIPMENT

A. The Contractor will develop documented inspection procedures to verify that material and equipment meet specified quality and contractual requirements and that they are properly received and handled to ensure that the quality is not degraded. The Contractor will ensure that all materials and equipment are positively identifiable and traceable to a specified origin point.

B. Purchased items entering the construction site will be inspected, including their supporting documentation, for verification that Subcontractors and Suppliers have met the appropriate quality requirement of the Contract Documents. Certificates of compliance and/or conformance will be submitted for all materials.

C. The Contractor will provide procedures and instructions to assure that the desired quality of an item is not compromised or degraded as a consequence of inappropriate handling, lifting, and rigging methods.

D. The Contractor will provide written procedures or instructions for cleaning, preservation, and storage of material and equipment.

Proper records will be maintained of all necessary maintenance activities during storage.
Purchased material and equipment will be clearly marked so that it can easily be identified but excessive handling or opening of crates and boxes.

Positive material identification measures will be implemented so that each item has a unique identifier (serialized) to distinguish identical items made in separate fabrication processes and confirm that the construction material is indeed the grade of material specified. Identification numbers must be reflected in all pertinent inspection and construction records.

G. The materials storage area(s) will be arranged for ease of retrieval and to prevent damage, deterioration, or loss. In general, materials received first will be used first.

2.2.7 CONTROL OF SPECIAL CONSTRUCTION PROCESSES

A. The CQP will contain provisions for controlling special construction work processes which limit the Contractor to imposed procedures which are specified for the work to obtain the desired end product. Also included is work which must comply with the regulations of other agencies.

B. The Contractor will assure that the work is performed in accordance with the applicable codes, standards, specifications, or other special contractual requirements using qualified personnel and/or equipment. Procedures will identify equipment and special requirements necessary to achieve compliance.

2.2.8 INSPECTION AND TESTING PLAN

A. The Contractor will include an inspection and testing (I&T) plan in the CQP.

B. The Contractor's inspection and testing plan will define methods to implement inspections, tests, verifications, and documentation to assure that items conform to the requirements of the Contract Documents. The Contractor will establish and maintain an inspection and testing plan producing objective evidence that structures, systems, components, or services
meet the requirements specified in the Contract Documents. The Contractor will update the plan to reflect changes in inspection and testing procedures as necessary.

C. The Contractor will include test requirements, acceptance criteria, and test conditions in the I & T. A list of tests which the Contractor is to perform will be furnished as part of the CQP. The list will cite the test name, specification references containing the test requirements, and the agency or personnel responsible for each type of test. Procedures will:

(1) Identify the quality characteristics to be inspected, examined, and tested at each activity Point.
(2) Specify inspection and test procedures and acceptance criteria to be used.
(3) Describe what, when, where, how, and by whom steps are to be performed. Include specific responsible personnel, pertinent materials and equipment, controlling documentation, and methods of process control.

D. The Contractor will use competent inspection personnel other than those performing or directly supervising the work being inspected. Inspection personnel will not report directly to immediate supervisors responsible for constructing or installing the work being inspected. Inspection personnel will be given the necessary authority and independence to perform their roles effectively. Personnel performing inspections and tests will possess a demonstrated competence in the specific area of interest and have an adequate understanding of the requirements. Guidelines will be established to assure that suitable education, experience, and technical qualifications are maintained for such personnel.

E. In-process inspection activities will be planned and performed to ensure the quality of the finished work. The Contractor will perform inspection and testing as required by his quality program. Hold points will be identified and recognized until the required inspections and tests are completed satisfactorily, including identification of nonconforming conditions.

F. The Contractor will demonstrate the acceptability of the construction activities with objective evidence through suitable inspections and testing results. Documented inspection and testing results will be prepared, reviewed, safety stored, and maintained by the Contractor. Such records will be available to the Commissioner during the course of the work and will be subject to continual surveillance and oversight by the Commissioner.

2.2.9 CONTROL OF MEASURING AND TESTING EQUIPMENT

A. The Contractor will describe methods for ensuring that equipment used for measuring and testing is in calibration or sound condition to provide accurate test or inspection results.

B. The Contractor will use methods to assure proper handling, storage, and care of measuring and testing equipment in order to maintain the required accuracy of such equipment. Measuring and testing equipment that is consistently found to be out of calibration or that has been subjected to possible damage should be identified as nonconforming, removed from service, and repaired or replaced. It will be incumbent on the Contractor to assure the conformance of materials tested with out-of-calibration equipment,

that they are free from defects, and that no risk exists to installed construction.

C. The Contractor will assure that all measuring and testing equipment selected for measurement, tests, or calibration is of the proper range and type and is controlled, adjusted, and maintained at specific intervals or prior to use to assure conformance to established requirements or predetermined accuracy. The equipment will have some indication attesting to the current calibration status showing date (or other basis) on which inspection or recalibration is next required.

2.2.10 INSPECTION AND TEST STATUS

A. The Contractor will distinguish between inspected and uninspected items by using suitable control devices. Inspection and test status identification of structures, systems, and components should be maintained and controlled from initial receipt through erection to operating the constructed item. Inspection and test status should be physically and clearly indicated on the constructed item or traceable to the item as imposed by the contract requirements.

2.2.11 IDENTIFICATION AND CONTROL OF NONCONFORMING CONDITIONS

A. The CQP will contain provisions for identifying, recording, controlling, dispositioning, and correcting nonconforming items including provisions for reinspecting and retesting items repaired and reworked. It is the Contractor's responsibility to promptly identify and segregate items detrimental to quality to prevent inadvertent use.

B. Personnel performing evaluations and/or responsible for the disposition of nonconforming items will have demonstrated competence in the specific area of interest, have an adequate understanding of the requirements, and have access to pertinent background information.

2.2.12 CORRECTIVE ACTION

A. The Contractor will investigate the cause of nonconformance and take appropriate corrective action to prevent reoccurrence. The identification, cause, and corrective action planned and taken will be documented and maintained.

2.2.13 DOCUMENTATION BY QUALITY RECORDS

A. The CQP will contain methods to identify quality records to be maintained and provide for their retrievability and retention. The Contractor will maintain quality records as evidence that all of its activities and those of its Subcontractors and Suppliers comply

with the requirements of the CQP. The Contractor will maintain records as evidence that:

(1) The item meets the requirements of the Contract Documents.
(2) Personnel procedures, and equipment for special fabricating, manufacturing, and construction process are qualified.
(3) Selection, surveillance, and oversight of Subcontractors is properly performed.
(4) Corrective action is taken for nonconforming conditions in a timely and efficient manner.
(5) The CQP and CDOT QA/QC Program was distributed to all project contractors and suppliers.

B. As a minimum, the Contractor will maintain the following documentation as quality records:

(1) Surveillance/oversight/internal audit records which:

(a) Document quality programs and procedures
(b) Identify items and services for which surveillance was performed
(c) Reveal results obtained
(d) Demonstrate analyses of surveillance data for use in corrective action

(2) Inspection and test records which results

(a) Include nonconformance reports
(b) Identify inspector or data recorder
(c) Identify date of inspection or test
(d) Reference document, drawing, and specification number
(e) Define applicable requirements
(f) Identify specific inspections performed and

(3) Record transmittals verifying that the CQP and CDOT QA/QC Program was distributed to all project contractors and suppliers.

2.2.14 CONTRACTOR SURVEILLANCE/INTERNAL AUDIT

A. The Contractor will establish and maintain a system of surveillance/oversight or internal audits to assure compliance with the requirements of the CQP on the part of the Contractor, Subcontractors, and Suppliers. Management reviews of participating organizations will periodically be conducted to assess the status and adequacy of the quality functions and activities.

2.2.15 CERTIFICATION AND TRAINING

A. The Contractor will provide training, qualification, and certification programs in accordance with recognized guidelines for personnel affecting and assuring quality. Personnel will have demonstrated competence in the specific area and have adequate understanding of the project requirements. Further, the Contractor will periodically review credentials of active personnel to assure that suitable education, experience, and technical qualifications are maintained. Indoctrination and training will be implemented as necessary to assure that proficiency is achieved and maintained for personnel with project responsibility.

B. A training procedure will establish the requirements for the conduct of training. Training is to be conducted by knowledgeable instructors.

44. PLANT MATERIAL

Wherever Plant Material is to be used, please note that the following will also apply:

The Contractor must secure all specified plant material immediately upon contract award. Proof that the plant material is secured must be on file with the Commissioner prior to the processing of any payment to the Contractor. However, if the Contractor proceeded to do everything required to secure the specified plants and for reasons beyond the Contractor's control plant substitutions are required, such substitution will follow the process detailed below.

Substitution of Plant Material
The Contractor will make every effort to maintain the design intent of all landscape plans. To this end, substitutions of plant material will be kept to an absolute minimum and requests for substitutions will adhere to the following requirements:

A. Requests for substitution of plant material will be submitted for review within 2(two) weeks following the award date. All proposed substitutions will be submitted at one time. All proposed substitutions are subject to approval.

B. Requests for plant substitutions will be submitted in writing and list contract item numbers, quantity, original plant name (botanical and common), original size, nurseries contacted (with phone numbers) for original material (10 minimum), name of substitution (botanical and common), and size. The Contractor will contact a minimum of ten (10) nurseries in search of a plant before that plant can be eligible for substitution.

C. If substitutions are approved for smaller sized plant material, new line items will be added to the contract. The unit price will be adjusted to reflect the lower cost of smaller plant material. The units will be increased as to keep the design intent.

45. WORKING HOURS

The working hours for this project will be as stated in the specifications and contract drawings. These hours shall not apply during security alerts, special events and National Holidays. These include but are not limited to: Fireworks Night on Independence Day, Taste of Chicago, Chicago Marathon, Venetian Night and dates of security alerts or warnings.

(Rev. 09-19)

SECTION 01 01 00

SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The work of this Contract generally consists of the construction of an elevated CTA station on the Green Line Elevated Line at Lake Street and Damen Avenue. The work includes, but is not limited to:

1. Foundation construction including micropiles, caissons, earth retention, and excavation.
2. A fare collection area with architectural finishes including two elevators, and one escalator.
3. Platforms with canopy.
4. Mechanical, plumbing, electrical, lighting, communications, signage, and fare collection systems will be installed.
5. Civil Site work as it relates to utility connections, utility relocation, pavement reconstruction, sidewalks, signaling.
6. Track structure modifications and replacements.

B. This project also includes all appurtenant and collateral work necessary to complete the Work as shown on the plans, as specified in the Contract Documents and as directed by the Commissioner.

C. This project description is intended to be general in nature and is neither a complete description nor a limitation on the Work to be performed. The Contractor shall perform all Work described in the Contract Documents or reasonably inferred, as necessary, to produce the results specified therein, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

1.03 SPECIALTY WORK UNDER REQUIRED INDIVIDUAL COORDINATION

A. Each of the following specialty portions of the work shall be coordinated by a Contractor's Specialty Coordinator identified by the Contractor in accordance with the requirements of Section 01 40 00 QUALITY REQUIREMENTS.

1. The Bridge work, as indicated on the drawings.

2. The Platform work, as indicated on the drawings.

1.04 SPECIAL PROVISIONS

A. Materials and Work: In addition to all other guarantees and warranties in the Contract Documents, the Contractor warrants and guarantees to the City and the Commissioner that all materials shall be new unless otherwise specified and the Work by the Contractor shall be in conformance with the requirements of the Contract Documents.

1.05 SURVEYS, LINES, AND LEVELS

A. Responsibility: Contractor is solely responsible for properly laying out the Work, and for all lines and measurements for the Work executed under the Contract Documents. Contractor shall verify the figures shown on the drawings before laying out the Work, and shall be held responsible for any errors or inaccuracies resulting from his failure to do so. The Commissioner or his/her representatives will in no case assume the responsibility for laying out the Work.

B. Reference Points and Layout: Establish on the site all necessary reference lines and permanent bench marks, the building lines, and elevations. Determine all lines and elevations for various parts of the Work as the Work progresses. Establish bench marks and axis lines at each level showing exact elevations and other lines and dimensional reference points as required for the information and guidance of all trades. Provide field checking of the structure, and surveys thereof, as may be required by the technical sections of the specifications. Contractor is solely responsible for the proper location and level of the Work and for the maintenance of the reference lines and bench marks.

1.06 TEMPORARY FACILITIES AT THE SITE

A. Summary: Comply with the SPECIAL CONDITIONS requirements for temporary facilities. Contractor shall be responsible for providing items of general services and temporary facilities as required for the proper and expeditious prosecution of the Work. Such items include, but are not limited to, temporary toilets, temporary storage, temporary electrical lighting and power, temporary water, temporary enclosures, temporary heating or cooling and ventilation, temporary openings, material hoists, temporary stairs or ladders, ramps and runways, temporary fire protection, protective coverings, temporary barricades, and other temporary facilities.

1.07 MANUFACTURERS' INSTRUCTIONS

A. Compliance: Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's written instructions.

B. Conflicts: In case of any differences or conflicts between the requirements of the manufacturer's instructions and the technical sections of the Specifications, the instructions or Specifications having the more detailed and precise requirements which are specifically applicable to the Work in question, as determined by the Commissioner, shall govern.

1.08 CONSTRUCTION PERMITS

A. The Contractor shall be responsible for obtaining all construction permits that may be necessary for access to the job site, for storage of materials and equipment and for construction operations. The cost of complying with the requirements of this section shall be considered included in the contract.

1.09 ADJACENT CONTRACT & BUILDING COORDINATION

A. The Contractor shall coordinate construction staging and traffic control operations with adjacent construction contracts prior to and throughout the duration of the project. This effort is to help provide the most safe and effective staging environment throughout the project and at locations where adjacent projects impact the limits of staging.

B. The Contractor is responsible for coordinating the Work with the building owners and their tenants, when building areas are to be reconstructed and/or otherwise disturbed due to construction activities. The Contractor shall define the limits of the proposed disturbance and the location of improvements at each individual location in consultation with the building’s owner/ occupants prior to the work being performed.

1.10 INFORMATION AVAILABLE

A. Contact the Commissioner for access to the following reports:

1. PSI Report.
2. PESA Report.
3. Geotechnical Report.
4. Soil Borings.
5. Letter #047 prepared by Capitol Cement Company, Inc. dated 18 December 2018.
6. Lake Street Improvement Shoring Shop Drawings, Submittal No. 07-01-02 prepared by Capitol Cement Company, Inc. dated 15 June 2018 (CTA Submittal #21).
7. Field Observation of Temporary Shoring Tower letter prepared by SGH and dated 29 November 2018.
8. Limited LBP Survey Report.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the work of this section shall be considered incidental to the contract.

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Product Requirements: Section 01 60 00.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Commissioner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Commissioner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use facsimile of form provided in Project Manual.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
   b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by

Commissioner and separate contractors, which will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Commissioner's Action: If necessary, Commissioner will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Commissioner will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than **15** days prior to time required for preparation and review of related submittals.

1. Conditions: Commissioner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Commissioner will return requests without action, except to record noncompliance with these requirements:
   a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   b. Requested substitution provides sustainable design characteristics that specified product provided.
   c. Substitution request is fully documented and properly submitted.
   d. Requested substitution will not adversely affect Contractor's construction schedule.
   e. Requested substitution has received necessary approvals of authorities having jurisdiction.
   f. Requested substitution is compatible with other portions of the Work.
   g. Requested substitution has been coordinated with other portions of the Work.
   h. Requested substitution provides specified warranty.
   i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Commissioner will consider requests for substitution if received within 60 days after the Notice to Proceed or the Notice of Award. Requests received after that time may be considered or rejected at discretion of Commissioner.

1. Conditions: Commissioner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Commissioner will return requests without action, except to record noncompliance with these requirements:
   a. Requested substitution offers Commissioner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Commissioner must assume. Commissioner's additional responsibilities may include compensation to architect for redesign and evaluation services, increased cost of other construction by Commissioner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Requested substitution provides sustainable design characteristics that specified product provided.
e. Substitution request is fully documented and properly submitted.
f. Requested substitution will not adversely affect Contractor's construction schedule.
g. Requested substitution has received necessary approvals of authorities having jurisdiction.
h. Requested substitution is compatible with other portions of the Work.
i. Requested substitution has been coordinated with other portions of the Work.
j. Requested substitution provides specified warranty.
k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of SUBSTITUTION PROCEDURES will not be measured for payment.

4.2 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the Work of SUBSTITUTION PROCEDURES will be included in the applicable Line Item contract lump sum price as shown in the Schedule of Prices.

REQUEST FOR SUBSTITUTION

TO:

FROM: _____
Name of manufacturer

_____
Street address

_____
City and state

_____
Phone number and name of person to contact

PROJECT: DAMEN GREEN LINE STATION
Chicago, Illinois
CDOT PROJECT CO. D-7-135B

1. Specification Section and Paragraph numbers of product specified _____.

2. Proposed Substitute

   A. Name and Model No.:

   B. Description:

   C. Attach applicable Submittals as required by the referenced Specification Section, i.e. Product Data, Materials List, Shop Drawings, Samples, Design Data, Test Reports, and Certificates. Attach Shop Drawings to the effect of the proposed substitution on adjacent components of the Work.

   D. Insert Numbers of applicable reference standards:

   E. Attach a color chart, if applicable.

   F. Attach installation instructions.

3. Manufacturer's Reputation: Attach the following:

   A. Evidence of reputation for prompt delivery.

   B. Evidence of reputation for efficiency in servicing products.

4. Comparison: Attach an itemized comparison of the proposed substitution with product specified. Significant qualities may include elements such as size, weight, durability, performance, and visual effects.

5. Changes in Work: Attach data relating to changes required in other work to permit use of proposed substitution and changes required in construction schedule and overall contract time. Coordinate changes or modifications needed to other parts of the Work and to construction performed by the Commissioner and separate Contractors that will be necessary to accommodate the proposed substitution.

6. Cost Data: Attach accurate cost data on proposed substitution in comparison with product specified.

7. Previous Installation: Provide the following information on similar projects on which proposed substitution was used, list projects in the locale of the project primarily and then in other areas that best represent its application on this project:

Name and Address of Project	Date of Installation	Name, Address, and Phone # of Architect
A.		
B.		
C.		
D.		

8. In making a request for substitution, the Manufacturer represents that:

   A. The Manufacturer has examined the Drawings and Specifications and has determined that, to the best of the Manufacturer's knowledge, the proposed substitution is appropriate for the use intended in the Drawings and Specifications.

   B. The Manufacturer will provide the same or better warranty for substitution as for product or method specified.

   C. The product is equal or better in quality and serviceability to the specified item.

_____

Name of Manufacturer and signature of Manufacturer's Rep. Date

_____

Name of Contractor and signature Date

END OF SECTION

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Work included: Schedule and administer project meetings throughout progress of the work.

B. Contractor's Responsibility: Excepting the General Conference to be conducted by the Commissioner, the Contractor shall prepare the agenda, conduct meetings, record proceedings, distribute recorded proceedings and decisions to participants in meeting and to parties affected by decisions made at meeting.

C. Notification: For meetings not regularly scheduled, give participants not less than three days prior notice.

D. Attendance: The Contractor shall have persons of authority in attendance to represent the Contractors' and the subcontractors' interests.

E. Related Sections:

1. Contract Closeout: Section 01 70 00.

1.3 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request from Contractor seeking information or clarification of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Key Personnel Names: Within 10 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including office and cellular telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current.

1.5 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled or required for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Commissioner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Startup and adjustment of systems.
8. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Commissioner's property.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Commissioner indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts,

bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

6. Mechanical and Plumbing Work: Show the following:
   a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
   b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
   c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
   a. Runs of vertical and horizontal conduit 1-1/4 inch diameter and larger.
   b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
   c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
   d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Review: Commissioner will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Commissioner determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Commissioner will so inform the Contractor, who shall make changes as directed and resubmit.
9. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Section 01 33 00 - Submittal Procedures.

C. Refer to individual Sections for additional Coordination Drawing requirements for Work in those Sections.

1.7 KEY PERSONNEL

A. Administrative And Supervisory Personnel: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Commissioner of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Commissioner, within three days of the meeting.

B. General Conference: After award of the contract and prior to performance of any work, the Commissioner shall schedule Pre-Construction Conference to be held among Commissioner, the Contractor, and sub-contractors to review and discuss, though not limited to, the following items:

1. Construction procedures, coordination with public use and traffic.
2. Construction schedule submitted at Pre-Construction Conference and updating.
3. Cost breakdowns.
4. Bonds and certificates of insurance.
5. Pay application procedures and documentation required with the payment requests.
6. Submittal procedures.
7. Introduction of Contractor's and Commissioner's key personnel assigned to the project.
8. Scheduling time and dates for Field Progress Meetings.
9. Critical work sequencing and long-lead items.
10. Procedures for processing field decisions and Change Orders.
11. Procedures for RFIs.
12. Procedures for testing and inspecting.
13. Distribution of the Contract Documents.
14. Submittal procedures.
15. Preparation of Record Documents.
16. Responsibility for temporary facilities and controls.
17. Construction waste management and recycling.
18. Parking availability.
19. Office, work, and storage areas.
20. Equipment deliveries and priorities.
21. First aid.
22. Security.
23. Progress cleaning.
24. Working hours.
25. Minutes: Record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Commissioner of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    a. The Contract Documents.
    b. Related RFIs.
    c. Related Change Orders.
    d. Purchases.
    e. Deliveries.
    f. Submittals.
    g. Review of mockups.
    h. Possible conflicts.

i. Compatibility problems.
j. Time schedules.
k. Weather limitations.
l. Manufacturer's written recommendations.
m. Warranty requirements.
n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities and controls.
q. Space and access limitations.
r. Regulations of authorities having jurisdiction.
s. Testing and inspecting requirements.
t. Installation procedures.
u. Coordination with other work.
v. Required performance results.
w. Protection of adjacent work.
x. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Make a record of each conference and the Contractor's Quality Control Program as required by Section 01 40 00, QUALITY REQUIREMENTS.
5. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
6. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings:

1. General: Schedule progress meetings on a weekly basis for coordinating, expediting, and scheduling of Work. Contractors, sub-subcontractors, and suppliers whose presence is necessary must attend when requested by the Commissioner.
2. Conduct separate coordination meetings with subcontractors. Commissioner will not be present at such meetings.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Off-site fabrication.
5) Access.
6) Temporary facilities and controls.
7) Quality and work standards.
8) Status of correction of deficient items.
9) Field observations.
10) RFIs.
11) Status of proposal requests.
12) Pending changes.
13) Status of Change Orders.
14) Pending claims and disputes.
15) Documentation of information for payment requests.

4. Minutes: Record the meeting minutes.
5. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Special Meetings: Called by the Commissioner when warranted and with frequency necessary. Place and time as mutually agreed by the Commissioner.

F. Project Closeout Conference: schedule and conduct a Project closeout conference, at a time convenient to Contractor and Commissioner, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Commissioner and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
   a. Preparation of record documents.
   b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
   c. Submittal of written warranties.
   d. Requirements for preparing operations and maintenance data.
   e. Requirements for demonstration and training.
   f. Preparation of Contractor's punch list.
   g. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
   h. Submittal procedures.
   i. Installation of Commissioner's furniture, fixtures, and equipment.

j. Responsibility for removing temporary facilities and controls.

4. Minutes: Record and distribute meeting minutes.

1.9 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Commissioner.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. RFI Forms:

1. Software-generated form with substantially the same content as indicated above, acceptable to Commissioner.

D. Hard Copy RFIs: Identify each page of attachments with the RFI number and sequential page number.

E. Software Generated RFIs: Software generated form with substantially the same content as indicated above.

1. Provide attachments of electronic files in Adobe Acrobat PDF format.

F. Commissioner's Action: Commissioner will review each RFI, determine action required, and return it. Allow 15 working days for Commissioner's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following work day.

1. The following RFIs will be returned without action:

   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for information of Commissioner's actions on submittals.
   f. Incomplete RFIs or RFIs with numerous errors.

2. Commissioner's action may include a request for additional information, in which case Commissioner's time for response will start again.
3. Commissioner's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Special Conditions.

   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Commissioner in writing within ten days of receipt of the RFI response.

G. On receipt of Commissioner's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Commissioner within seven working days if Contractor disagrees with response.

H. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Commissioner.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Commissioner's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.10 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Commissioner's Digital Data Files: Digital data files will be provided by Commissioner for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Commissioner makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.

3. Digital Drawing Software Program: Contract Drawings are available.
4. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.

    a. Subcontractors, and other parties granted access by Contractor to Commissioner's digital data files shall execute a data licensing agreement in the form of Agreement included in this Project Manual.

B. Upon completion of Project, provide one complete archive copy of Project files to Commissioner in a digital storage format acceptable to the Commissioner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of PROJECT MANAGEMENT AND COORDINATION will not be measured for payment.

4.2 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the Work of PROJECT MANAGEMENT AND COORDINATION shall be considered incidental to the contract.

END OF SECTION

SECTION 01 32 36

TELEVISED INSPECTION OF SEWER MAINS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes requirements for televising the interior of existing city sewers to document the physical condition of the pipe and structures.

1. Televise existing sewer(s) when new water mains are constructed parallel to the existing sewer. Existing sewer(s) should be televised for their entire length through the construction area, starting at a manhole closest to the beginning of the construction area, working upstream, to a manhole closest to the end of the construction area.

1.03 REFERENCES

A. U.S. Department of Transportation, Federal Highway Administration: Manual on Uniform Traffic Control Devices (MUTCD), Part 6, Temporary Traffic Control.

B. NASSCO: Pipeline Assessment Certification Program (PACP)

1.04 SUBMITTALS

A. The Contractor must provide two (2) DVDs of the televised inspections for documenting the condition of existing city sewers within the area of construction, or as directed by the Commissioner. The first televised inspection must be made before the start of any construction. The second televised inspection is to be made after the water main has been installed and street and parkway restoration has been completed. The location and narration of both the pre-construction and post construction televised inspections must be synchronized by means of narration and an on screen distance meter to enable a comparison to be made to judge the physical condition of the sewer(s) before and after construction.

B. Videotaped inspections must be recorded on a DVD, of such format to be viewed on a PC or multiple-format DVD player in a read only format. All recordings are to be in high quality color. Printed labels on DVD containers and

cases must include the name of the water main project, contract number, and date of inspection(s).

1.05 QUALITY ASSURANCE

A. Submit DVDs with logs for quality review and comment to Owner and Engineer within 24 hours after the first days' work has been completed. Submit tapes and logs on a routine basis within seven (7) days after completing each tape. Picture quality and definition shall be to the satisfaction of Owner and Engineer. Inspection equipment that fails to produce satisfactory inspection quality shall be removed.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Inspection Equipment:

1. Monitoring Studio:

    a. Temperature controlled
    b. Size sufficient to allow seating for two people in addition to operating technician.
    c. Secure cable, chains, and other devices used with the camera so as not to obstruct camera view or otherwise interfere with proper documentation of sewer conditions.

2. Television Monitor:

    a. Locate in monitoring studio
    b. Color video picture
    c. Resolution capability of no less than 350 lines
    d. Continuous display during survey:
        1) Date of survey
        2) Number designation of manhole section being surveyed
        3) Continuous forward and reverse readout of camera distance from the manhole reference

3. Cables: 600 feet long, minimum
4. Power source
5. Lights
6. Television Camera:

    a. Explosion proof
    b. Resolution capability: Minimum of 460 lines of horizontal resolution and 400 lines of vertical resolution.
    c. 360-degree pan and tilt unit, with adjustable supports specifically designed and constructed for operation in connection with pipe

inspection. Lights shall be mounted on and turn in the direction of the camera head.

d. 65-degree viewing angle, minimum, and either automatic or remote focus and iris controls. Remote control adjustment for focus and iris shall be located in the monitoring studio.
e. Operative in 100 percent humidity conditions.
f. Mounted on a device, sized for each pipe diameter, that is capable of performing work as described in this section. (Unless some significant impassable condition arises, in which case the contractor must contact the Commissioner for direction on how to proceed.)
g. Equip with tag line suitable for pulling camera backwards.
h. Ability to achieve proper balance of tint and brightness.
i. Equip with winch, power winch, TV cable, powered rewind, or other devices used to move camera through pipe.
j. Focal Distance: Adjustable through range from 6 inches to infinity.
k. Camera Lighting:
    1) Minimize reflective glare.
    2) Remote variable intensity control.
    3) Lighting quality to provide clear, in-focus picture of entire inside periphery of pipe.

l. Sufficient for 6–inch through 72–inch diameters.
m. Remote Reading Footage Counter:
    1) Accuracy: two-tenths of one foot over length of section being inspected.
    2) Mounted over television monitor.
    3) Marking on cable will not be allowed.
    4) Calibration: Each day prior to setup.

2.02 RECORDING OF DOCUMENTATION

A. Media:

1. DVD-R.
2. DVD disc must be recorded in format compatible with standard DVD video players.
3. Opening Screen:

    a. Date of inspection.
    b. Pipe structure identification number.
    c. Upstream and downstream node identification numbers.
    d. Street address.
    e. Pipe size.
    f. Normal (upstream to downstream) or reverse (downstream to upstream) pull.

4. Continuous View:

    a. Current distance along reach (tape counter footage).
    b. Do not include pipe structure identification number along active tape (only on opening screen).

5. Audio (voice over):

   a. Description of inspection setup, including related information from log form.
   b. Unusual conditions.
   c. Operation changes (e.g., remove roots and restart inspection at footage prior to root removal).
   d. Verbal (voice over) description and location of each defect.
   e. Verbal description and location of each service connection.

6. DVD Labeling:

   a. Provide printed label on the inside face of the actual diskette that indicates the following:
      1) Name of Owner.
      2) Project Title.
      3) Date of Inspection.
      4) Inspection Company.
      5) Tape Number.

PART 3 - EXECUTION

3.01 GENERAL

A. No additional working days will be allowed due to delays in securing the video inspection services of a private vendor.

B. The initial video of the sewer(s) must be made within one (1) month of the start of construction, unless directed otherwise by the Commissioner. A second video inspection of sewers must be conducted after all water mains and surface restoration is completed.

C. Any out of focus video or distorted audio on any portion of the video will be cause for rejection and require a new DVD of the inspection to be submitted at no additional cost to the City.

D. When non-remote powered and controlled winches are used to pull television camera through line, telephones, radios, or other suitable means of communication shall be provided between the two manholes to ensure that adequate communications exist between crewmembers.

3.02 TELEVISING PROCEDURES

A. Set camera so axis is at centerline of pipe.

B. Show continuous footage reading on tape image. Place on screen where it is clearly visible (e.g., if black font, do not place on dark background, if white font, do not place on light background).

C. Keep camera lens clean, and clear. If material or debris obscures image or causes reduced visibility, clean or replace lens prior to proceeding with recording operation.

D. Camera lens shall remain above visible water level and may submerge only while passing through clearly identifiable line sags (or vertical misalignments).

E. Record inside of each lateral, and connection of lateral to pipeline.

F. Recordings shall clearly show cracks and fractures, and their severity, in addition to obvious features, i.e., laterals and joints.

G. Immediately report obstructions that restrict flow and cause inspection to be interrupted to Owner or Engineer. Document condition with still photograph, and begin inspections of other pipelines.

H. Camera Operation:

1. Speed: 30 feet per minute, maximum, during inspection.
2. Stop, for a minimum of 5 seconds, at every lateral, broken pipe, root intrusion, or other defect or adversity.
3. Pan entire diameter or area of pipe at each defect.
4. Lens, lighting, and focus shall be readjusted in order to ensure clear, distinct, and properly lighted image of defect.

I. Insert 5 second blank space between line segments to clearly mark end of one televised line and beginning of another.

J. Loss of color or severe red or green color will be cause for rejection of inspection.

K. Recordings shall be without distortion or outside interference.

L. Line segments shall be televised complete from structure-to-structure on same DVD in continuous run. Video must clearly show camera starting and ending at structure, unless defect does not allow it. Do not perform partial televising on one DVD and then complete run on another DVD. If line is partially televised, due to excusable condition, i.e., collapsed line, televised length shall be viewed by Commissioner for acceptability.

M. Record all measurements in English units.

N. Obtain pipe diameter by physical measurement in upstream (or downstream) access structure.

O. Verify pipe material (e.g., RCP, VCP, CMP) and surface lengths between manholes.

P. Use calipers or measuring rod to determine diameter of inlet and outlet pipe.

Q. Footage measurements shall begin at centerline of upstream manhole, unless Owner or Engineer approves otherwise.

R. Continuous Footage Readings:

1. Use to identify location of defects.
2. Accurate to within plus or minus 2 percent tolerance.
3. Defect identifications are to be called out and recorded to the nearest 1 foot.
4. Line segment recording will be unacceptable if continuous footage meter is inaccurate, or identified defects or features leave doubt as to accuracy of locations or total length.

S. For measurement of distance to defects, attach marker flag to top of camera yoke. Measurements recorded in log shall be zeroed in alignment with marker rather than camera itself. Measurement shall be zeroed after each segment inspected.

T. Check accuracy of measurement meters daily by use of walking meter, roll-a-tape, or other suitable device.

3.03 RECORDED INORMATION FOR SEWER INSPECTIONS

A. Audio and written documentation must accompany all DVD's submitted to the Comfmissioner.

B. The voice narrations on the recording must provide brief but informative comment on data of significance, i.e., the distance traveled within the sewer, location of any unusual conditions or damage, collapsed pipe or manhole sections, blockages, or other discernible features.

C. The DVD recording(s) must include the following information:

1. Data View:

a. Name of streets containing sewers being televised.
b. Report or videotape number.
c. Date of TV inspection.
d. Upstream and downstream manhole or station numbers.
e. Current distance of travel (tape counter distance).

2. Printed labels on DVD container must include location, date, format, and other descriptive reference information.

D. Work Product:

1. DVD diskettes and completed inspection log sheets,
2. Inspection Log Sheet:

a. A single and complete log for each manhole-to-manhole section of pipe will be submitted.
b. Provide separate logs for normal and reverse setups of same segment.

c. Other data of significance, including those defects listed on table at end of this section shall be recorded on videotape.
d. Subject to audits against tapes.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of TELEVISED INSPECTION OF SEWER MAINS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of TELEVISED INSPECTION OF SEWER MAINS shall be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

END OF SECTION 01 32 36

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals in accordance with the requirements specified in the Special Conditions.

B. Make submittals to the Commissioner of the Chicago Department of Transportation (CDOT), unless otherwise directed by the Commissioner.

C. Conform to requirements specified in the Special Conditions.

D. Related Sections:

1. Project Management and Coordination: Section 01 31 00.
2. Construction Photographic Documentation: Section 01 38 00.
3. Quality Requirements: Section 01 40 00.
4. Contract Closeout: Section 01 70 00.
5. Record Documents: Section 01 78 39.
6. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Commissioner's responsive action.

B. Informational Submittals: Written information that does not require Commissioner's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Commissioner reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Commissioner and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action, Informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Commissioner's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled dates for installation.
    i. Activity or event number.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Commissioner's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Commissioner will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 working days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Commissioner's consultants, or other parties is indicated, allow 21 working days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Commissioner and to Commissioner's consultants, allow 15 working days for review of each submittal. Submittal will be returned to Commissioner before being returned to Contractor.

D. Identification – Paper: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Commissioner.
3. Include the following information on label for processing and recording action taken:
   a. Project name.
   b. Date.
   c. Name and address of Commissioner.
   d. Name and address of Contractor.
   e. Name and address of subcontractor.
   f. Name and address of supplier.
   g. Name of manufacturer.
   h. Submittal number or other unique identifier, including revision identifier.

      1) Number each submittal using the Specification Section number followed by a decimal point and then a sequential number (e.g., 06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06 10 00.01.A).

   i. Number and title of appropriate Specification Section.
   j. Drawing number and detail references, as appropriate.
   k. Location(s) where product is to be installed, as appropriate.
   l. Other necessary identification.

E. Identification – Electronic: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
   a. Name each file using a project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., CDOT PROJECT NO. D-7-135B -06 10 00.01). Name each resubmittal using an alphabetic suffix after another decimal point (e.g., CDOT PROJECT NO. D-7-135B -06 10 00.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Commissioner.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Commissioner, containing the following information:
   a. Project name.
   b. Date.
   c. Name and address of Commissioner.
   d. Name of Contractor.
   e. Name of firm or entity that prepared submittal.
   f. Name of subcontractor.
   g. Name of supplier.
   h. Name of manufacturer.
   i. Number and title of appropriate Specification Section.
   j. Drawing number and detail references, as appropriate.
   k. Location(s) where product is to be installed, as appropriate.

l. Related physical samples submitted directly.
m. Other necessary identification.

5. Include the following information as keywords in the electronic file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

F. Options: Identify options requiring selection by the Commissioner.

G. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

H. Additional Copies: Unless additional copies are required for final submittal, and unless Commissioner observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Commissioner.

I. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Commissioner will discard submittals received from sources other than Contractor.

1. Transmittal Form: Provide locations on form for the following information:
   a. Project name.
   b. Date.
   c. Destination (To:).
   d. Source (From:).
   e. Names of subcontractor, manufacturer, and supplier.
   f. Category and type of submittal.
   g. Submittal purpose and description.
   h. Specification Section number and title.
   i. Drawing number and detail references, as appropriate.
   j. Transmittal number, numbered consecutively.
   k. Submittal and transmittal distribution record.
   l. Remarks.
   m. Signature of transmitter.

2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Commissioner on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "No Exceptions or Exceptions As Noted "

K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

L. Use for Construction: Use only final submittals with mark by Commissioner indicating "No Exceptions" or "Exceptions As Noted."

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Procedures: Prepare and submit Submittals required by individual Specification Sections.
1. Submit electronic submittals via email as PDF electronic files.
   a. Commissioner will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
2. Action Submittals: Submit 3 paper copies of each submittal, unless otherwise indicated. Commissioner will return 2 copies.
3. Informational Submittals: Submit 2 paper copies of each submittal, unless otherwise indicated. Commissioner will not return copies unless it does not comply with specified requirements.
4. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 70 00 – Contract Closeout.
5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Submit certificates and certifications signed by an officer or other individual authorized to sign documents on behalf of that entity.
6. Test and Inspection Reports Submittals: Comply with requirements specified in Section 01 40 00 - Quality Requirements.
7. Statement of Manufacturer's Review: Submit a completed Statement of Manufacturer's Review with each submittal.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.

d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data as PDF electronic files.
7. Number of Copies: Submit 3 copies of Product Data, unless otherwise indicated. Commissioner will return 2 copies. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal is based on Commissioner's electronic drawings that is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.
2. Submit Shop Drawings in the following format
   a. PDF electronic file.
   b. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
   c. Number of Copies: Submit 3 opaque (bond) copies of each submittal. Commissioner will return 2 copies. Mark up and retain 1 returned copy as a Project Record Drawing.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of appropriate Specification Section.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Commissioner's property, are the property of Contractor.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit 3 full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Commissioner will return 2 sets with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit 3 sets of Samples. Commissioner will return 2 Sample sets.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least 4 sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.
4. Submit product schedule in the following format:
   a. PDF electronic file.
   b. Number of Copies: Submit 3 copies of product schedule or list, unless otherwise indicated. Commissioner will return 2 copies.
   c. Mark up and retain one returned copy as a Project Record Document.

F. Contractor's Construction Schedule: Comply with requirements specified in Section 01 31 00 – Project Management and Coordination.

G. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Submit product schedule in the following format:
   a. PDF electronic file.
   b. Number of Copies: Submit 3 copies of subcontractor list, unless otherwise indicated. Commissioner will return 2 copies.
   c. Mark up and retain 1 returned copy as a Project Record Document.

H. Coordination Drawings: Comply with requirements specified in Section 01 31 00 -Project Management and Coordination.

I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

K. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

L. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

M. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

N. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

O. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

P. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

Q. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

R. Schedule of Tests and Inspections: Comply with requirements specified in Section 01 40 00 - Quality Requirements.

S. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

T. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

U. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

V. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Section 01 78 39 – Record Documents.

W. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

X.

2.2 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Commissioner.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit four copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Commissioner.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 01 70 00 – Contract Closeout.

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 COMMISSIONER'S ACTION

A. General: Commissioner will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Commissioner will review each submittal, make marks to indicate corrections or modifications required, and return it. Commissioner will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. A – NO EXCEPTIONS: When the Commissioner marks a submittal "No Exceptions," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.

2. B - EXCEPTIONS AS NOTED: When the Commissioner marks a submittal "Exceptions As Noted," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.

3. C – REVISE AND RESUBMIT: When the Commissioner marks a submittal "Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.

   a. Do not use, or allow others to use, submittals marked "Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.

4. D - REJECTED: When the Commissioner marks a submittal "Rejected," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. The submittal does not conform to the design concept or meet requirements of the Contract Documents.

   a. Do not use, or allow others to use, submittals marked "Rejected" at the Project Site or elsewhere where Work is in progress.

5. E – FOR INFORMATION ONLY: Where a submittal is marked “For Information Only”, the Commissioner will not return the submittal unless it does not comply with specified requirements.

6. F – NOT REVIEWED: Submittals not required by the Contract Documents will be marked “Not Reviewed”, the Commissioner will return the submittal without action.

C. Informational Submittals: Commissioner will review each submittal and will not return it, or will return it if it does not comply with specified requirements. When returned the Commissioner will forward each submittal to appropriate party with comments.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Commissioner.

E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

END OF SECTION

CDOT NO. D-7-135B

STATEMENT OF MANUFACTURER'S REVIEW

PROJECT: Damen Green Line Station

CITY OF CHICAGO Department of
Transportation Division of Engineering
Suite 1100, 30 North LaSalle Street
Chicago, Illinois 60602

SUBJECT: _____

SPECIFICATION REFERENCES: _____

STATEMENT: The undersigned hereby state that the Drawings and Specifications, the shop drawings, and the product data, have been reviewed with qualified representative(s) of the materials manufacturers, and all of the parties are in agreement that the selected materials and systems are proper and adequate for the applications shown, especially with respect to compatibility with adjacent systems and materials.

EXCEPTIONS: (Agreed upon with Commissioner prior to installation)

_____

_____

_____ _____

CONTRACTOR Date

By: _____
(signed) (printed)_____

_____ _____
INSTALLER Date

By: _____
(signed) (printed)_____

_____ _____
(OTHER) Date

By:_____
(signed) (printed)_____

SECTION 01 35 15
SPECIAL PROJECT PROCEDURES FOR ADJACENT CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the requirements for Hazardous Working Conditions.

B. Communication with CTA should follow normal channels through the Commissioner.

1. The Commissioner will provide written correspondence to the CTA Project Manager, as well as CTA Operations.

C. No interruption to CTA service will be allowed unless approved in writing by the CTA.

D. No service disruptions will be allowed for the completion of this work, except as noted herein. If the CTA deems it necessary, the CTA will impact operations to avoid a hazardous condition to either the passengers or employees and charge the Contractor for all associated costs and damages incurred. No compensation will be made for CTA charges to the Contractor due to unauthorized Contractor access or other unapproved impacts to CTA operations.

E. The CTA's Representative for this project will be:

1. Mr. Abdin Carrillo, Project Manager, Construction Oversight, (312) 681-3913.

F. This section includes the requirements for safe construction operations on, above, below, and adjacent to operating tracks of the CTA rail system. Be responsible for compliance with the CTA, Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System (Appendix C). Comply with the CTA Adjacent Construction Manual including addenda and Right of Way Requirements document, available at https://www.transitchicago.com/nearbyconstruction/

1. In case of conflict between the manual and this Specification, the most stringent shall apply.

1.3 DEFINITIONS

A. CTA: The Chicago Transit Authority, an operating transportation agency.

B. RIGHT-OF-WAY WORK: Work performed at, above, or below track level within the CTA Right-of-Way.

C. IN-SERVICE TRACK: CTA tracks are in service seven days a week, 24 hours a day, unless specifically removed from service for specific times by a Rail Service Bulletin issued by the Vice President, Rail Operations. Copies of the CTA's current train schedule for the lines affected by this project is available on the CTA's website and are subject to changes at any time, before or during, the Contract.

D. OUT-OF-SERVICE TRACK: The CTA tracks within limits defined by CTA that are temporarily removed from service for the purpose of completing specific work. Traction power will remain on at all times unless power removal is requested by the Contractor and approved by the CTA. In such cases, traction power must be removed and restored by CTA personnel. The Contractor may request the CTA to de-energize portions of the CTA right-of-way to perform work on, or near an Out-of-Service Track when no revenue service is scheduled, or as specified under a Rail Service Bulletin. Upon completion of the Out-of-Service Work, the Contractor shall maintain sufficient personnel on-site to correct any deficiencies in the Contractor's Work discovered by the CTA during power and service restoration and testing.

E. TRACK ACCESS OCCURRENCE: A condition which provides a modification to the normal operation of CTA service to facilitate access to perform work on or near the CTA Right-of-Way as defined and limited herein.

F. RE-ROUTE: Modification to the normal routing of trains in order to remove rail traffic from a section of track to facilitate access to perform work on or near the CTA Right-of-Way as defined and limited herein.

G. LINE CUT: A temporary cessation of service on a transit line; meaning total stoppage of transit service on all tracks and at all stations within the closure zone to facilitate access for a contractor to perform work on or near the CTA Right-of-Way as defined and limited herein.

H. SINGLE-TRACK: A temporary operation established by operating trains bi-directionally on one track while the adjacent track is taken out-of-service as defined herein. Only one single-track at a time can be set up on a line and only for very limited time periods. If CTA or a separate contractor(s) request single track operations along the same line concurrently with the Contractor for this contract, CTA shall have the exclusive authority to determine which request shall be granted.

I. RUSH HOURS: Monday through Friday, from 0500 to 0900 hours and from 1500 to 1900 hours.

J. FLAGGER SHIFT: A flagger shift is defined as the services of a CTA Flagman up to, but no more than 8 hours including travel and required breaks. For example:

1. A five hour work shift which requires 3 flaggers will use 3 flagger shifts.
2. An eight hour work shift requiring 3 flaggers shall use 6 flagger shifts (because travel & break time will increase the flaggers work hours beyond eight).
3. A ten hour work shift requiring 3 flaggers will use 6 flagger shifts.

K. INFRASTRUCTURE SHIFT: An infrastructure shift is defined as up to, but no more than 8 hours worked per CTA Infrastructure employee. For example:

1. A five hour work shift requiring 2 signal maintainers will use 2 infrastructure shifts.
2. An eight hour work shift requiring 2 towermen shall use 2 infrastructure shifts.
3. A ten hour work shift requiring 2 lineman will use 4 infrastructure shifts.

L. PERSON-IN-CHARGE (PIC): A person or persons, specified in a CTA Rail Service Bulletin, who is solely in charge of a work zone and is the single point contact between CTA and all persons (Contractor's, CTA and others) working in a work zone. The Rail Service Bulletin may identify the PIC by name or by radio call number.

M. POWER & WAY SERVICE BULLETIN (PWS Bulletin): A document authorized by the CTA Infrastructure Division intended to supplement a CTA Rail Service Bulletin by defining power/signal removal and restoration procedures and other work zone protection measures required to safely perform construction and/or maintenance work on or adjacent to the CTA Right-of-Way (ROW).

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preconstruction Meeting: confer with the CTA's Representative regarding the CTA's requirements for the protection of clearances, operations and safety.

B. Prior to the start of any work on or over the CTA's right-of-way, meet with the CTA Representative to determine requirements for flagmen and other necessary items related to the work activities on, above, below, and adjacent to the CTA facilities. At least 21 calendar days prior to the start of work request CTA to prepare a Right-of-Entry document. Conform to requirements of the "CTA Requirements for Contractors Working along the Right-of-Way (R.O.W.)", available at https://www.transitchicago.com/nearbyconstruction/ .

C. Notify the CTA Representative 72-hours in advance of the time to enter upon the CTA right-of-way for the performance of work.

1.5 SUBMITTALS

A. Submit a Rail Service Bulletin Request form at least 21 calendar days in advance of the Contractor's proposed scheduled time to enter upon the CTA Right-of-Way for the performance of any work under this Contract.

B. Submit a draft Construction Process Plan by such method as the Commissioner may direct, at least 21 calendar days in advance of work requiring a Construction Process Plan, and at least 14 calendar days prior to a pre-activity meeting.

1. Include necessary calculations prepared by a qualified Structural Engineer licensed in Illinois, showing compliance with the specified performance criteria.

C. Submit detailed drawings prepared and sealed by a qualified Structural Engineer licensed in Illinois, for falsework, sheeting, and construction procedures adjacent to and under the tracks.

D. Submit drawings and design calculations for protective shields prepared and sealed by a qualified Structural Engineer licensed in Illinois.

1.6 PROJECT CONDITIONS

A. The CTA must maintain rail operations at all scheduled times for the benefit of the public. Conduct operations in such a manner as not to cause damage to the CTA equipment, put the public or the CTA personnel in danger, cause inconvenience to the customers, interrupt train service (except as permitted herein), or cause avoidable inconvenience to the public and the surrounding communities.

B. The CTA will be operating trains during the construction of this project. The rail operations are 24 hours per day, seven days per week.

C. Certain portions of the project may be performed on, above or adjacent to sections of track where rail service is suspended in order to facilitate the work. For any work occurring within, above or adjacent to a section of track to be taken out of service, the Contractor shall confirm with the CTA that track within the work limits has been taken out of service and the third rail de-energized, as required, prior to beginning the work.

D. If the CTA deems any of the Contractor's work or operations hazardous to the CTA's operations or to the public, the CTA shall contact the Commissioner. The Commissioner may elect to immediately suspend work until reasonable remedial measures are taken satisfactory to the CTA.

E. The CTA may review any of the Contractor's procedures, methods, temporary structures, tools or equipment that will be utilized within the CTA Right-of-Way. These reviews do not relieve the Contractor of responsibility for the safety, maintenance, and repairs of any temporary structure or work, or for the safety, construction, and maintenance of the work, or from any liability whatsoever on account of any procedure or method employed, or due to any failure or movement of any temporary structure, tools or equipment furnished as necessary to execute work on CTA Right-of-Way.

F. 5 weeks prior to the start of any work on, above or adjacent to the CTA right-of-way, attend weekly coordination meetings with CTA Operations and other CTA departments to review and coordinate proposed work activities of the Contractor. Provide a five week look-ahead schedule, in a format acceptable to CTA, reflecting proposed work activities within the CTA Right-of-Way.

G. Rail Service Bulletin Requests will be required when performing work which impacts rail operations.

H. CTA generally permits only one Track Access Occurrence at a time on any given route. Other work on CTA's system, including required operations and/or maintenance by CTA, or work by other contractors elsewhere on the route, may

limit the available dates of track access occurrences for this project. The Contractor is strongly encouraged to submit Rail Service Bulletin requests with more than the 21 day minimum required advance notice. The CTA has indicated that they typically will not grant Track Access Occurrences on consecutive weekend periods in order to provide scheduled service to customers.

I. Observe rules, safety regulations, and other requirements of the CTA, including, but not limited to, the following Standard Operating Procedures (SOP's) noted in the Chicago Transit Authority Safety System, 'Safety Manual for Contract Construction On, Above or Adjacent to the CTA Rail System' document included in the appendix.
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1. No. 7037, "Flagging on the Right-of-Way".
2. No. 7038, "Train Operation Through Slow Zones".
3. No. 7041, "Slow Zones".
4. No. 8111, "Workers Ahead Warning System".
5. No. 8130, "Safety on Rapid Transit Tracks".
6. No. 8212, "Test Train Procedures"
7. Sketch 2000-SZ-1, Slow Zone Equipment

1.7 REIMBURSEMENT OF COSTS

A. The cost of all flagmen, infrastructure crews, engineering inspection, switchmen, test trains, and other workmen furnished by the CTA shall be paid for directly to the CTA by the Contractor.

B. The costs associated with Track Access Occurrences granted and established by the CTA shall be paid for directly to the CTA by the Contractor.

C. The amount paid to the Contractor shall be the amount charged to the Contractor for all authorized CTA charges including CTA additive rates audited and accepted by Commissioner.

D. Following approval of the CTA invoices by the Commissioner, the Contractor shall pay all monies to the CTA as invoiced and shall submit to the Commissioner certified and notarized evidence of the amount of payments. No overhead or profit will be allowed on these payments.

E. If there are maximum amounts of flagger shifts identified within this specification and if Contractor operations require flagger shifts that are granted by the CTA beyond these limits, the Contractor shall pay for the services, but will receive no reimbursement.

F. The Commissioner will not be liable for any delays by the CTA in providing flagmen, establishing track closures or other service provided by the CTA and identified within this special provision.

G. An allowance for payment for CTA Test Trains, Support Services and Track Access Occurrences has been included in the Schedule of Prices. The amount of the allowance is common to all Bidders and must be included in the total Base Bid. Should actual charges for CTA test trains and construction support be less than the

allowance, only the costs incurred must be paid, and the Contract must be reduced by the amount of the allowance not used. Should actual charges for CTA test trains and construction support exceed the allowance, the whole allowance must be paid and the amount in excess of the allowance will be paid by contract modification.

1.8 RAIL SAFETY TRAINING

A. Personnel assigned to work on, above, below, or adjacent the CTA Right-of-Way shall be required to attend an all-day Rail Right-of-Way Safety Training Session in accordance with the CTA, Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System. The cost of this training is currently $200.00 per employee, paid by the Contractor in advance. The certification is good for one calendar year from the date of issuance. Coordinate rail safety training with the Commissioner. The cost of training shall be paid directly to the CTA by the Contractor.

B. Rail Right-of-Way Safety Training for Contractor and subcontractor personnel will be scheduled by CTA as training slots become available. Be advised that the Contractor's failure to request training sufficiently in advance of when the employee is required on the work site shall not be cause for relaxing the requirement for Rail Right-of-Way Safety Training.

C. The $200.00 fee is non-refundable. If any individual fails to report for training or is rejected for training and must be rescheduled, an additional $200.00 will be required. No additional compensation will be made for the rescheduling of any training.

D. Upon successful completion of CTA Rail Safety Training, each trainee will be issued a non-transferable Rail Safety Tour Identification Card with the trainee's photo and a decal with pressure sensitive adhesive to be affixed on the hard hat. The Rail Safety Tour Identification Card and the decal are valid for 1 year from the date of issue. The validity of the Card and the decal are in no way related to the length of this Contract.

E. Contractor and Subcontractor personnel must renew their Rail Safety Tour Identification Cards annually by successfully completing Rail Safety Training again. Personnel who fail to maintain a valid Rail Safety Tour Identification Card are not permitted to work on, above or adjacent to the CTA Rail Right of Way and CTA reserves the right to remove such personnel from the work site.

F. The costs incurred by the Contractor for CTA Rail Safety Training will not be reimbursed.

1.9 MANDATORY ITEMS FOR PERSONNEL ON CTA RIGHT-OF-WAY

A. Personnel assigned to work on the CTA Right-of-Way:

1. Contractor's and Subcontractor's employees will be given individual property permits. These permits shall be carried by each employee at all times while on CTA property. All permits issued shall be returned to CTA at the

completion of the project, if the employee no longer works on this project, or on the date of expiration.

2. Employees shall carry a valid Rail Safety Tour Identification Card at all times while on CTA right-of-way in accordance with Article 2-2 of the CTA Safety Manual.
3. Employees shall wear an undamaged hard hat with current rail safety sticker affixed, CTA standard safety vest and eye protection at all times while on CTA right-of-way. Noise protection shall be used when necessary. Comply with OSHA requirements as required for the work.
4. Personnel shall wear suitable work shoes with defined heel and non-slip soles. Steel toes or metal cleats on the sole or heel of shoes are prohibited. Shoelaces are to be kept short so they do not pose a tripping hazard. Athletic shoes, sandals, open-toed shoes, moccasins and/or shoes with heels higher than 1" are not permitted.
5. Personnel shall have a non-metallic, working flashlight after dark or when working in the subway.

B. Personnel assigned to work adjacent to or above the CTA right-of-way shall wear a CTA standard safety vest at all times. Personnel without current Rail Safety Training and a valid property permit shall not enter onto any CTA Right-of-Way.

1.10 CTA OPERATING REQUIREMENTS

A. Strictly comply with operating requirements of the Chicago Transit Authority while construction work is in progress, specifically as follows:

1. Work performed on the CTA Right-of-Way will be allowed during the Construction Period only in accordance with the Article "ALLOWABLE HOURS OF CONSTRUCTION". During most periods of construction, a "slow zone" shall be established at the work site and flagging personnel shall be deployed to facilitate safe and continuous train operations and to protect Contractor, CTA employees, passengers, the general public, and property in the vicinity.
2. No one is permitted to enter the CTA Right-of-Way during Rush Hours. Access to the underside of the existing or proposed bridge structure within the limits of the CTA Right-of-Way will not be permitted.

B. As much work as possible is to be done under normal CTA operating conditions (under traffic) without disruption of train movements. A maximum interruption of service to the CTA traffic of 15 minutes or as agreed upon with the CTA will be allowed. No interruption to CTA service will be allowed unless approved in writing by the CTA. The CTA has indicated during overnight periods, train headways are between 15 and 30 minutes.

C. Pedestrian traffic access to CTA station facilities shall be maintained at all times. Barricades and signage for sidewalk closures as well as all details for pedestrian crossings of street intersections at the entrance of the station must be coordinated with the CTA at least 28 days prior to modifications to staging.

D. Bus traffic access to CTA station facilities must be maintained. Any proposed changes to bus routes or normal access by pedestrians will need to be coordinated and approved by CTA (and Pace where applicable).

E. Access control of the CTA Right-of-Way must be maintained at all times. This includes eliminating openings directly to the Right-of-Way where existing median barriers are to be removed. All planned removals of existing access control must be coordinated with the CTA, with plans for counter measures provided to the CTA at least 3 weeks prior to removals. If the CTA grants the removal of a portion of the existing access control, provide a fence system to enclose the Work area and provide a visual separation between the Work area and the CTA operating track(s). The fence shall be designed and installed to meet CTA requirements, including, but not limited to, horizontal clearance requirements, minimum wind and vertical loading, foundation embedment, screening, fencing connections, installation requirements, maintenance of the fence throughout the installed period, removal of the fence at the completion of the period for the fence need and restoration of the CTA Right-of-Way. CTA shall approve fence designs, components, and installation procedures prior to the start of fence installation. The cost to design, install, maintain and remove the fence shall be considered included in the work required to be performed within the CTA Right-of-Way and will not be paid for separately.

1.11 ALLOWABLE HOURS OF CONSTRUCTION

A. Construction activities within CTA Right-of-Way are not permitted during Rush Hours. Access to the underside of the existing or proposed bridge structure within the limits of the CTA Right-of-Way will not be permitted during Rush Hours.

B. Construction activities within CTA Right-of-Way may be permitted during non-Rush Hour periods under flagging protection with the advance concurrence of the CTA as follows:

1. Monday thru Friday: From 0900 to 1500 and from 1900 hours to 0500 hours the next day (the power shall remain on for these hours unless allowed via specific Track Access Occurrence).
2. Weekends: 1900 hours Friday to 0500 hours Monday

C. Track Access Occurrences:

1. The total number of Track Access Occurrences shall be as specified below:

   a. Weekend Line Cut: A maximum of 1 occurrence will be permitted. Construction activities within the CTA Right-of-Way may be permitted between the hours of 02:00 Saturday and 04:00 Monday, including any time required for test trains stipulated in the Rail Service Bulletin. This weekend line cut occurrence will remove both tracks on the Lake Street Branch of the Green Line Route between Ashland and California Avenues. The rail traffic in this section of track will cease during this occurrence. In addition to CTA Linemen, Signal Maintainers, etc., bus shuttles will be provided during the Line Cuts, with the costs reimbursed to CTA by the Contractor.
   b. If proposed work requires that CTA operations be suspended due to any circumstance, The Commissioner shall be informed immediately to coordinate the service suspension with the CTA.
2. The exact dates and hours for all Track Access Occurrences are subject to change by the CTA depending on the nature of the work, access requirements

of CTA personnel, work performed under separate contract or operational requirements of the CTA. The approval of specific dates and times for Track Access Occurrences on this Contract may be affected by major events or by a Track Access Occurrence scheduled elsewhere on that route or the CTA System. The CTA has indicated that they typically will not grant Track Access Occurrences on consecutive weekend periods in order to provide scheduled service to customers.

3. Other work on the Green Line may affect the availability of Track Access Occurrences for this project.

D. The CTA reserves the right to modify the allowable dates or hours of track access occurrences based on service requirements for the subject route and manpower availability for the date and location requested.

E. The CTA reserves the right to deny or to cancel a previously approved request for a Track Access Occurrence based on service requirements for the time period requested. The CTA may notify the Contractor of such denial or cancellation no later than 1 day prior to a Track Access Occurrence. Service requirements may be affected by major events (e.g., festivals, White Sox and Cubs games, concerts), or by a Track Access Occurrence scheduled elsewhere on that route or the CTA System.

F. The Contractor will not be permitted to perform work requiring a Track Access Occurrence or Flagging during the following special events:

1. Taste of Chicago.
2. Independence Day.
3. Chicago Air and Water Show.
4. Chicago Marathon.
5. Chicago Blues Festival.
6. Chicago St. Patrick's Day Parade.
7. Thanksgiving Day and the day after Thanksgiving.
8. Christmas Day.
9. New Year’s Eve and New Year’s Day.
10. Easter Sunday.
11. Bud Billiken Parade.
12. Pitchfork Music Festival.
13. Lollapalooza.
14. Pride Parade.

G. In addition, CTA reserves the right to limit or deny access to the system during other major special events that may develop and that may impact service needs, during emergencies, and during severe weather conditions.

H. The CTA, at their discretion, may provide a Track Access Occurrence or Flagging during a time period identified above provided the request is made in conformance with this specification and is properly scheduled with the CTA as required.

1.12 CONSTRUCTION PROCESS PLAN

A. A Construction Process Plan will be required whenever work, in the opinion of the CTA, affects the safety or causes disruption of service or inconvenience to transit users, CTA Operations, or impacts CTA Right-of-Way including, but not limited to: protection of CTA tracks/ CTA Right-of-Way, demolition, temporary shoring installation, drilled shaft installation, pier construction, structural steel erection over CTA tracks/ CTA Right-of-Way, temporary pedestrian bridge to CTA's station entrance, and any other necessary temporary construction related to the above listed items. At a minimum, an individual Construction Process Plan shall be required for each instance the Contractor requests a Track Access Occurrence from CTA and for any work that requires flagging protection from CTA. The plan shall include/address the following:

1. Applicable Contract Documents.
2. Possible conflicts.
3. Compatibility problems.
4. Time schedules.
5. Weather limitations.
6. Temporary facilities & signage.
7. Space and access limitations.
8. Governing regulations.
9. Safe Work Plans (including Hazard Analysis).
10. CTA Operations Impact.
11. Proposed Traffic Control & Staging Areas.
12. Lift Plan.

B. For construction processes where failure of temporary structures will result in service interruptions and/or damage to CTA infrastructure prepare calculations and drawings. CTA reserves the right to require a 3rd party Structural Engineer review of the calculations, drawings and installation.

C. The draft plan must also include reference to Contractor Requests for Information (RFI's) and submittals that pertain to work identified in the plan.

D. In addition, for any work to be performed during a Track Access Occurrence, provide the following to the CTA:

1. A track access plan specifically identifying the area(s) of power removal and work zone protection methods being requested.
2. Work zone protection methods to be performed by the Contractor.
3. Name, title, contact information, and work hours for Contractor's on-site supervision.
4. Work zone protection requested by the Contractor for implementation by the CTA (subject to CTA approval).
5. Pre-approved Safety and Quality Control Checklists, applicable to the work elements being performed during the specific track outage request for completion by the Contractor and submission to the Person-In-Charge during Track Access Occurrence.
6. A general schedule reflecting proposed work to be performed within the requested Track Access Occurrence.

E. After pre-activity meeting minutes have been agreed to, comments from the meeting must be incorporated into a final Construction Process Plan.

F. Prior to the CTA implementing an authorized Track Access Occurrence, provide, at least 48 hours in advance, an hourly schedule broken into tasks with a defined critical path that clearly establishes milestones that may be monitored. The hourly schedule shall also include, but not be limited to:

1. Name, title, contact information, and work hours for Contractor's on-site supervision.
2. Power removal (min 1 hour).
3. Proposed work activities.
4. Activities for inspection and completion of safety & quality checklists by Contractor.
5. Submission of safety & quality checklists to the PIC during Track Access Occurrence. The checklists shall be submitted to the PIC prior to commencing power restoration activities.
6. Power, Signal Restoration (min 1 hour).
7. Test train (min 1/2 hour).

G. The CTA intends to issue Power & Way Service Bulletins to supplement CTA Rail Service Bulletins. The Power & Way Service Bulletins are intended to provide procedural guidelines for safely removing and restoring the CTA's power & way systems (primarily traction power & signal) within the limits defined by the contract and Contractors specific track outage plan(s).

H. CTA labor shall be required to de-energize and re-energize traction power and perform such other work as may be deemed by the CTA to be required pursuant to the Contractor's work activities and authorized Track Access Occurrences, etc. CTA Signal Maintainer shall also be required to observe and witness the Contractor disconnection and reconnection of temporary signal work at each location where modifications are performed to support construction activities. One Signal Maintainer will be required to witness testing at each location or housing where it is taking place. CTA Signal Maintainer shall also be required to witness the Contractor restoration safety testing, prior to the line being returned to the CTA.

I. Two Linemen will be required at each location where traction power is energized or de-energized. The Contractor's schedule must include travel time for the CTA Electrician's (min. 1/2 hour) if they are to energize or de-energize traction power at more than one location.

J. Failure of the Contractor to provide the CTA the minimum specified time required for the removal and restoration of all Power & Way systems within an authorized Track Access Occurrence will result in specified liquidated damages for failure to return track(s) to service in accordance with the contract requirements. There will be no reimbursement for liquidated damages charged to the Contractor by CTA. The following schedule for liquidated damages has been established by the CTA:

1. From 1 minute through 29 minutes delay - $5,000.00.
2. From 30 minutes through 59 minutes delay – an additional $5,000.00.

3. For each additional hour or fraction thereof - $30,000.00 per hour.

1.13 HAZARDOUS WORKING CONDITIONS

A. Caution personnel of the presence of electric third rail (600 volts DC), live cables and moving trains on CTA tracks. Take precautions to prevent damage to life or property through contact with the electrical or operations systems. The Contractor shall caution personnel that any contact with live electric third rail or "live" portions of train undercarriage may result in a severe burn or death.

B. Establish third-rail safety precautions in accordance with CTA regulations. Use insulating hoods or covers for live third rail or cables adjacent to the work. On every day and at every work site where a live third rail hazard exists, the Contractor shall instruct employees of the emergency procedures. Knowledge of the disconnect switch locations or manner of disconnection shall be available at all times to the personnel on the job. Unless otherwise noted, only CTA Electricians are allowed to disconnect power.

C. The third rail may be de-energized during authorized Track Access Occurrences. The planning and implementation of the de-energizing shall be listed in the Contractor's process plan and include documenting checklist requirements.

1.14 TRACK SAFETY

A. Conduct operations over, on, under, adjacent to, or adjoining, the CTA Right-of-Way in such a manner as not to cause damage, settlement or displacement of any structures, tracks or any portion thereof. Monitor CTA tracks for vertical and horizontal movements. Refer to Section 31 09 13 "Monitoring Track Structures During Construction".

B. Damages to the CTA tracks, supporting structures, facilities, and properties caused by the Contractor's operations shall be replaced or repaired by the Contractor to the satisfaction of the CTA without reimbursement. Obtain photo documentation of damaged property to the CTA prior to performing any repair or replacement work.

C. The CTA shall have the right to perform any work it deems to be of an emergency nature and/or necessary to permit normal train operations during construction operations by the Contractor. The work to be completed by the CTA may impact the ongoing Contractor operations. If the emergency work is required due to Contractor actions, the cost of such service or emergency work provided by the CTA shall be borne by the Contractor with no reimbursement by the Commissioner.

D. Work shall comply with the CTA "Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System" and CTA "Standard Operating Procedures".

E. Train Clearances

1. Calculate the clearance requirements for curved track sections to ensure encroachment into the clearance envelope will not occur. Prepare detailed

drawings for falsework, sheeting, and construction procedures adjacent to and under the tracks before doing any work on same. Falsework, sheeting, and construction procedures shall be constructed in accordance with the approved drawings and specifications.

2. Horizontal Clearance:
   a. Minimum 7’-2”. Take such precautions as are necessary to ensure the safety and continuity of the CTA operations and passengers. Provide a minimum horizontal clearance of 7'-2" from the centerline of the nearest tangent track to any falsework, bracing and forms or other temporary obstruction during the work under this Contract.
   b. Limited minimum 6’-1”. In limited cases and with advance authorization by the CTA, a minimum horizontal clearance of 6’-1” between the centerline of the nearest tangent track and an obstruction may be allowed. This clearance does not allow personnel to safely stand between the obstruction and an operating train. In addition, an obstruction at this clearance is a hazard to motormen with a cab window open. Any required flagging by the CTA will need to be requested as described herein.
3. Vertical Clearance: A minimum vertical clearance of 14'-6" above the high running rail the CTA tracks must be provided at all times.
4. In case of any settlement or displacement of structures or tracks, immediately proceed with shoring or other work necessary to maintain the CTA property in a safe condition for the operation of train service. If the Contractor fails to undertake this work within 24 hours after notice by the Commissioner in writing, the CTA may proceed to repair or shore such structure or tracks. The cost thereof shall be billed to the Contractor with no compensation. If the settlement or displacement is severe enough to limit train service, the repairs shall be made immediately. Costs of any disruption to the CTA service due to the Contractor's operations or negligence shall be at the Contractor's expense with no compensation.

F. Protective Shield

1. Furnish, install, and later remove protective shields to protect the CTA traffic from damage due to:
   a. Falling material.
   b. Work on bridge piers.
2. Protective shields will be necessary for any demolition/repair/new construction activities.
3. The protective shield may be a platform, a net, or any other structure, approved by Commissioner, that can support the construction debris and satisfy train clearance requirements.
4. Required protective shield for falling material, as indicated on the plans and the supporting members shall be designed to sustain a load of 200 pounds per square foot in addition to its own weight.
5. Required protective shield for work on bridge piers shall be designed for a 30 psf minimum wind load pressure or greater as determined by Contractor’s engineer for site specific conditions. Any other loads that can be imposed by Contractor’s construction activities shall also be included.
6. Preferred material for shield is wood.
7. Construct the protective shield in accordance with approved shop drawings.

1.15 TRACK FLAGGING OPERATIONS

A. Temporary Track Flagging slow zones per CTA SOP 7041 and CTA "Safety Manual for Contract Construction On, Above or Adjacent to the CTA Rail System" are restricted in the following manner:

1. Temporary track flagging slow zones can only be mobilized, utilized and demobilized in non-rush hour time periods and no more than 1 Track Flagging Operation zone will be permitted at any given time. Furnish and install the required slow zone signage and equipment. A Track Flagging Operation zone is defined as a contiguous work zone, of no more than 600 feet in length, regardless of the number of tracks fouled. The costs for manpower, signage, and equipment for flagging operations will be billed by the CTA to the Contractor with reimbursement as defined herein.
2. Current Standard Operating Procedures require Slow Zone with flagging protection whenever any workers are scheduled to work on, across, or near a section of track. Comply with the CTA "Flagmen Requirements Manual" for flagging protection. If the work will take place in an area of restricted visibility then flagmen must be assigned (for any number of workers/duration of work) and a slow zone must be established.
3. Temporary Track Flagging slow zone signs will be placed and then removed, turned, or hooded so it cannot be read from the motor cab when the work crew clears the Right-of-Way.
4. Provide CTA with a written request for flagmen and other personnel at least 72 hours (three normal working days and before noon on Wednesday for the following week beginning Sunday) prior to the date, and time the work will be performed and the CTA personnel are requested.
5. Pay for CTA flagging and other personnel costs (costs will be deducted from the Contract) under any of the following circumstances:

    a. Flagging or other personnel were requested by the Contractor and scheduled by the CTA but were not used by the Contractor.
    b. The Contractor failed to properly notify the CTA at least 24 hours in advance of the date and time the work was to be performed to cancel scheduled personnel.
    c. When the Contractor estimates that additional flagging personnel, signalmen, linemen, or towermen are needed to secure the project construction site or for a specific phase of construction.
    d. When work being performed includes repair or rework resulting from previously installed non-conformant work.
6. The costs for flagger shifts beyond those included in the bid form, required for the Contractor's operations, that are requested and granted by the CTA will be reviewed after the flagger shift request has been made to the Commissioner.

B. The providing of such personnel and any other safety precautions taken by the CTA shall not relieve the Contractor of any liability for death, injury or damage arising in connection with the construction operations. See CTA SOP No. 7037, "Flagging on the right-of-way", for a description of flagging personnel duties.

C. To minimize flagmen usage, the Contractor shall use approved barricades, barricaded scaffolds and/or safety railings. Barricades and safety railing

arrangements shall be in accordance with Section 4-5.3 of the CTA "Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System".

D. The CTA does not guarantee that flagging or other personnel will always be available when requested. Requests for flagging manpower shall conform to the CTA "Flagman Requirements Manual". Certain work locations require multiple flagging personnel when only one track is fouled by the work.

E. Pay for flagging and other personnel costs incurred and charged by the CTA. The cost for the each flagger shift shall be approximately $900.00 per flagger shift (exact cost will be based on actual wage rates, fringes and overhead). The Contractor shall also be responsible to reimburse the CTA for costs associated with the use of other personnel for infrastructure shifts throughout the duration of the contract. The cost for any other CTA personnel (signalmen, linemen, towermen, inspectors, etc.) shall be approximately $1,100.00 per infrastructure shift (exact cost will be based on actual wage rates, fringes and overhead).

F. By labor contract, CTA flagging personnel are entitled to a 30-minute break after a continuous 5-1/2 hour work period, including report and travel time. The 5-1/2 hour period begins when the person reports to work at his or her home terminal. Additionally, flagging personnel are entitled to occasional personal breaks (to use the washroom facilities) during the normal course of work. When flagging personnel leave the work site, work must cease unless provision is made for a relief flagger. The Contractor shall coordinate the Project work schedule with the flagging personnel break periods.

G. Report any actions of perceived CTA employee misconduct, or if any CTA employee does not provide a full level of cooperation in support of the contract, to the Commissioner.

1. Failure to make the proper notification in writing may adversely affect any claim that the Department may file with respect to CTA employee performance or lack thereof.

H. If the Contractor, the Commissioner, CTA Construction or Safety Inspector believes that the Flagman is unable to perform his/her duties responsibly, work shall be stopped immediately, ensure that the Right-of-Way is safe for train operations, and the Work Crew shall exit, without delay, the Rail System Right-of-Way. Contribute incident information to the Commissioner prior to the end of the workday.

I. CTA Flaggers only provide flagging protection for the CTA Right-of-Way, and only CTA Flaggers are permitted to provide flagging protection for the CTA Right-of-Way. Flaggers for streets, highways, or other railroads are solely the responsibility of the Contractor, and will not be permitted to provide flagging protection for the CTA Right-of-Way.

1.16 TRACK ACCESS OCCURRENCES

A. The entire system must be fully operational when the tracks are put back into service after a Track Access Occurrence. The track where work was conducted must be returned to the CTA in revenue condition; all stations must be open, fully

functional and properly cleaned. The Contractor shall be immediately available with sufficient staff for up to one hour after revenue operation begins to ensure that all systems are functioning properly.

B. The Contractor shall allow enough time prior to putting the tracks back into service to make sure the line can be fully operational. A test train shall be required after any construction activity, determined by CTA to require a test train. The scheduling of test trains must include travel time to and from the location being tested. Additional time should also be allowed for any possible remedial work required before the system can be made fully operational.

C. Components of the system, including, but not limited to, tracks, signals, stations, entrances, etc. must be fully and properly operational prior to putting the tracks and facilities back into service. Facilities under demolition or construction and temporary facilities shall be safe and secure so they do not impact revenue service operations.

D. The Contractor shall be subject to fines if any station, facility, yard, structure, track, or component is not fully operational and useable at the prescribed predetermined time; including planned staging of construction sites. The CTA will identify appropriate fines at the time of the incident. No compensation will be made for fines levied by the CTA due to Contractor actions or delays in providing CTA facilities at prescribed times.

E. Clean debris and equipment from the work or staging areas after work has been completed each work day. In the event the Contractor fails to clean to the CTA's satisfaction, the CTA may perform any necessary cleaning and fine the Contractor the cost of such cleaning. No compensation will be made for fines levied by the CTA due to delays and cleaning costs.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The Work of 01 35 15 - SPECIAL PROJECT PROCEDURES FOR ADJACENT CONSTRUCTION will not be measured for payment.

4.2 PAYMENT

A. Payment for Work specified in RAIL SAFETY TRAINING Article must be included in the contract lump sum Price as shown in the Schedule of Prices for MOBILIZATION.

B. Payment for Work specified in TRACK FLAGGING OPERATIONS Article will be included in the allowance as shown in the Schedule of Prices for TRACK FLAGGING AND OPERATIONS.

C. Payment for Work specified in TRACK ACCESS OCCURANCES Article will be included in the allowance as shown in the Schedule of Prices for TRACK ACCESS OCCURANCES.

END OF SECTION

SECTION 01 38 00

CONSTRUCTION PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Employ a professional photographer to take construction record photographic documentation periodically during course of the Work.

B. The photographer shall visit the site for the purpose of taking photographic documentation as scheduled and approved by the Commissioner.

C. The Commissioner may cancel and reschedule site visits due to inclement weather at no additional cost to CDOT.

D. Employ Web-Based Photographic Documentation Service Provider: A firm specializing in providing photographic equipment, Web-based software, and related services for construction projects, with record of providing satisfactory services similar to those required for Project.

1.03 DEFINITIONS

A. UAV: Unmanned Aerial Vehicle.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For photographer and Web-based photographic documentation service provider.

B. Key Plan: Submit key plan of Project site with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation of construction.

1.05 REQUIRED PHOTOGRAPHIC DOCUMENTATION

A. Pre-Construction Photographs

1. Provide photographic views of existing (pre-construction) conditions at station site as directed by the Commissioner to a cost specified in the Additional Special Conditions.
2. The Commissioner may direct that pre-construction photographs be taken at any time during the duration of the Project as work is scheduled to begin on different tasks.
3. Provide a minimum of 100 photographs.

B. Construction Photographs:

1. Photograph project from 20 different views each month during construction, as directed by the Commissioner.
2. Provide 2 prints of each view of the pre-construction and construction photographs enclosed in 2 separate binders with double-faced plastic sleeves. Each month furnish binders to Commissioner.

C. Time-Lapse Sequence Construction Photographs: Take photographs as indicated, to show status of construction and progress since last photographs were taken.

1. Frequency: Take photographs 8am, noon, and 4pm on each day.
2. Vantage Points: Following suggestions by Commissioner and Contractor, photographer to select vantage points. During each of the following construction phases, take not less than two of the required shots from same vantage point each time to create a time-lapse video sequence as follows:

    a. Commencement of the Work, through completion of subgrade construction.
    b. Above-grade structural framing.
    c. Exterior building enclosure.
    d. Interior Work, through date of Substantial Completion.

D. Digital files:

1. High resolution digital files shall be furnished uploaded to Web-based photographic documentation service provider's Web site.
2. Obtain the photographer's agreement prior to employment to furnish additional prints to CDOT at commercial rates applicable at time of purchase.
3. Time lapse video must be available to CTA for opening day video loop on station monitors.

E. Web-Based Photographic Live Video Stream Documentation: Transmit simultaneous video streams at full rate.

1. Stream video recordings to approved Web-based photographic documentation service provider's Web site.
2. Identification: For each recording, provide the following information:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Contractor.
d. Date(s) and time(s) video recording was recorded.
e. Description of vantage point, indicating location, direction (by compass point), and elevation of construction.

1.06 QUALITY ASSURANCE

A. Drone & Operator Requirements:

1. Provide a FAA registered operator for commercial aerial UAV services.
2. Provide a FAA registered UAV weighing between 0.55 lbs. to 55.0 lbs.
3. UAV capable of utilizing Global Positioning System.
4. UAV capable of Omnidirectional Obstacle Sensing System.

B. Aerial Photo Requirements:

1. Camera capable of providing high quality photos (greater than 12MP) in formats of: JPEG, DNG (RAW), JPEd + DNG, etc.

C. Aerial Video Requirements:

1. High quality video capable of providing high resolution (ie. 4K:3840x2160 24/25/30p @ 100 Mbps).

PART 2 - PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

A. Color; date encoded high-quality 35 mm digital prints.

1. Finish: Smooth surface, glossy.
2. Size: 8"x 10".

B. Identify each print on back, listing:

1. CDOT Project Number with picture sequential number
2. Project Name
3. Date:
4. Description/Key Plan

a. Orientation of view
b. Date and time of exposure
c. Key plan in lower right hand corner permanently affixed.
d. Name and address of photographer.

2.02 WEB-BASED PHOTOGRAPHIC LIVE VIDEO STREAM DOCUMENTATION

A. Project Camera: Provide fixed exterior camera installation, mounted to provide unobstructed view of construction site from location approved by Commissioner.

1. Provide two fixed-location camera, with the following characteristics:

a. Static view
b. Capable of producing minimum 5.0 megapixel pictures.
c. The outdoor camera system shall consist of a weatherproof aluminum constructed housing, HD streaming camera to be mounted on a fixed pole, wall, parapet or ceiling.
d. The camera shall have the ability to provide live video.
e. The camera shall upload HD video over a wireless cellular modem, a wireless point-to-point system or a RJ-45 hardwired connection to a DSL or cable modem.
f. The content shall be sent to a secure, password protected website with an Interface and Online Software features provided by the Vendor as a Managed Service.
g. The system shall operate on 120VAC.
h. Provide power supply, active high-speed data connection to service provider's network, and static public IP address for each camera.

B. Web-Based Image Access: Password-protected access for Project team administered by Contractor, providing current image access and archival image access by date and time, with images downloadable to viewer's device.

2.03 INTERFACE AND ONLINE SOFTWARE

A. Remote Access: Contractor’s System Vendor shall provide an internet based interface and online software as a managed service, to allow the viewing of all high-definition digital still images captured and stored and live video, from any location with internet access via a secure password protected website.

1. Maintain images on the System Vendor’s website for reference available at all times during the life of the project and for not less than 60 days after completion.

B. Online Interface Features:

1. Software delivered by Vendor as a Managed Service.
2. Displays Company logo and project name.
3. Capable of viewing actual live video.
4. Picture in Picture to view live video, while viewing high definition images.
5. Calendar based navigation system for selecting specific images.

6. Multifunction image browsing.
7. A multi-view screen to view all of the cameras on a project at the same time.
8. Share image tools: save, print, email and post to message board or mobile devices.
9. Time lapse features include – Instant time lapse play back by day, week, month or year.
10. Account security features include – Four levels of password protection, IP address block/ permission and SSL protection of the user login password.
11. All Images are the Copyright of CDOT and Protected on Secure Servers Owned and Operated by the System Vendor.

PART 3 - EXECUTION

3.01 CONSTRUCTION PHOTOGRAPHS

A. Factual presentation.

B. Correct exposure and focus.

1. High resolution and sharpness
2. Maximum depth-of-field
3. Minimum distortion.

C. Take views as directed and in the presence of the Commissioner.

D. Provide a drone based video upon Final Completion.

3.02 WEB-BASED PHOTOGRAPHIC LIVE VIDEO STREAM DOCUMENTATION

A. Maintain cameras and Web-based access in good working order according to Web-based construction photographic documentation service provider's written instructions until final completion. Provide for service of camera and related networking devices and software.

B. Termination and Removal: Removal of camera system when instructed by the Commissioner.

C. Camera system including associated appurtenances and mounting equipment are property of CDOT.

3.03 DELIVERY OF PRINTS

A. Deliver two sets of prints and the digital files with each Application for Payment.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of CONSTRUCTION PHOTOGRAPHS will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of CONSTRUCTION PHOTOGRAPHS will be included in the applicable Line Item contract lump sum price as shown in the Schedule of Prices.

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality assurance and control services required by Commissioner or authorities having jurisdiction are not limited by provisions of this Section.

C. Furnish a complete written description of the Contractor's Quality Control Program for the project. Itemize the procedures to be followed for each separate category of Work and arrange the description of the separate categories so as to correspond with the Sections of the Specifications.

D. Related Sections:

1. Construction Photographic Documentation: Section 01 38 00.
2. Divisions 02 through 41 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Commissioner.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the completed Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency. Testing Agency shall be responsible for setting up, conducting, and interpreting tests with a report. Reports shall include an executive summary at the beginning that includes every non-conformance item and specifically notes each item's deviation from the Project requirements.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

L. Witness Test/Witness Testing: Testing at a Testing Agency's facility or at a manufacturing plant that is intended to be witnessed by the Commissioner.

M. Specialty Work: Work as specified in various sections, coordinated by a Contractor's Specialty Coordinator, and as indicated on drawings as Platform Specialty Work and Bridge Specialty Work.

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Commissioner for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Commissioner for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.

5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Commissioner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Structural Engineer Qualifications: A Structural Engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29CFR1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality assurance service to Commissioner, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Commissioner.

2. Notify Commissioner seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Commissioner's approval of mockups before starting work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 03 through 33.

L. Travel expenses related to Mockup reviews, Witness testing, Factory inspections, Plant visits, etc.

1. If facilities that the Commissioner is to visit are within the City of Chicago Metropolitan area pay for transportation expenses for 4 representatives of the Commissioner while engaged in the review process.
2. If facilities are out of the City of Chicago Metropolitan area pay for living, lodging, and transportation expenses for 4 representatives of the Commissioner while engaged in the review process. Living expenses shall include transportation, meals, hotel (similar or equal in quality to Holiday Inn Hotels) and a rental car.
3. List of facilities to visit include:

    a. Steel reinforcement fabrication plants.
    b. Cast-in-Place concrete batch plants.
    c. Precast manufacturing plants
    d. Cast Connex manufacturing plant.
    e. Steel fabrication plants.
    f. Stainless steel fabrication plants.
    g. Forming system manufacturing plant.
    h. Hot dip galvanization plants.
    i. Steel decking manufacturing plant.
    j. Nonslip surface flooring manufacturing plant.
    k. Glass (float plant).
    l. Glass (heat treatment plant).
    m. Glass fabrication plants.
    n. Panel system manufacturing plants.
    o. Stone paving plants.
    p. Escalator manufacturing plants.
    q. Elevator manufacturing plants.
    r. Nail laminated timber manufacturing plants.
    s. Lighting Manufacturer Plants
    t. UPS Manufacturer Plants
    u. Traction Power Switchgear (Circuit Breaker) Plants
    v. AC Switchgear Plants
    w. Cable Manufacturer Plants

1.7 CONTRACTOR'S ADMINISTRATION STAFF

A. General: Furnish a competent and adequate staff as necessary for the proper administration, coordination, supervision, and superintending of the Work. Key members of this staff shall not be changed without the consent of the Commissioner, unless such members prove to be unsatisfactory to the Contractor and cease to be employed in a similar capacity by the Contractor.

B. Contractor's Coordinating Engineer: Furnish the services of a qualified engineer, who shall be responsible for coordinating the Work with the various trades, including the review of the shop drawings, eliminating conflicts or interferences between the various trades, checking for completeness of the shop drawings and directing changes in the Work as may be required to affect compliance with the Contract Documents. Coordinating Engineer must submit evidence of having previous experience in coordinating these areas of Work on projects of similar scale and complexity for comparable rapid transit projects for major transit operators and will be required to participate in the construction progress meetings as directed by the Commissioner. Submit resume for review and approval by the Commissioner prior to commencing work.

C. Contractor's Specialty Coordinator: Furnish the services of a qualified manager, who shall be responsible for coordinating the Specialty Work with the various trades, including the review of the shop drawings for the Specialty Work, eliminating conflicts or interferences between the various trades of the Specialty Work, checking for completeness of the shop drawings and directing changes in the Specialty Work as may be required to affect compliance with the Contract Documents. Submit evidence of Specialty Coordinator having previous experience in coordinating these areas of Specialty Work on projects of similar scale and complexity. Submit resume for review and approval by the Commissioner prior to commencing work.

D. Contractor's Project Manager: Prior to commencement of the Work, select a project manager who shall have full responsibility for the prosecution of the Work, with full authority to act in all matters as necessary for the proper coordination, direction, and technical administration of the Work. The Project Manager must submit evidence of having previous experience on projects of similar scale and complexity for comparable rapid transit projects for major transit operators and will be required to participate in the construction progress meetings as directed by the Commissioner. Submit resume for review and approval by the Commissioner prior to commencing work.

1.8 CONTRACTOR'S ASSISTANCE TO THE COMMISSIONER

A. Refer to requirements for inspection and testing by the Commissioner as specified in the SPECIAL CONDITIONS. The activities of the Commissioner's testing laboratories are solely at the discretion of the Commissioner and in no way relieve the Contractor of sole responsibility for maintaining the Quality Control Program.

The Commissioner's testing laboratories will perform independent inspections and tests, interpret and evaluate the results for compliance with the Contract Documents, record observations, and submit reports.

1.9 QUALITY CONTROL

A. Commissioner Responsibilities: Where quality-control services are indicated as Commissioner's responsibility, Commissioner will engage a qualified testing agency to perform these services.

1. Commissioner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Tests and inspections not explicitly assigned to Commissioner are Contractor's responsibility. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality control services.

a. Contractor shall not employ same entity engaged by Commissioner, unless agreed to in writing by Commissioner.

2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Commissioner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Commissioner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.
1. Distribution: Distribute schedule to Commissioner, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Commissioner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Commissioner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Commissioner and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality control service to Commissioner with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Commissioner.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Commissioner's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The Work of QUALITY CONTROL will not be measured for payment.

4.2 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the Work of QUALITY REQUIREMENTS will be included in the applicable Line Item contract lump sum price as shown in the Schedule of Prices.

END OF SECTION

SECTION 01 42 00
REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. Approved: When used to convey Commissioner's action on Contractor's submittals, applications, and requests, "approved" is limited to Commissioner's duties and responsibilities as stated in the Conditions of the Contract.

C. Indicated: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

D. Regulations: Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

E. Furnish: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

F. Install: Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

G. Provide: Furnish and install, complete and ready for the intended use.

H. Project Site: Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

I. General Requirements:

1. Drawings and general provisions of the Contract, including General and Additional Special Conditions (if any) and other Division 01 General Requirement Sections, apply to all sections of the work.

2. The provisions or requirements of Division - 01 Sections apply to entire work of the Contract and where so indicated, to other elements which are included in the project.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated and except when to comply with standards having different revision dates as referenced in the indicated codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point www.dodssp.daps.mil	(215) 697-6257
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point www.dodssp.daps.mil	(215) 697-6257

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(202) 862-5100
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
ACI	ACI International (American Concrete Institute) www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960

AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
ALCA	Associated Landscape Contractors of America www.alca.org	(800) 395-2522 (703) 736-9666
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (212) 591-7722
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWI	Architectural Woodwork Institute www.awinet.org	(800) 449-8811 (703) 733-0600
AWPA	American Wood-Preservers' Association www.awpa.com	(334) 874-9800

AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSI	Cast Stone Institute www.caststone.org	(770) 972-3011
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
FSC	Forest Stewardship Council www.fsc.org	52 951 5146905
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	See National Glass Association	
GS	Green Seal www.greenseal.org	(202) 872-6400
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000

IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance (The) www.igmaonline.org	(613) 233-1510
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(702) 567-8150
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864 (847) 577-7200
MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org	(312) 644-6610
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(281) 228-6200
NAIMA	North American Insulation Manufacturers Association (The) www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000

NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(703) 442-4890
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NTMA	National Terrazzo & Mosaic Association, Inc. www.ntma.com	(800) 323-9736 (540) 751-0930
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections www.boltcouncil.org	(800) 644-2400 (312) 670-2400
RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
SAE	SAE International www.sae.org	(724) 776-4841
SDI	Steel Deck Institute www.sdi.org	(847) 462-1930
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEI	Structural Engineering Institute www.seinstitute.com	(800) 548-2723 (703) 295-6195
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association	

	(Now IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
UL	Underwriters Laboratories Inc. www.ul.com	(800) 285-4476 (847) 272-8800
USGBC	U.S. Green Building Council www.usgbc.org	(202) 828-7422
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association (Now WCSC)	
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ICBO	International Conference of Building Officials (See ICC)
ICBO ES	ICBO Evaluation Service, Inc.

	(See ICC-ES)	
ICC	International Code Council www.iccsafe.org	(703) 931-4533

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-6816
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(202) 366-4000
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
	(See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
USPS	Postal Service www.usps.com	(202) 268-2000

E. Project Referenced Codes And Compliance Acts: Project Work is to conform with, but is not necessarily be limited to the following codes and regulations:

1. City of Chicago Building Code, Current Edition
2. National Electric Code, Current edition
3. International Plumbing Code, Current edition
4. International Mechanical Code, Current edition
5. USDOJ's "2010 ADA Standards for Accessible Design".
6. ICC A117.1 Current Edition.
7. The Illinois Accessibility Code, Current edition

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work will not be measured for payment.

4.2 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the work of this section shall be considered incidental to the contract.

END OF SECTION

SECTION 01 43 41
SPECIAL MOCKUPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Furnish and install special mockups work, including but not limited to:

1. Design of mockup and supporting structure.
2. Fabrication and installation of mockup.
3. Field painting.
4. Field modifications.
5. Demolition and removal.

B. The aluminum curtain wall work specified in this section shall be performed as specified in Section 08 44 13 ALUMINUM CURTAIN WALLS.

C. The structural glass curtain wall work specified in this section shall be performed as specified in Section 08 44 26 STRUCTURAL GLASS CURTAIN WALLS.

D. Extent of Platform mockup (Mockup A), Bridge mockup (Mockup B), and NLT mockup (Mockup C) are indicated on drawings. Provide materials and systems within mockup extents as indicated.

1.3 DESIGN REQUIREMENTS

A. The mockups shall be constructed of actual components and materials for the intended area, shall be fully glazed, with proposed glazing materials, and shall demonstrate the general scope and essence of the proposed systems in terms of architectural design concept, principal dimensions, and major architectural elements. The mockups will be reviewed by the Commissioner for coordination of elements, constructability, and esthetic effect.

B. Properly design the special mockups and supporting structure to withstand wind pressures, loading deflections, shrinkage, and thermal movements within the tolerances specified for the finished work.

C. Obtain and pay for permits required for the work.

D. The special mockups shall be representative of actual building conditions, conform to accepted details of construction, incorporate accepted materials and finishes, including connection with the structure, and be fully glazed. Provide sufficient glass for initial testing and retesting as may be required.

E. Build the special mockups at a location to be approved by the Commissioner. The assembly shall be fabricated and installed under the supervision of the fabricators' and installers' foremen.

F. Testing shall be performed on mockups according to requirements in "FIELD QUALITY CONTROL" Article.

G. Subject to compliance with requirements, approved mockup components may become part of the completed Work if undamaged at time of Substantial Completion.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design:

1. Design, engineer, fabricate, and install special mockups work in compliance with specified standards, performance requirements, material selections and requirements of this and related sections.
2. Include engineering analysis by a qualified Engineer, using structural performance requirements and design criteria indicated herein.

B. In general, performance requirements specified for the actual building also apply to special mockups and vice versa. Variations in criteria over the surface of the building, such as wind pressure, shall be taken into account in testing of mockups. Where certain performance is required for specific test conditions of mockups and samples, that same performance is also required of the actual building, for natural conditions equivalent to or less severe than the test conditions.

C. Compliance with the specified performance requirements shall be established by testing of the full scale special mockups.

1.5 ACTION SUBMITTALS

A. Product Data: for items specified herein.

B. Shop Drawings: Include full size details of the mockups, profiles, materials, interface with other trades, and information regarding joints and fasteners.

C. Samples:

1. 12 inch x 12 inch sample corner assembly.
2. 4 inch x 4 inch pieces of non-standard color selected by Commissioner.

D. Material List: Include list of materials and systems to be part of Special Mockups.

1.6 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Application and installation instructions.

B. Test and inspection reports: For special mockups. Show compliance with performance requirements.

C. Qualification Data: For Engineer.

D. Design Calculations: Submit calculations prepared by a qualified Engineer, showing compliance with the specified performance criteria. Calculations will not be reviewed by the Commissioner but are for informational purposes only. Test reports are not an acceptable substitute for design calculations.

1.7 QUALITY ASSURANCE

A. Fabricator/Installer Requirements: Same as those of the final construction.

B. Engineer Qualifications: Structural Engineer licensed in the State of Illinois and experienced in providing engineering services of the kind indicated that have resulted in the successful installations, similar in material, design, and extent to that indicated for this Project.

1.8 DELIVERY, STORAGE AND HANDLING

A. Build Special Mockups at a suitable location proposed by Contractor and approved by Commissioner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. See the referenced specification sections.

B. Types, sizes, colors, patterns, products, and manufacturers are indicated on the Drawings. Furnish trim shapes as required by conditions, angles, corners, bullnose, and other shapes required by installation conditions.

2.2 FABRICATION

A. Methods of fabrication, assembly, and installation, unless otherwise indicated, shall be identical to the actual building. The Contractor shall be responsible to guarantee satisfactory performance as herein specified.

B. Include items for attaching components to supporting structure and supplementary parts and materials to complete the installation. Glazing members shall be removable for interchanging glass panels in the field.

2.3 FINISHES

A. Provide special mockup members free of scratches and serious blemishes affecting the finish system.

B. Finishes shall be in accordance with the related sections requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble components at the location approved by the Commissioner, utilizing anchoring methods, arrangement and allowances for expansion and contraction, proper joints and intersections, glazing, and sealing as required to obtain a rigid and weather resistant installation.

B. The mockups shall be constructed under the supervision of the fabricator's and installer's foremen.

C. Completed work shall be plumb, level, and true.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following tests:

1. Gutter & Downspout Capacity Test: In accordance with the Municipal Code of Chicago Storm Drainage requirements.
2. Water-Spray Test: A minimum of two tests areas, designated by the Commissioner, shall be tested according to AAMA 501.2.

C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.

1. Test a minimum of 12 areas.
2. Repair installation areas damaged by testing.

D. Assemblies will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

F. Repair leaks and other defects. Retest as directed by the Commissioner. Repair or replace other work damaged by such leaks.

3.3 DEMOLITION AND REMOVAL

A. When directed by the Commissioner, demolish and remove the mockups and supporting structure. Dispose of debris off the site.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of SPECIAL MOCKUPS will not be measured for payment.

4.2 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the Work of SPECIAL MOCKUPS will be included in the applicable Line Item contract lump sum price as shown in the Schedule of Prices.

END OF SECTION

SECTION 01 55 26

TRAFFIC CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Furnish and install all Traffic Control as shown on the Drawings and as specified herein, including but not limited to the following:

1. The governing factor in the execution and staging of construction for this Project is to provide the public with the safest possible travel conditions.
2. The Work under this Section includes the furnishing, installation, maintenance and removal of all traffic control and protection, including but not limited to signs, message boards, arrow boards, temporary concrete barriers, removal of existing pavement markings, energy attenuating systems, barricades, flagmen, warning lights, sandbags and all appurtenances used for the purpose of safely regulating, warning or guiding traffic and pedestrians through the construction zone as required by these Detailed Specifications and as directed by the Commissioner.
3. Traffic Control is required for all work along Wabash Ave. between E. Monroe St. and E. Lake St. and the local roadways as identified in the Maintenance of Traffic Plan

1.03 REFERENCES

A. Illinois Department of Transportation - Standard Specifications for Road and Bridge Construction, latest edition.

B. Illinois Department of Transportation – Manual on Uniform Traffic Control Devices for Streets and Highways, latest edition.

C. CDOT Rules and Regulations for Construction in the Public Way, latest edition.

1.04 SUBMITTALS

A. Submit the following

1. Traffic Control Plan

a. The Contractor must submit a traffic control plan for the Project showing lane closures and durations and all signing and traffic control devices required with closures for the duration of the Project.
b. The Contractor must submit all requests and obtain all approvals for temporary lane closures from the Commissioner. All requests shall be submitted a minimum of 72 hours in advance of the proposed road closures. Temporary closures, where required, will be permitted only between the hours of 10:00 p.m. to 6:00 a.m.

1) No lane closures will be permitted during actual or predicted snow removal conditions.

2. Construction schedule for Traffic Control Plan

1.05 QUALITY CONTROL

A. Installation must be performed only by a qualified installer. The term qualified means experienced in performing the Work required by this Section on Projects of comparable scope, size and complexity. The Contractor must be able to demonstrate to the satisfaction of the Commissioner and Chief Procurement Officer that it and/or any subcontractors performing such Work have the qualifications, experience and, if applicable, licenses and permits to perform the Work in accordance with the terms and conditions of this Contract. The Contractor must submit evidence of such qualifications, licenses and permits upon request by the Commissioner.

1. The Contractor must provide a manned telephone on a continuous 24-hour-a day basis to receive notification of any deficiencies regarding traffic control and protection to correct any such deficiencies.

B. Perform Work in accordance with the latest edition, of the appropriate divisions, of the following:

1. IDOT Standard Specifications for Road and Bridge Construction.
2. IDOT Manual on Uniform Traffic Control Devices for Streets and Highways.
3. IDOT Standard Specifications for Traffic Control Items.

1.06 SPECIAL REQUIREMENTS

A. Job Conditions - General

1. The Contractor's vehicles must always move with and not across or against the flow of traffic, separated from traffic by temporary precast concrete barriers if required.
2. Vehicles must enter or leave work areas in a manner, which will not be hazardous to or interfere with normal traffic. Vehicles must not park or stop except within the designated work areas.
3. Personal vehicles will not be permitted to park within the right of way. The Contractor's personnel will be prohibited from crossing the roadway, and all pedestrian movements will be limited to within barricaded areas.

PART 2 - MATERIALS AND EQUIPMENT

2.01 MATERIALS

A. Traffic Control Devices

1. All signs, signals, markings, reflectorized safety posts, portable barricades, portable flashers, arrow boards, portable message sign boards, flagmen, or other devices that are used for the purpose of regulating, warning and guiding local and crossroad traffic must conform to the applicable portions of the State of Illinois "Manual on Uniform Traffic Control Devices for Streets and Highways," and "Standard Specifications for Traffic Control Items."
2. Striping obliterating tape to void pavement marking will be black, non-reflective and self-adhering.
3. No waiving of these requirements will be allowed without the prior written approval of the Commissioner.
4. Before beginning construction if the Contractor intends to use any signs not shown in the manual or any modification of standards shown in the manual, the Contractor must submit the details of the change and the use of the modified signs.

PART 3 - CONSTRUCTION METHODS AND INSTALLATION

3.01 GENERAL

A. All traffic control and protection must conform to the requirements of Section 701 Work Zone Traffic Control and Protection, IDOT Standard Specifications for Road and Bridge Construction, latest edition.

B. The cones or barricades, lights, and all warning signs, as required by IDOT, which will be required whenever a lane of the traveled way is closed to traffic, will be furnished and maintained by the Contractor. The Contractor will furnish and maintain all additional barricades, signs, warning lights, cones and flagmen, which is the opinion of the Commissioner, are necessary to safeguard the traffic and protect the work site. The Contractor will be responsible for the traffic protection for the duration of this Contract.

C. Placement of all signs and barricades must proceed in the direction of flow of traffic. Removal of all signs and barricades must start at the end of the construction areas and proceed toward oncoming traffic unless otherwise directed by the Commissioner. The Contractor will be required to cover all traffic control devices which may be inconsistent with traffic patterns during all changes.

3.02 FURNISH

A. The Contractor's manner of prosecuting the work or minor revisions or modifications in the construction operations may require traffic control to not be installed in accordance with a standard detail and device. In such cases, the standard details and devices proposed to be used must be submitted to and approved by the Commissioner in advance of the change in traffic control.

B. The Contractor will be required to furnish all traffic control devices unless specifically stated otherwise. Whenever the operation of the Contractor endangers or interferes with vehicular or pedestrian traffic, as determined by the Commissioner, the Contractor will furnish all additional traffic control devices necessary to direct traffic and protect his workmen, at no extra cost to the Commissioner. Sand bags that are used to secure barricades and sign stands are included in this item. The Commissioner reserves the right to inspect all traffic control equipment furnished by the Contractor one week before it is used on this Contract. In addition, the Contractor must furnish additional flagmen at no cost to the Commissioner, on a continuous basis whenever construction operations encroach on traveled lanes, such as pavement marking, patching operations, etc.

C. Portable precast units which have the New Jersey configuration and which have previously been cast meeting earlier Illinois Department of Transportation standards may be used on this Project. The units must be in good condition, without cracks or spalls, and the connecting loops must not be broken. The Contractor will be allowed to mix barrier units of previous designs in the same run with new units, provided the connecting loops are compatible and the units are of the same width so that a smooth, continuous face can be obtained. Units having designs other than the New Jersey configuration may be used with the written approval of the Commissioner.

3.03 INSTALLATION

A. Lane closure signs, flagmen signs, and detour signs must be erected prior to placement of drums, barricades, and/or cones and remain erected until such time as the traffic control devices have been removed from the pavement.

B. Construction signs referring to temporary lane closures during working hours must be removed or covered during nonworking hours.

C. The Contractor must so arrange his operations as to keep the closing of any lane of the traveled way to a minimum.

D. The Contractor will be responsible for the proper location, installation and arrangement of all traffic control devices used for the Project. The Commissioner will inspect the traffic control device placement before work on each stage begins, and any deficiencies will be corrected by the Contractor before starting work on that stage.

E. Whenever operations require or indicate that a relocation of a proposed or existing traffic control device is advisable including the existing signs and barricades as determined by the Commissioner, the Contractor must remove, relocate, and erect all traffic control devices in question. After the work has been completed, the Contractor, at the Commissioner's direction, must return and erect the device in its original location.

F. All advance warning signs for lane closures, guide signs, intermediate information signs and standard signs must be installed at a minimum mounting height of seven feet to the bottom of the sign. Signs must be installed in a manner to resist damage or knockdown in severe wind conditions and also allow ease of relocation during stage changes.

G. The Contractor will not be permitted to erect, change or remove his barricade system without prior approval of the Commissioner. The Contractor will be required to leave and maintain all traffic control devices in place until all construction operations have been completed in each stage. The Contractor must arrange and manipulate barricade placement and schedule construction operations to permit continuous operation of all lanes designated as open to traffic unless otherwise directed by the Commissioner.

H. The height of the barricades must be no less than three feet above the pavement or shoulder elevation. This additional protection will be considered included in the Contract, and no additional compensation will be allowed.

1. At some locations it may be necessary to supplement Type II barricades with 55-gallon steel drums. The Contractor will do this upon request from the Commissioner, at no additional cost to the City.

I. Removal of existing pavement marking and striping where required, will be by use of water blasting only.

3.04 MAINTENANCE

A. The Contractor will be required to respond to any call from the Commissioner concerning all requests for improving or correcting traffic control devices including pavement marking tape, within one-half hour from the time of notification.

B. In the event of severe weather conditions, the Contractor must provide additional personnel and equipment to maintain, relocate or remove all traffic control devices. In additional to general maintenance requirements throughout the day, the Contractor must realign all traffic control devices as necessary on a daily basis. The Contractor must relocate to the proper location all traffic control devices misplaced by Subcontractor operations. After notification, relocation of devices must take place in an expeditious manner.

3.05 REMOVE

A. The Contractor must remove all traffic control devices that were furnished, installed, and maintained by him or her under this Contract, and such devices, will remain the property of the Contractor. All traffic control devices must remain in place until specific authorization to relocate the devices is received from the Commissioner for stage changes.

3.06 TEMPORARY GUIDE SIGNS

A. The Contractor will furnish and erect temporary guide signs at the Project for maximum public guidance through the construction area and must maintain same in good condition until completion of the Project. Upon completion, the signs shall be removed. The location of the signs will be determined by the Commissioner. These temporary signs must be displayed in place prior to the commencement of construction.

3.07 GENERAL CLEAN-UP

A. All rubbish and debris resulting from the Work of this Section must be collected and disposed of as directed by the Commissioner. The Contractor must keep all public roadways, and other public right-of-ways affected by the work, clean and free from debris and dust at all times.

B. All work areas must be left in a broom clean condition.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of TRAFFIC CONTROL shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of TRAFFIC CONTROL shall be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

END OF SECTION 01 55 26

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Sections include the following:
1. Substitution Procedures: Section 01 25 00.
2. References: Section 01 42 00.
3. Contract Closeout: Section 01 70 00.
4. Divisions 03 through 33 Sections for specific warranty requirements for products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and

other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 INFORMATIONAL SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:
    a. Specification Section number and title.
    b. Generic name used in the Contract Documents.
    c. Proprietary name, model number, and similar designations.
    d. Manufacturer's name and address.
    e. Supplier's name and address.
    f. Installer's name and address.
    g. Projected delivery date or time span of delivery period.
    h. Identification of items that require early submittal approval for scheduled delivery date.
3. Initial Submittal: Within fifteen days after date of commencement of the Work, submit three copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
    a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
4. Completed List: Within thirty days after date of commencement of the Work, submit three copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
5. Commissioner's Action: Commissioner will respond in writing to Contractor within five days of receipt of completed product list. Commissioner's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Commissioner's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 - Submittal Procedures. Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Commissioner will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Commissioner's construction forces. Coordinate location with Commissioner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's

disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Commissioner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Commissioner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 03 through 32 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 70 00 "Contract Closeout."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Commissioner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Commissioner will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Commissioner's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system.
6. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
7. Where products are specified by name and accompanied by the term "or equal", "or approved equal", or "or other as approved by Commissioner, comply with provisions of Section 01 25 00 Substitution Procedures. The Commissioner is the sole determiner of what is equal, equivalent or acceptable for such products and substitutions.
8. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Commissioner's sample. Commissioner's decision will be final on whether a proposed product matches.
    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Section 01 25 00 Substitution Procedures for proposal of product.
9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Commissioner will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Commissioner will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Commissioner will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Commissioner may return requests without action, except to record noncompliance with these requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
2. Evidence that proposed product provides specified warranty.
3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
4. Samples, if requested.

B. Submittal Requirements: Approval by the Commissioner of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of PRODUCT REQUIREMENTS will not be measured for payment.

4.2 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the Work of PRODUCT REQUIREMENTS will be included in the applicable Line Item contract lump sum price as shown in the Schedule of Prices.

END OF SECTION

SECTION 01 70 00

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies the requirements for closing out the Contract in addition to those requirements specified in the Special Conditions and the Additional Special Conditions.

1.03 INFORMATIONAL SUBMITTALS

A. Submit a deliverables log for items to be delivered during Closeout.

PART 2 - PRODUCTS

2.01 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Commissioner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Commissioner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Commissioner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Commissioner. Advise Commissioner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Commissioner of changeover in heat and other utilities.
12. Submit changeover information related to Commissioner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Commissioner will either proceed with inspection or notify Contractor of unfulfilled requirements. Commissioner will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Commissioner, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

2.02 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment.
2. Submit certified copy of Commissioner's Substantial Completion inspection list of items to be corrected (punch list), endorsed and dated by Commissioner. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest control final inspection report and warranty.
5. Instruct Commissioner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Commissioner will either proceed with inspection or notify Contractor of unfulfilled requirements. Commissioner will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2.03 PUNCH LIST ITEMS

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Commissioner.
   d. Name of Contractor.
   e. Page number.

4. Submit list of incomplete items in the following format:
   a. PDF electronic file. Commissioner will return annotated file.

2.04 WARRANTIES

A. Submittal Time: Submit written warranties on request of Commissioner for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within ten days of completion of designated portions of the Work that are completed and occupied or used by Commissioner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the Table of Contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 3 - EXECUTION

3.01 DEMONSTRATION AND TRAINING

A. Operating and Maintenance Instruction: Instruct the Commissioner's personnel to operate, adjust, and maintain systems, subsystems and stand-alone equipment not part of a system. Provide instructors experienced in operation and maintenance procedures. Arrange for each installer of equipment that requires regular maintenance to meet with the Commissioner's personnel to provide instruction in proper operation and maintenance at each location. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Provide instruction at mutually-agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season. Schedule training with the Commissioner providing at least fourteen days advanced notice.

B. Instruction for operating equipment shall include, but not be limited to, the following:

1. System design and operating philosophy review.
2. Document review, including operation and maintenance manuals and as- built documents.
3. Operations review, including:
    a. Safety procedures.
    b. Hazards.
    c. Control Sequences
    d. Startup
    e. Shutdown
    f. Emergency operations
4. Adjustments, including those for noise, vibration economy, and energy efficiency.
5. Troubleshooting
6. Maintenance, including:
    a. Safety procedures.
    b. Hazards.
    c. Spare parts and materials.
    d. Tools.
    e. Lubricants.
    f. Fuels.
    g. Cleaning.
    h. Warranties.
    i. Maintenance agreements and similar continuing commitments.
7. Repair

3.02 CLEANING

A. General: In addition to the daily clean-up required by the ADDITIONAL SPECIAL CONDITIONS, the Contractor is responsible for the final cleaning of the job site and for the coordination and direction of the cleaning by every trade. Each trade is

required to perform cleaning for its portion of the Work and as directed by the Contractor. Perform final leaning of items provided as a part of the Contract, before acceptance of the Work, including removal of dust, dirt, and stains from all finished metal, stone, glass, or other finish surfaces.

B. Unfinished Areas: Clean the shafts, closets, chases, and similar spaces which are generally unfinished, and leave free from rubbish loose material, droppings, extraneous construction materials, dirt, and dust.

C. Finished Areas: Clean finished surfaces to remove any mortar, dust, and other extraneous matter, including but not limited to, the exposed surfaces of finished metal, concrete, masonry, stone, equipment, and fixtures.

D. Final Cleaning: In addition to the cleaning specified herein and in the various sections of the Specifications, prepare the work for acceptance by a thorough cleaning throughout, including washing or cleaning of surfaces on which dirt or dust has collected. Employ a firm specializing in window cleaning to wash and polish glass on both sides. Re-cleaning will not be required after the Work has been inspected and accepted, unless later operations of the Contractor make re-cleaning of certain portions necessary.

E. Removal: Remove public and private trash and rubbish from every area on a daily basis. As soon as practicable after completion of the Work, dismantle the temporary construction facilities and remove from the site the construction equipment, fences, scaffolding, rubbish of every kind, surplus materials, and supplies belonging to Contractor or its subcontractors.

3.03 SUBMITTALS FOR CONTRACT CLOSEOUT

A. Warranties and Guarantees: In addition to the general guarantee of the Work, as required by the GENERAL CONDITIONS and ADDITIONAL SPECIAL CONDITIONS, furnish any other extended warranties or guarantees as required by the Specifications.

B. Waivers of Lien: Furnish the releases and waivers of liens arising out of the provisions of the Contract.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of PROJECT CLOSEOUT will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the Work of CONTRACT CLOSEOUT will be included in the applicable Line Item contract lump sum price as shown in the Schedule of Prices.

END OF SECTION

SECTION 01 71 13

MOBILIZATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Mobilization, including furnishing labor, materials and equipment necessary for temporary construction facilities, preparatory work; the movement of personnel, equipment, supplies and incidentals to the project site; the establishment of offices, buildings or other facilities necessary to work on the project; and for other administrative work or operations which must be performed, or costs which must be incurred when beginning work on the project.
2. A maximum value of 3 percent of the total base bid will be allowed for this item.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. MOBILIZATION will not be measured for payment.

4.02 PAYMENT

A. The work under this item will be paid for at the contract lump sum price for MOBILIZATION, which payment is to be full compensation for work shown on Contract Plans and as specified, and must include labor, materials, equipment,

tools, transportation, handling and incidentals and operations necessary to complete this item in every respect unless specifically excepted herein.

B. Partial payment of the lump sum for MOBILIZATION will be made in accordance with the following schedule:

1. Upon execution of the contract, the Contractor may draw 10 percent of the pay item as a part of the first request for partial payment.
2. When 5 percent or more of the original contract amount is earned, an additional 30 percent of the pay item will be paid.
3. When 10 percent or more of the original contract amount is earned, an additional 20 percent of the pay item will be paid.
4. When 25 percent or more of the original contract amount is earned, the remaining balance of the pay item will be paid.

C. Nothing herein shall be construed to limit or preclude partial payments for other items as provided for by the contract.

4.03 PAY ITEM ACCOUNT NUMBER

A. Mobilization: 017113

END OF SECTION

SECTION 01 78 39

RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This section specifies administrative and procedural requirements for project record documents:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections:

1. Contract Closeout: Section 01 70 00.
2. Divisions 03 through 32 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.03 FORMAT

A. General: Do not use Record Documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Commissioner's reference during normal working hours. Upon Substantial Completion of construction and prior to the Final Acceptance inspection by the Commissioner, the Contractor shall submit an electronic copy of the Record Documents for the Commissioner’s review and approval.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
2. Mark new information that is important to the Commissioner, but was not shown on the original Contract Documents.
3. Note related Change Order, Requests for Information, Substitution Requests and Submittal numbers where applicable.

B. Record Drawings: Maintain a clean, undamaged set of Contract Drawings at the site. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing conditions fully and accurately; where Shop Drawings are used, record

a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
2. Each drawing sheet shall be a standalone digital CAD file, with no reference drawings (x-ref) included in the final deliverable to the Commissioner. Comply with U.S. National CAD Standards (NCS). Documents shall incorporate revisions in a legible fashion and shall not contain any clouds or strike-outs.

C. Record Specifications: Maintain one complete copy of the Project Specification, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual work performed in comparison with the text of the specifications and modifications. Give particular attention to substitutions and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

D. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and specifications. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned later by direct observation.

E. Record Sample Submittal: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet with the Commissioner and the Commissioners' personnel to determine which of the submitted samples that have been maintained during progress of the work will be transmitted to the Commissioner for record purposes. Comply with delivery to the Commissioner's sample storage area.

1.04 RECORD DOCUMENT SUBMITTALS

A. The Contractor will be required to submit an updated set of Record Documents to the Commissioner (current to the date of the Pay Application) incorporating as-built information to the Commissioner concurrent with every Pay Application. Submit the Record Drawings in AutoCAD format. Pay Applications will not be processed if the Contractor is not in compliance. Replicate the breakout of discipline specific information on the Record Documents in a manner consistent with the original Construction Documents and be of a similar scale and size.

B. Record Documents: Upon Substantial Completion of construction and prior to the Final Acceptance inspection by the Commissioner, the Contractor shall provide revised Record Documents for the Commissioner's review and approval.

1. Upon approval, the Contractor shall furnish the Commissioner the following Record Documents:

    a. Submit 1 set of marked-up Record Prints, 2 sets of Record Electronic Drawing files, and 3 copies printed from record plots. Plot and print each Drawing, whether or not changes and additional information were recorded.
    b. Record Specifications: Submit 2 copies of Project's Specifications, including addenda and contract modifications.
    c. Record Product Data: Submit 2 copies of each Product Data submittal. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

C. Record Product Data: Upon Substantial Completion of construction and prior to the Final Acceptance inspection by the Commissioner, submit a complete set of Record Product Data to the Commissioner for review and approval. Make any required corrections to the Record Product Data and then submit the final set of Record Product Data to the Commissioner.

D. The Final Acceptance will not be performed until these items are submitted and approved by the Commissioner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Manuals: Comply with the SPECIAL CONDITIONS requirements for operation and maintenance manuals. Under the direction of the Contractor, each subcontractor shall furnish 12 complete sets of operation and maintenance instruction manuals. The manuals shall contain the manufacturers' instructions for each item of equipment and apparatus furnished under the Contract, together with any additional data as may be required by the various sections of the Specifications. The manuals shall be indexed and suitably bound in hard cover binders.

1. Maintenance Schedule: For components of the Work which shall require routine maintenance, based on the manufacturers' published literature for the materials and equipment provided in the Work, furnish a "Schedule of Maintenance" and clearly indicate in the schedule the type and frequency of such maintenance to be performed.

B. Endorsement: At the completion of the Work, the Contractor and each subcontractor shall certify, by endorsement thereon, that each of the manuals is complete and accurate.

C. Submittal of Manuals: Prior to the Contractor's application for final payment, and as a condition to approval of the applications, each subcontractor shall deliver to

the Contractor the manuals arranged in proper order, indexed and endorsed. Assemble the manuals for all divisions of the Work, review them for completeness, and submit the manuals in suitable transfer cases indexed and marked for each division of the Work.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of RECORD DOCUMENTS will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the Work of RECORD DOCUMENTS will be included in the applicable Line Item contract lump sum price as shown in the Schedule of Prices.

END OF SECTION

SECTION 02 16 10

MONITORING ADJACENT STRUCTURES DURING CONSTRUCTION ACTIVITY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1, Terms and Conditions for Construction, Book 2, Instructions and Execution Documents and Additional Special Conditions, and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Purpose: The work associated with this specification requires the Contractor to monitor construction activities, and monitor structures that are susceptible to damage resulting from construction activities. This includes, but is not limited to, the following:

1. Installation of surrounding excavation support systems may result in ground movements around adjacent structures. Ensure that ground movements are within acceptable limits so that there is no increase in likelihood of damage to adjacent structures.
2. Adjacent structures and ground movements adjacent to open cuts or embankments are within acceptable limits so that there is no increase in likelihood of damage to adjacent structures.

B. Scope: The work includes, but is not limited to, furnishing, installing, calibrating, maintaining, protecting and replacing all necessary equipment, developing monitoring software, establishing survey points, and all necessary equipment and materials for a complete monitoring system, including qualified personnel with experience and training to implement, review, assess, and draw conclusions on data generated by the monitoring system.

A summary of the work described within this specification includes, but is not limited to, the following:

1. Identify all susceptible adjacent structures.
2. Perform Preconstruction Document Review.
3. Perform Preconstruction Condition Surveys.
4. Evaluate adjacent structure.
5. Develop Response Values and contingency plans.
6. Perform interim construction surveys that include monitoring, collecting, and reporting instrument data.
7. Perform post-construction condition survey.

C. Monitoring system includes, but is not limited to, the following: Install slope inclinometers to measure lateral deformations adjacent to temporary support walls. Measure movements at locations on adjacent structures using surface monuments, tilt meters, string potentiometers, and other devices. Measure pore water pressures within soft clays surrounding adjacent structures.

D. Qualified personnel shall include and meet the minimum qualifications herein.

1. Contractor's superintendent that has experience supervising a minimum of 10 site vibration monitoring programs of equivalent size and complexity to this Project.
2. A field instrumentation specialist(s) that has a minimum of 5 years' experience using every piece of monitoring equipment used on this project and is a licensed Professional Engineer or Surveyor in the State of Illinois.
3. A Licensed Structural Engineer in the State of Illinois with a minimum of 10 site vibration monitoring programs of equivalent size and complexity to this Project. The Structural Engineer must sign and seal all submittals related to this Section

E. Division of Responsibility: The Contractor's superintendent is responsible for overall coordination, delivery of field reports, acceptable working limits, and the decision to perform work based on monitoring data the Contractor's team collects. Furthermore, the Contractor is responsible for providing and maintaining access to instrument locations throughout construction. Reporting to the Contractor's superintendent, the field instrumentation specialist(s) are responsible for providing, installing, and obtaining data from the ground instrumentation and from the structural instrumentation, and the Structural Engineer is responsible for identifying all of the risks to the adjacent structures, setting the acceptable working limits, and verifying that temporary conditions are engineered to sufficiently meet the acceptable limits.

F. Adjacent Structures: Adjacent Structures: The Contractor is to meet the requirements for the protection of supporting adjacent structures from the construction activity according to all provisions of the CTA-ACM.

G. Related Work Required Elsewhere:

1. Section 31 09 13 – Monitoring Track Structures During Construction Activity.
2. Section 31 20 00 – Earthwork.
3. Section 31 50 00 – Excavation Support and Protection.
4. Section 31 63 33 – Steel Pipe Micropiles.
5. Section 31 63 00 – Caissons / Drilled Piers.

1.03 DEFINITIONS

A. Definition of project terms and abbreviations are found within Specification Section 01 35 00.

1. The Project = Includes the new train station, pedestrian bridge, North Side access, Chicago Transit Authority (CTA) track structure, and portions of

property within the City of Chicago Right of Way and under CDOT control near the intersection of Damen Avenue and Lake Street. Refer to drawings for more information.

2. CTA-ACM = Chicago Transit Authority Adjacent Construction Manual Rev 00, September 2017.
3. Track Structures = Includes all structures owned by the (CTA) including, but not limited to, the new and existing train track supporting superstructure and substructure both within the Project boundaries and outside the Project boundaries. In addition, this includes the new train station, pedestrian bridge, and North Side access.
4. Adjacent Structures = Include (1) structures adjacent to the Project that may be affected by construction of the Project, including, but not limited to, structures that may be affected by vibrations, displacements, settlement, excavations, demolition, or other construction activities; (2) structures including, but not limited to, buildings, roads, utilities, and infrastructure deemed important enough for monitoring; (3) any building or structure not owned by the CTA, and any building Owned by another City of Chicago agency; and (4) any relevant structure that is expected to be in place prior to completion of the work on the Project.
5. Response Values = Threshold Values and Limiting Values.
6. Threshold Values = A performance-based monitoring unit, predetermined by the Contractor for a specific type and location of monitoring. The Contractor must incorporate corrective actions into its construction means and methods to avoid reaching the established threshold value. The threshold value will be determined by the Contractor using current industry standards and recommendations, and will consider the type, age, and sensitivity of the Adjacent Structures to minimize serviceable damage. The CTA-ACM denoted Threshold values as Warning Values.
7. Limiting Value = A performance-based monitoring unit, predetermined by the Contractor for a specific type and location of monitoring. The Contractor must stop work immediately upon equaling or exceeding a limiting value. The limiting value will be determined by the Contractor using current industry standards and recommendations, and will consider the type, age, and sensitivity of Adjacent Structures to protect a structure or utility from unacceptable levels of distress.
8. Cased Deep Benchmarks = Benchmarks founded at an elevation below the bottom of the excavation and that are isolated from the surrounding soil by an outer casing. Cased deep benchmarks are used as control benchmarks for determining the elevation of all other instruments.
9. Surface Settlement Markers = Markers placed on structures and monitored using optical survey methods to determine vertical and horizontal displacements during construction.
10. Inclinometer Casing = An instrument installed within vertical holes located entirely in the in situ soil. A probe, lowered within the inclinometer casing, is used to monitor horizontal displacements of the soil behind the Temporary Earth Retention Structures at depth during construction.
11. Tiltmeter Plates = Instruments installed on structures to monitor angular rotation of the structure during construction. The plates are monitored by placing a portable tiltmeter on the plate.
12. Vibrating Wire Strain Gages = Gages installed on horizontal struts (or directly to adjacent structure with written permission from the Owner) to monitor the

load in the struts during construction. The strain gages are read with a vibrating wire indicator.

13. Crack Monitoring Pins = Two pins; one pin placed on each side of a crack that can be measured with calipers to determine accurate changes in crack dimensions.
14. String Potentiometers = Cable-actuated position sensors that locate a specific ground position in one or more directions.
15. Vibration Monitors = Seismograph equipment that accurately monitors ground movements (accelerations, velocities, and overall movement).
16. Settlement Indicators = Equipment set up to measure and record the elevation at the top of soil of a specific location. Repeated readings at the same precise location would provide indication of settlement (lowering elevation of the top of soil).

1.04 REFERENCES

A. Chicago Transit Authority Adjacent Construction Manual (CTA ACM) Rev 00, September 2017, applicable Sections as specified in this Specification.

B. Geotechnical Report by GEI, Inc.

1.05 SUBMITTALS

A. Resumes of the qualified personnel previously listed (Contractor's Superintendent, all field instrumentation specialists needed, and a structural engineer), and other key personnel, detailing relevant experience and qualification as noted within Section 1.03.

B. Product data for all monitoring equipment used including measurement range, resolution, repeatability, accuracy and precision, temperature range, etc., as applicable for individual equipment.

C. Drawings and details showing proposed physical locations of instrumentation indicating layout and instrumentation installation details. The plan must show the instrumentation in relation to nearby:

1. Existing adjacent structures and supporting foundations and their distance to related construction activity.
2. Shoring structures to be installed.
3. Any installations for protecting shoring structures.
4. Surface and subsurface infrastructure.

D. Preconstruction Condition Survey:

1. Perform a detailed survey of all adjacent structures including, but not limited to, the following:

   a. High-resolution photography.
   b. Visual exterior condition assessment.

c. Visual condition assessment of any adjacent structure uncovered during the work.
d. List all documents reviewed in preparation for the Preconstruction Condition Survey.
e. List how the probable means and methods of construction planned for the Project may adversely affect the visually observable systems previously described.

E. Response Value Summary Report:

1. Using the information gathered in the preceding tasks, evaluate potential impacts on the Adjacent Structures from construction-phase activities including, but not limited to, post-construction ground or structure movements associated with the design, construction-induced vibrations, and excavation-induced ground movements using published literature and empirical correlations. Perform this evaluation using a licensed Structural Engineer in the State of Illinois. Report shall include, but not limited to, items below for each risk identified:

a. Level of structural and nonstructural risks associated with anticipated construction activity.
b. Instrumentation recommended to monitor each risk.
c. Frequency of measurements taken during construction from the instrumentation noted above.
d. The limit state values (Threshold Value and Limiting Value) associated with each measurement taken during construction.
e. Contingency plans the Contractor will perform in the event the Limit State Values are exceeded.

2. Include the following information:

a. Name(s), telephone number(s), and location(s) of person(s) responsible for implementation of contingency plans.
b. Materials, equipment, and supplies required to implement contingency plans.
c. Location at work site of all necessary materials, equipment, and supplies required to implement the contingency plans.
d. Each type of anticipated remedial method proposed to stabilize soil and/or structure movements. Include basis for determining proposed actions.
e. Step-by-step procedure for performing work involved with contingency plans.
f. Clear identification of objectives of contingency plans and methods to measure success of contingency plans.

F. A field monitoring plan that contains a detailed step-by-step procedure for conducting and reporting all monitoring measurements to include, but not limited to, the following:

1. The Contractor is solely responsible for obtaining permission from adjacent property owners to access their property, install instruments, keep a contact

list of all adjacent property contacts, and to coordinate all construction-related matters to the adjacent structure owners.

2. A schedule indicating the proposed time sequence of instrument installation.
3. Field validation plan and summary report of the results as specified in Part 3 - Installation of Instruments.
4. A schedule complying with required monitoring and reporting frequencies, for all instruments and monitoring points.
5. Types of monitoring instruments with manufacturer's data sheets, including regularly scheduled calibration and maintenance procedure requirements.
6. Data survey methods for optical surveys necessary to demonstrate that the specified accuracies can be achieved at a minimum 95% level of confidence.
7. Data processing procedures.
8. Reporting Procedures for scheduled reports and for special reports when Threshold Values and Limiting Values are being approached and are exceeded.
9. Outlines of sample reports and processed data forms.
10. Processed data as specified in Part 3 - Data Collection and Processing.
11. Descriptions for the monitoring equipment that meet the requirements as specified in Part 2 - Products.
12. Submit all of the above at least six (6) weeks prior to start of excavation work. An agreement is to be reached between the Structural Engineer and the Contractor's Superintendent on the contingency plan to be utilized for stopping further movement, prevention of additional damage, and corrective actions.
13. Post-construction Condition Survey:

    a. Perform a detailed survey of all adjacent structures that duplicates the process performed during the preconstruction survey.
    b. Perform the survey within thirty calendar days after Substantial Completion of the Project.
    c. Identify any deviations from the Preconstruction Condition Survey. The post-construction surveys will be used to evaluate if the Project construction activities caused damage to the Adjacent Structures.

1.06 QUALITY ASSURANCE

A. The Contractor employs the services of the qualified personnel specified within Para. 1.04.

B. Prior to the start of construction, the Contractor meets with the Commissioner to discuss the Preconstruction Condition Survey, Response Value Summary Report, and a field monitoring plan.

    1. The Contractor provides access to instrument locations and prevents construction activities that would damage ground instruments during construction.

C. The Contractor ensures that the field monitoring schedule of reports (established within Para. 1.05.F) is followed.

1.07 JOB CONDITIONS

A. Existing site geotechnical conditions have been investigated and a report prepared by GEI, Inc. This report is in the appendix of these Specifications. Neither CDOT nor their representatives are in any way responsible for the safety and serviceability of the work. The Contractor, and their Structural Engineer, are expected to make his own interpretations of the data for their own purposes. Furthermore, the General Contractor must install, monitor, and interpret data from any additional instrumentation that the General Contractor deems necessary to insure the safety and serviceability of the work.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. The Contractor shall use any and all equipment they deem necessary to carry out the work described within this Specification. The General Contractor is solely responsible for the determination, acquisition, and operation of all equipment.

PART 3 - EXECUTION

3.01 PRODUCT ACCESS AND SCHEDULE

A. The approximate Project schedule is denoted on the drawings.

3.02 AVAILABILITY OF DATA

A. Do not disclose instrument monitoring data to third parties and do not publish instrument monitoring data without prior approval of the Commissioner

B. The General Contractor is expected to make their own interpretations of instrument-monitoring data for their own purposes.

C. The General Contractor may observe equipment readings at any time (but as a minimum during the preapproved scheduled times), or take supplementary readings at no additional cost to the Commissioner. All data collected by the General Contractor must be made available to the Commissioner.

3.03 INSTRUMENT INSTALLATION, PROTECTION, MAINTENANCE, AND REPLACEMENT

A. Protect and maintain instruments. Drain water or flush debris from under protective covers. Keep protective covers locked.

B. Provide approved substantial protective barriers as required around cased deep benchmarks and around subsurface settlement indicators.

C. Repair or replace damaged or missing instrument components or entire instruments as required within five days at no additional cost to the City of Chicago.

D. The location of the instruments will be per approved submittal.

E. Installation of any instrument requires permission from the adjacent structure owner and shall not damage or interfere with adjacent structures and their daily operations. Contractor shall design, install, and protect displacement monitors from accidental movement or damage from snow plows

3.04 DATA COLLECTION AND PROCESSING

A. The Contractor is solely responsible for creating the validation plan. This plan shall clearly show that the appropriate equipment and qualified personnel were used to successfully complete the track monitoring plan.

B. Validation of Equipment and Crew: The installed monitoring system, each component thereof, is to be field certified for the accuracy and reliability required for the Threshold and Limiting Values.

C. The following are items mandated by CTA for data collection and processing:

1. The processed survey data will be submitted on a similar form as shown in Appendix E in CTA ACM.
2. For excavation within the Zone of Influence as specified in Section 3 of CTA ACM, monitoring frequency specified in CTA ACM Section 10.3 will be followed.
3. For earth retention structure or drilled shafts, the survey points for adjacent structures shall comply with Figure 10- 1 in CTA ACM, unless otherwise directed by the field instrumentation specialist that more survey points are required.

D. The following are items mandated by CTA for defining and submitting Threshold and Limiting Values:

1. Threshold Values and Limiting Values as specified in Section 10.2 of CTA ACM for adjacent structures.
2. Limiting Values as specified in Section 7.9 of CTA ACM for top of shoring wall within the Zone of Influence of adjacent structures.

E. If a Threshold Value is reached:

1. Notify Commissioner and CTA within 12 hrs.
2. Within 24 hrs of monitoring data indicating that a Threshold Value has been reached, implement contingency plans per approved submittal.

F. Take all necessary steps such that the Limiting Value is not reached. The Commissioner may require the Contractor to suspend activities in the affected area.

G. If a Limiting Value is reached:

1. Notify Commissioner and CTA immediately. CTA reserves the right to suspend all construction activities in the affected area.
2. Within 24 hrs of processing instrumentation data indicating that a Limiting Value has been reached, implement contingency measures as specified in approved process plans for stopping further movement and corrective actions.
3. Perform a detailed evaluation of construction procedures and submit to the Commissioner the evaluation and recommended procedures to reduce movement. Furnish and install additional instruments if they are needed to further define the magnitude of the indicated problem.

3.05 REPORTING DATA

A. Formal monitoring reports will be submitted within five working days of retrieving the raw data. Raw data is made available to the CTA within one working day of reading when requested. The Contractor may observe the readings at any time but as a minimum during the preapproved scheduled times), or take supplementary readings. The Contractor is responsible for the safety and serviceability of the work. The Contractor is to make interpretations of the data for the purposes of monitoring for any movement. Do not disclose instrumentation data to third parties. Do not publish data without prior written approval of the CTA.

3.06 DAMAGE TO INSTRUMENTS

A. Take precautions during the course of construction to prevent damage to instruments and monuments. Pay all costs associated with restoring damaged instruments.

3.07 DAMAGE TO ADJACENT STRUCTURES

A. The Contractor shall repair adjacent structure damage to match the existing condition and quality of workmanship as was present during the Preconstruction Condition Survey.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of MONITORING EXISTING CONDITION AND CONSTRUCTION ACTIVITY DURING CONSTRUCTION will not be measured for payment.

4.02 PAYMENT

A. Payment for the Work of MONITORING EXISTING CONDITION AND CONSTRUTION

ACTIVITY DURING CONSTRUCTION is included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

B. In the event that any submittal is not sufficient for approval by the Commissioner, the Contractor shall supplement their track monitoring plan with the necessary instrumentation, personnel, and labor sufficient to obtain approval at no extra cost to the Commissioner.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

END OF SECTION

SECTION 02 24 00

ENVIRONMENTAL ASSESSMENT

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings

B. Book 1: Project Information, Instructions to Bidders, and Execution Documents

C. Book 2: Standard Terms and Conditions for Construction Contracts

1.02 APPLICABILITY

A. This environmental summary is for information purposes only.

1.03 INTRODUCTION

A. Related Work

1. Section 02 61 00.10 Special Waste Hauling and Disposal

2. Section 02 61 00.20 Special Waste Plans and Report

3. Section 02 61 00.40 Soil Disposal Analysis

B. Description of Work: This environmental summary is for information purposes only. No work is associated with this section.

1.04 AVAILABLE ENVIRONMENTAL ASSESSMENT DOCUMENTS

A. A Preliminary Environmental Site Assessment (PESA) for the Damen Green Line Elevated Station (Dated August 2018 by GSG Consultants, Inc.)

B. A Preliminary Site Investigation (PSI) for the Damen Green Line Elevated CTA Station (Dated August 2018 by GSG Consultants, Inc.)

1.05 SITE DESCRIPTION

A. The project area is a vacant, non-vegetated lot, and a portion of W. Lake Street. The CTA elevated Green Line tracks run over W. Lake Street. One (1) pole-mounted transformer was located along the public alley on the south side of the site.

1.06 SITE HISTORY

A. The available historical aerial photograph for 1938 depicts the site as being occupied by elevated tracks running east-west through Lake Street, with an elevated station at the intersection of Lake Street and Damen Avenue. In the

southwest corner of Lake Street and Damen Avenue is a multi-story building of undetermined use. The 1952 through 1984 aerial photograph is similar to the 1938 photograph, with the exception that the only the multi-story building is present. Sometime between 1984 and 1988, the multi-story building was razed, leaving the site vacant until the current day.

Available Sanborn Fire Insurance Maps for the year 1916 depicts the site as being occupied by Chicago and Oak Park Elevated tracks through the center of W. Lake Street, with an elevated station with a ticket office at the intersection of W. Lake Street and N. Robey. The portion of the site located at the southwest corner of the intersection of Robey and Lake is occupied by five (5) three-story commercial properties, a two-story mixed use commercial and residential property labeled "CARPR SHOP," a two-story office building, and a garage. On the 1950 and 1975 Sanborn Maps, N. Robey has been renamed N. Damen Avenue, the elevated station has been removed, and the office, the garage and the two-story mixed-use building have been razed, and the remainder of the site is vacant. The corner of Damen Avenue and Lake Street is a vacant lot from 1988 through 2004.

1.07 ENVIRONMENTAL CONDITIONS

A. A PSI was performed in August 2018 on the proposed improvement area. A total of ten (10) soil borings were advanced to a depth of 12 feet below the existing ground surface. Based on the analytical data, soil at eight (8) boring locations exceeded the TACO Tier 1 Industrial/Commercial SROs and soil at nine (9) boring locations exceeded the Construction Worker ingestion exposure route. Based on the analytical data, soil at nine (9) boring locations exceeded the Clean Construction or Demolition Debris (CCDD) Maximum Allowable Concentration (MAC) Values. All excavated soil that exceeded the Tier 1 Industrial/Commercial shall be disposed of at a licensed Subtitle D facility as solid waste. Based on the analytical data, Construction Worker Precautions will need to be implemented during construction activities at the site.

END OF SECTION

SECTION 02 41 13

REMOVAL OF EXISTING PAVEMENT AND APPURTENANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This work includes removal and disposal of existing street pavement, alley pavement and driveways, streetcar rails, sidewalks and curb and gutter as shown on the plans or as directed by the Commissioner.

B. Pavement removal will include full-depth saw cutting and the removal and disposal of surface, base and subbase courses, block, brick, concrete, asphalt and other pavements including driveways and the cutting, removing, disposing of streetcar rails and ties encountered in the field.

C. The Contractor must coordinate all streetcar-rail removal work if required with CDOT.

D. Except as modified herein, the work must be in accordance with the applicable portions of the Standard Specifications (IDOT), Sections 202 and 440.

1.03 RELATED SECTIONS

1. Section 024113.13: Hot Mix Asphalt Surface Removal
2. Section 312000: Earth Moving
3. Section 321621: Concrete Curbs, Gutters, and Walks
4. Section 321623: Portland Cement Concrete Sidewalk, 5 inch
5. Section 321623.10: Portland Cement Concrete Sidewalk, Special

1.04 REFERENCES

A. Standard Specifications for Road and Bridge Construction, Illinois Department of Transportation (IDOT), Adopted January 1, 2012, or latest edition.

1.05 QUALITY ASSURANCE

A. The Contractor must comply with all applicable codes, laws, ordinances and regulations of governmental authorities having jurisdiction over the removal work, including applicable OSHA and Standard Specifications requirements.

B. The Contractor must verify all existing conditions and dimensions in the field.

1.06 SUBMITTALS

A. Furnish the Commissioner with permission in writing from the property owner for the use of the property to dispose of surplus excavated/removed materials, in accordance with Article 202.03 of the Standard Specifications (IDOT).

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 Sawcut a perpendicular full-depth joint at the limit of removal as shown on the Drawings or as directed by the Commissioner. If the surface to remain is damaged, repair or replace it as directed by the Commissioner. This additional work will not be measured for payment, but will be done at the Contractor's expense. Sawcuts must be straight and even and performed with a sawing machine meeting the approval of the Commissioner.

3.02 Sidewalk removal includes saw cutting and removal to the nearest joint beyond the end of replacement shown on the Plans, or as directed by the Commissioner. It shall be the responsibility of the Contractor to determine the thickness and composition of the existing sidewalk and pavement and the extent which it is reinforced. No additional compensation will be allowed because of variation from the assumed thickness, or from the thickness shown on the plans, or for variations in the amount of reinforcement. Should the contractor deface the edge, a sawed joint must be constructed and any additional work, including removal and replacement must be done at the contractor's expense.

3.03 Dispose of excess removed materials in accordance with Article 202.03 of the Standard Specifications.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of REMOVAL OF EXISTING PAVEMENT AND APPURTENANCES shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of REMOVAL OF EXISTING PAVEMENT AND APPURTENANCES shall be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

END OF SECTION 02 41 13

SECTION 02 41 13.13

HOT MIX ASPHALT SURFACE REMOVAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This work consists of removing the existing hot-mix asphalt surface to varying depths and to the limits specified on the plans, constructing butt joints as necessary and other work as directed by the Commissioner.

B. Upon completion of the grinding operation any excess material, dust or debris remaining on the pavement must be removed by means of a mechanical street sweeper following directly behind the grinding operation.

C. During the removal of the hot-mix asphalt surface the Contractor will encounter P.C.C. base course in patches, utility repairs, structure adjustment or other minor portions of the area being milled which are undetectable prior to the milling operation. It will be understood and agreed upon that no extra compensation will be allowed to the Contractor to grind (mill) P.C.C. Pavement and/or Base.

D. Unless otherwise specified, excess material resulting from operation must be removed and disposed of as specified in Article 202.03 of the IDOT Standard Specifications.

E. Also included in this item is the removal and legal disposal of any existing debris accumulated in the gutter or at the face of curb. This work will be considered included in this item and will not be measured for payment.

F. The Contractor must be responsible for avoiding or dislodging any part of the existing brick base course underneath the hot-mix asphalt surface.

G. In the event that the Contractor cannot finish the grinding operation due to delays caused by the City, Private Utility work or adjacent construction and moves to another location, the Contractor must finish the grinding operation as soon as the said location is cleared of all conflicting work. The remobilization cost will be considered included in HOT-MIX ASPHALT SURFACE REMOVAL, of the depth specified, and no additional compensation will be made.

H. The Contractor must notify the Commissioner 72 hours prior to the need for the removal of parked vehicles from the street. The Contractor will then post the "No Parking" signs at least 72 hours preceding construction.

I. The Contractor must notify the Office of Emergency Management at (312) 747-7580 72 hours prior to the need for towing of vehicles. The City of Chicago will be responsible for removing parked vehicles located in the scheduled work area. Signs preventing parking will have to be erected at least 72 hours before the work is scheduled. The police are to be present to issue tickets and supervise towing prior to the relocation of vehicles.

J. If in the event that the next operation to be performed on the segment will not occur within 5 working days the "No Parking" signs must be removed and reposted 48 hours prior to resumption of work. No additional compensation will be made for removal and re-posting of signs.

K. The Contractor must coordinate all streetcar-rail splice work if required with CDOT.

L. Except as modified herein, the work must be in accordance with the applicable portions of the Standard Specifications (IDOT), Sections 202 and 440.

1.03 RELATED SECTIONS

A. Section 024113: Removal of Existing Pavement and Appurtenances

1.04 REFERENCES

A. Standard Specifications for Road and Bridge Construction, Illinois Department of Transportation (IDOT), Adopted April 1, 2016, or latest edition.

1.05 SUBMITTALS

A. Furnish the Commissioner with permission in writing from the property owner for the use of the property to dispose of surplus excavated/removed materials, in accordance with Article 202.03 of the Standard Specifications.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 The nature and condition of the equipment and the manner of performing the work must be such that the ground surface is not torn, gouged, shoved or otherwise injured by the grinding operations. Removing the pavement to the required depth adjacent to structures in the pavement surface such as drain castings and utility covers must be accomplished in a manner satisfactory to the Commissioner. This work will be considered as included in HOT-MIX ASPHALT SURFACE REMOVAL, of the depth specified. Sawcutting and removing the pavement to construct butt joints must be accomplished in a manner satisfactory to the Commissioner. No separate payment will be made for sawcutting and constructing butt joints. This work will be considered included in HOT-MIX ASPHALT SURFACE REMOVAL, of the depth specified.

3.02 The equipment used for surface removal must be a self-propelled grinding machine capable of removing in one pass, a layer of pavement at least six feet (6') in width and zero to four (0" – 4") inches in depth. The grinding machine must be on not less than a 6-foot wheelbase and must be capable of grinding variable depths required. It will be required that the material be windrolled and conveyed by a continuous conveyor to a truck for removal from the construction site. It must also have an effective means for removing excess material from the surface and from preventing any dust resulting from the operation escaping into the air.

A. Prior to the start of grinding operations and until all excess material, dust or debris is removed by mechanical sweeper, all catch basins and open lid manholes must be plated or have burlap placed between the lid and frame to prevent any grinding debris from entering the sewer system. Any debris entering a manhole must be immediately removed.

B. Grindings must be immediately removed from the site and legally disposed of in accordance with Article 202.03 of the IDOT Standard Specifications. Stockpiling of any debris resulting from this item will not be allowed.

3.03 The milling of side streets at intersections, alley returns, and other confined areas may be accomplished thru the use of a smaller, more maneuverable machine other than specified above.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of HOT MIX ASPHALT SURFACE REMOVAL will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of HOT MIX ASPHALT SURFACE REMOVAL will be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

END OF SECTION 02 41 13.13

SECTION 02 41 16

STRUCTURE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the demolition, removal, and proper disposal of the abandoned building in entirety located at the project site as defined by the drawings, including, but not inclusive of, the following:

1. Existing track structure columns and foundations.
2. Existing track structure girder ends to accommodate new construction.

B. Existing Construction to Remain:

1. Do not undermine or otherwise compromise the structural integrity or support of these elements to remain. Provide shoring and other protection as required.
2. Other walls, structures, utilities, pavements, and other elements are close to the structure to be demolished, and these items must be similarly protected from damage during the demolition work.

C. Any salvageable items, if any, to be removed by the Authority prior to the start of the demolition work.

D. Work includes providing, installing, maintaining, and removing temporary construction barriers as required during the course of the work. Construction barriers to be of plywood and wood framing unless approved otherwise.

E. Work includes providing, installing, and removing foot traffic barricades and control devices and signage as required during the course of the work and as approved by the Authority.

F. Contractor is to schedule all work with the Authority. Contractor to submit a process plan and phasing plan for all the demolition, removal, fill, and site grading work.

G. Work may require rerouting existing functioning overhead or underground utility lines as required to maintain service to adjacent properties.

H. Contractor to cap any abandoned utilities at the property line. Contractor to verify that all utilities to the site are shut off; if not, Contractor to arrange with the city or utility company to properly shut off and cap the utilities to the site.

I. Work of the project includes filling voids remaining after removing underground structures and/or utilities with granular fill, compacted.

J. Work of the project includes grading the site after all demolition and removal work is completed using a granular fill material, compacted.

K. Work of the project includes the removal from the site of all demolished material, including broken concrete, masonry, metal, wood, glass, and all other debris and rubble. This material shall not be used for fill or for grading the site.

L. Material removed from the site shall be recycled according to city code. Material not recycled shall be removed and disposed of properly at an approved landfill.

M. Related Sections: The following sections contain requirements that relate to this Section:

1. Section 02 16 10 – Monitoring Adjacent Structures During Construction.
2. Section 31 09 13 – Monitoring Track Structures During Construction.
3. Division 31 Section "Earthwork."

N. Definition of project terms and abbreviations are found within Specification Section 01 35 00.

O. Remove: Remove and legally dispose of all items.

1. Remove and Salvage for Recycling: Items indicated to be removed and recycled are to be separated and arranged for recycling. Construction debris from demolition and construction waste materials are to be picked up by recycling waste haulers for recycling to the greatest extent possible. As a minimum requirement, the Contractor to follow the City of Chicago Ordinance for recycling construction debris.

1.03 MATERIALS OWNERSHIP

A. Demolished materials shall become the Contractor's property and shall be removed from the site and legally disposed of by the Contractor.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the conditions of the contract and Division 01 Specification Sections, for approval, unless otherwise indicated:

1. Proposed dust-control measures.
2. Proposed noise-control measures.
3. Schedule of demolition activities indicating the following:

a. For each location: Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
b. Interruption of utility services.
c. Coordination for shutoff, capping, and continuation of utility services.
d. Detailed sequence of demolition and removal work to ensure uninterrupted progress of Authority's on-site operations.

e. Locations of temporary barriers and means of egress.
f. Foot traffic control or interruption. Closing of areas.
g. Shoring required.
h. Indicate how demolition work will avoid interruption of Authority's on-site operations.
i. Demolition plan.

4. Proposed recycling procedures.
5. Inventory of items to be removed and salvaged for reuse.
6. Proposed rat control measures.

B. Contractor to submit a process plan and phasing plan for the demolition work.

C. Contractor to submit proposed barricades, control devices, and signage as required during the demolition and other work, including the proposed location of the barricades, control devices and signage; and the materials proposed to be used for the barricades, control devices, and signage; for the Authority's review and approval.

D. Provide the following, for information purposes:

1. Photographs or videotape for information purposes, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.

E. Provide the following at Project Closeout according to Division 01 Section "Project Closeout":

1. Record drawings, including identification and accurate locations of capped utilities and other subsurface structural, electrical, or mechanical conditions.

F. Provide written and dated documentation of the total amount of each different waste material, the amount of each sent to a recycling facility and the amount of each sent to a landfill. Documentation shall be done on a daily basis. Indicate when and who the materials were picked up by and the name of the recycling facility the materials were sent to.

G. A demolition plan shall be submitted to the Authority for approval. Demolition shall not commence until the contractor has received written approval from the Authority.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with governing EPA notification regulations before starting selective demolition.
2. Comply with hauling and disposal regulations of authorities having jurisdiction.
3. Comply with City of Chicago Recycling Ordinance.

1.06 PROJECT CONDITIONS

A. Contractor required to survey existing conditions to verify all existing dimensions and conditions, locations of items and construction sizes of items and including conditions and limitations under which he is to do his work.

B. Contractor required to locate all existing utilities and other improvements, including utilities not exposed to view.

C. There will be no extras allowed to compensate Contractor for his failure to review and verify existing conditions and dimensions.

D. Demolition work to adhere to phasing plans for the project.

1.07 HAZARDOUS MATERIALS

A. The Contractor is not responsible to remove hazardous material that is encountered in the course of the work and not identified as hazardous material in the contract documents or otherwise addressed in the contract documents. If previously unidentified hazardous material is encountered, do not disturb the materials. Immediately notify the Authority for direction and arrangement for proper removal by licensed asbestos abatement workers and proper disposal.

B. Material containing lead-based paint to be disposed of as hazardous waste, according to all applicable laws and regulations, unless approved otherwise, at Contractor's expense and at approved landfills. Do not allow lead dust to contaminate other surfaces. The Contractor shall be responsible for handling, transporting, and disposing of any hazardous materials generated during the course of the project in accordance with all applicable federal, state, and local environmental regulations and codes.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that those utilities indicated and approved to be disconnected and capped, have been properly done so.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required. All work indicated may vary based on actual field conditions and dimensions.

C. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service, if any, and protect them against damage during selective demolition operations.

1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Authority and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Authority and to governing authorities.

a. Provide not less than 72 hrs' notice to Authority if shutdown of service is required during changeover.

B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
3. Cut off pipe at property limits; cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

C. Utility Requirements: Refer to their respective sections of these specifications for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

A. Conduct demolition operations and remove debris to ensure minimum interference with adjacent occupied and used facilities.

1. Do not close or obstruct adjacent occupied or used facilities without permission from Authority and authorities having jurisdiction. Provide alternate routes around closed or obstructed foot traffic ways.
2. Do not block required exits or stairways.

B. Conduct demolition operations to prevent injury to people and damage to adjacent facilities to remain. Ensure safe passage of people around selective demolition area.

C. Erect and maintain dustproof partitions and temporary enclosures as required to limit dust and dirt migration and to separate areas from fumes and noise.

D. If required, provide and maintain shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of adjacent buildings or components during demolition and until new support is installed.

3.04 POLLUTION CONTROLS

A. Use temporary enclosures and other suitable methods to limit the spread of dust and dirt.

B. Comply with governing environmental protection regulations.

C. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

D. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.05 EXTERMINATION

A. Rat Control: A licensed exterminator shall be retained by the Contractor. Prior to beginning demolition, provide and place bait boxes around the perimeter of the site for the duration of the project. Separate any food waste from other debris and place in garbage containers with tightly fitting lids.

3.06 DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated on the drawings. Use methods required to complete work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of offsite.
7. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
9. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
10. Saw cut between concrete to be removed and concrete to remain.

B. Demolish masonry in small sections. Cut masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools. Sawcut between existing masonry to be removed and to remain.

C. Demolish and remove existing construction according to the IDOT Standard Specifications for Road and Bridge Construction, Section 501, Removal of Existing Structures.

D. The Contractor is fully responsible for the means and method of demolition and the integrity and stability of the existing structure during demolition until the work is completed.

E. Do not remove more of the existing structure than indicated on the drawings or as required. Do not damage, mar, cut, or deface the remaining structure to remain or material to be reused.

F. Verify all dimensions and existing conditions.

3.07 PATCHING AND REPAIRS

A. Contractor to take precautions to avoid damage to adjacent surfaces, neighboring properties, nearby walls, property line fences and at parkways, sidewalks, driveways, streets and alleys.

B. Contractor to promptly patch and repair any damage, holes, cracks, or damaged surfaces caused by demolition operations to match adjacent construction.

C. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials. Patch to match existing, using materials to match existing.

1. Completely fill holes and depressions in existing masonry or concrete to remain with an approved masonry or concrete patching material, applied according to manufacturer's printed specifications.

D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

E. Repairs, patching, and replacements due to damage by the Contractor are the complete responsibility of the Contractor.

3.08 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials, accumulated debris, rubbish, and other materials resulting from demolition operations. Do not allow demolished materials to accumulate on-site except as required for recycling operations.

B. Recycle construction debris from demolition operations and construction waste to the greatest extent possible. Contractor must follow City of Chicago Recycling of Construction Debris Ordinance as a minimum requirement.

C. Concrete, masonry, steel, wood, glass, cardboard, and other materials shall be separated at the construction site and pick up shall be arranged with their respective recycling waste haulers for recycling of the individual waste materials.

D. Provide written and dated documentation of the total amount of each different waste material, the amount of each sent to a recycling facility and the amount of each sent to a landfill. Documentation shall be done on a daily basis. Indicate when and who the materials were picked up by and the name of the recycling facility the materials were sent to.

E. Disposal of Nonrecyclable Debris: Transport materials that are not suitable for recycling off Authority's property and legally dispose of them.

3.09 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

B. Sweep adjacent pavements broom clean on completion of demolition operation.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of STRUCTURE DEMOLITION shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of STRUCTURE DEMOLITION shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

C. Structural Work: 030000.

END OF SECTION

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This section includes the demolition, removal and proper disposal of the items indicated on the drawings to be removed and any other items to be removed as required to facilitate the installation of the new work including but not limited to the following:

1. Remove existing plumbing supply, drain, and vent piping, etc. integral with the work, to the extent shown on the drawings, and as otherwise required. Cap piping as required.
2. Remove existing light fixtures, electrical outlets, wiring, conduit, etc. integral with the work, to the extent shown on the drawings, and as otherwise required. Cap wiring and conduit as required.
3. Remove existing pavement surface and base course as indicated on the drawings.
4. Remove existing irrigation and domestic water piping as indicated on the drawings.
5. Remove planters as indicated on drawings.
6. Remove all other items as shown on the drawings, indicated, or as otherwise required to facilitate the new construction.

B. Any salvageable items to be reused are to be removed carefully to avoid damage to the items, including the following:

1. Existing exterior light fixtures
2. Existing CTA Logo (sign)
3. Rotogates & Turnstiles
4. CTA Vending Machines & ATM Machines
5. All signage and art work
6. Stainless steel railings
7. Radiant heaters
8. Windbreaks
9. Pay Phones
10. Benches, Trash cans and other platform furniture

Any other items located by the Contractor shall be salvaged unless otherwise indicated by the Commissioner.

C. Work includes providing, installing, maintaining, and removing temporary construction barriers as required during the course of the work. Construction barriers to be of plywood and wood framing unless approved otherwise.

D. Work includes providing, installing, and removing foot traffic barricades and control devices and signage as required during the course of the work and as approved by the Commissioner.

E. Contractor is to schedule all work with the Commissioner. Contractor to submit a process plan and phasing plan for all the work, including demolition.

F. Work may require re-routing underground utility lines as required to clear the new construction.

G. Work includes patching and repairs to existing adjacent surfaces after removal or demolition. Patching and repairs to match existing materials and finishes.

H. Work includes coring and cutting existing surfaces for installation of new plumbing piping and electrical conduit. Patch upon completion.

1.03 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Commissioner's property.

B. Remove and Salvage for Recycling: Items indicated to be removed and recycled are to be separated and arranged for recycling. Construction debris from demolition and construction waste materials are to be picked up by recycling waste haulers for recycling to the greatest extent possible. As a minimum requirement, the Contractor to follow the City of Chicago Ordinance for recycling construction debris.

C. Remove and Salvage for Re-use: Items indicated to be removed and salvaged remain the Commissioner's property. Remove, clean and pack or crate items to protect against damage. Identify contents of containers and deliver to Commissioner's designated storage area.

D. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

E. Existing to Remain: Protect items indicated to remain against damage and soiling during selective demolition. When permitted by the Commissioner, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.04 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged for re-use, reinstalled, or otherwise indicated to remain the Commissioner's property,

demolished materials shall become the Contractor's property and shall be removed from the site and legally disposed of by the Contractor.

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the conditions of the contract and Division 01 Specification Sections, for approval, unless otherwise indicated:

1. Proposed dust-control measures.
2. Proposed noise-control measures.
3. Schedule of demolition activities indicating the following:

    a. For each location: Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
    b. Interruption of utility services.
    c. Coordination for shutoff, capping, and continuation of utility services.
    d. Locations of temporary partitions, barriers, and means of egress.
    e. Foot traffic control or interruption. Closing of areas and proposed duration of closures.
    f. Shoring required.
    g. Indicate how demolition work will avoid interruption of Commissioner's on-site operations.
    h. Demolition plan.

4. Proposed recycling procedures.
5. Inventory of items to be removed and salvaged for re-use or returned to the Commissioner.

B. Contractor to submit to the Commissioner for approval a process plan and phasing plan for the demolition work. Demolition shall not commence until the contractor has received written approval from the Commissioner.

C. Contractor to submit proposed barricades, control devices, and signage as required during the demolition and other work including the proposed location of the barricades, control devices, signage and schedule of impacts for the Commissioner's review and approval.

D. Provide the following, for information purposes:

1. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.

E. Provide the following at Project Closeout according to Division 01 Section "Contract Closeout:"

1. Record drawings; including identification and accurate locations of capped utilities and other subsurface structural, electrical, or mechanical conditions.

F. Provide written and dated documentation of the total amount of each different waste material, the amount of each sent to a recycling facility and the amount of each sent to a landfill. Documentation shall be done on a daily basis. Indicate when and who the materials were picked up by and the name of the recycling facility the materials were sent to.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction. Comply with City of Chicago Recycling Ordinance.

1.07 PROJECT CONDITIONS

A. Contractor required to survey existing conditions to verify all existing dimensions and conditions, locations of items and construction sizes of items including conditions and limitations under which he is to do his work.

B. Contractor is required to locate all existing utilities, including utilities not exposed to view.

C. There will be no extras allowed to compensate the Contractor for his failure to review and verify existing conditions and dimensions.

D. Demolition work to adhere to phasing plans for the project.

1.08 HAZARDOUS MATERIALS

A. Any components to be removed which contain lead paint shall be removed according to all applicable federal, state, and local regulations. This shall include 29 CFR1926.62 and 29 CFR1910.1025 under the Occupational Safety and Health Act, Toxic Substance and Control Act, Resource Conservation and Recovery Act, Illinois Lead Poisoning Prevention Act (77 Illinois Adm. Code 845) and City of Chicago Code 11-4-2190 (Sandblasting, grinding, and chemical washing of building, facility, or other structures; permit and notification requirements; performance standards for lead paint abatement; and disposal of debris.) Contractor shall submit removal or mitigation plan to the Commissioner for approval. All work shall be done in accordance with Ch.1 and Ch.3 of National Emission Standards for Hazardous Air Pollutants (NESHAP).

B. Material containing lead based paint to be disposed of as hazardous waste, according to all applicable laws and regulations, unless approved otherwise, at Contractor’s expense and at approved landfills. Do not allow lead dust to contaminate other surfaces. The Contractor shall be responsible for handling, transportation, and disposing of any hazardous materials generated during the course of the project in accordance with all applicable federal, state, and local environmental regulations and codes.

PART 2 - PRODUCTS

2.01 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use material whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that those utilities indicated and approved to be disconnected and capped, have been properly done so.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required. All work indicated may vary based on actual field conditions and dimensions. Additional demolition and/or patching may be required depending on the condition of materials and construction upon opening up the existing construction and actual justification and/or attachment of the materials.

C. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function of design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Commissioner.

D. Survey the condition of the adjacent structures to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of these during selective demolition.

E. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES

A. Contractor to refer to Private Utility Phasing Plan in Civil Drawings to identify non- city utilities to be relocated by others before Work performed under this Contract. These are indicated as Phase 1 on the Drawings. Coordination may be required with these utility companies during demolition activities.

B. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by the Commissioner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Commissioner and to governing authorities.

    a. Provide not less than 72 hours' notice to the Commissioner if shutdown of service is required during changeover.

C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections if required to maintain continuity of service to other parts of the building before proceeding with selective demolition.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

D. Utility Requirements: Refer to their respective sections of these specifications for shutting off, disconnecting, removing, or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

A. Conduct demolition operations and remove debris to ensure minimum interference with adjacent occupied and used facilities.

1. Do not close or obstruct adjacent occupied or used facilities without permission from the Commissioner and authorities having jurisdiction. Provide alternate routes around closed or obstructed foot traffic.
2. Do not block required exits or stairways.

B. Conduct demolition operations to prevent injury to people and damage to adjacent facilities to remain. Ensure safe passage of people around selective demolition area.

1. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
2. Cover and protect equipment that has not been removed.

C. Erect and maintain dust-proof partitions and temporary enclosures as required to limit dust and dirt migration and to separate areas from fumes and noise.

D. If required, provide and maintain shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building components during selective demolition and until new support is installed.

3.04 POLLUTION CONTROLS

A. Use temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Protect sewer structures with filter fabric in accordance with CDWM Standards.

D. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.05 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials promptly and properly dispose of off-site.
7. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly. On-site stage or sale of removed items is prohibited.
9. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

B. Demolish masonry in small sections. Cut masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools. Sawcut between existing masonry to be removed and to remain.

C. Demolish and remove existing construction according to the IDOT Standard Specifications for Road and Bridge Construction, Section 501, Removal of Existing Structures.

D. The Contractor is fully responsible for the means and method of demolition and the integrity and stability of the existing structure during demolition until the work is completed.

E. Do not remove more of the existing structure than indicated on the drawings or as required. Do not damage, mar, cut, or deface the remaining structure to remain or material to be reused.

F. Verify all dimensions and existing conditions. Contractor shall submit to the Commissioner any and all locations where existing structural damage, corrosion, or missing piece (such as rivet or bolt) is found during field survey verification. Corrosion would account for 10% or more of the cross section of a specific member to have been affected.

3.06 PATCHING AND REPAIRS

A. Promptly patch and repair holes and damaged surfaces caused by demolition operations to match adjacent construction.

B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials. Patch to match existing, using materials to match existing.

1. Completely fill holes and depressions in existing masonry or concrete to remain with an approved masonry or concrete patching material, applied according to manufacturer's printed specifications.

C. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

D. Patch and repair floor, ceiling and wall surfaces in the new space where demolished walls or partitions extend one finished area to another. Provide a flush and even surface of uniform color and appearance.

1. Closely match texture and finish of existing adjacent surface.
2. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
3. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat.
4. Where applicable, remove existing floor and wall finishes and replace with new materials, if necessary, to achieve uniform color and appearance.

E. Repairs, patching, and replacements due to damage by the Contractor are the complete responsibility of the Contractor.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials, accumulated debris, rubbish, and other materials resulting from demolition operations. Do not allow materials to accumulate on-site except as required for recycling operations.

B. Recycle construction debris from demolition operations and construction waste to the greatest extent possible. Contractor must follow City of Chicago Recycling of Construction Debris Ordinance as a minimum requirement.

C. Concrete, masonry, steel, wood, glass, cardboard and other materials shall be separated at the construction site and pick up shall be arranged with their respective recycling waste haulers for recycling of the individual waste materials.

D. Disposal of non-recyclable debris: Transport materials that are not suitable for recycling off Commissioner's property and legally dispose of them.

3.08 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior the start of work.

B. Sweep the building broom clean on completion of selective demolition operation

C. Change filters on air-handling equipment on completion of selective demolition operations.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of SELECTIVE DEMOLITION shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of SELECTIVE DEMOLITION shall be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK for all applicable work performed with the CIVIL WORK pay item account and STRUCTURAL WORK for all applicable work performed with the STRUCTURAL WORK pay item account.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000

B. Structural Work: 030000

END OF SECTION 02 41 19

SECTION 02 42 13

UTILITY RELOCATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Relocate existing utilities as shown on the Drawings or as directed by the Commissioner. Contractor to refer to Private Utility Phasing Plan in Civil Drawings to identify non-city utilities to be relocated by others before Work performed under this Contract. These are indicated as Phase 1 on the Drawings. Coordination may be required with these utility companies during work performed.

B. Make arrangements with appropriate City agencies and utility companies before proceeding with Work. Items requiring replacement shall be replaced in-kind. The Contractor will be solely responsible for the removal and resetting work.

1.03 RELATED SECTIONS

A. Section 312310: Excavation, Trenching and Backfilling (Utilities).

B. Section 330514: Water Valve Box or Buffalo Box to Be Adjusted.

C. Section 330515: City Electrical Vault or Handhole to Be Adjusted.

D. Section 330522: Repair and Adjustment of Sewer Mains and Structures.

1.04 REFERENCES

A. Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, Adopted April 1, 2016, or latest edition.

B. Standard Specifications for Water and Sewer Main Construction in Illinois, current edition.

C. City of Chicago Department of Water Management, specifications for water main and appurtenance's construction.

1.05 QUALITY ASSURANCE

A. Comply with all codes, laws, ordinances and regulations of governmental authorities having jurisdiction over this work including applicable OSHA and Standard Specifications requirements.

B. Verify all existing conditions and dimensions in the field.

C. Verify locations of all existing underground utilities, to determine which utilities require relocation/replacement. Record drawings are available at the Chicago Bureau of Electricity and Department of Water Management.

PART 2 - PRODUCTS (NOT USED)

PART 3 - PART EXECUTION

3.01 Fire Hydrants and water mains will be relocated in accordance with Department of Water Management criteria, Chicago Standard Specifications for Water and Sewer Main construction in Illinois, and Sections 561 and 564 of the IDOT Standard Specifications.

3.02 Valve Vaults shall be reconstructed according to Section 602 of the IDOT Standard Specifications.

3.03 Sewer main relocation will be done in accordance with Department of Water Management criteria, Chicago Standard specifications for Water and Sewer Main construction in Illinois and Section 550 of the IDOT Standard Specifications.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of UTILITY RELOCATION will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of UTILITY RELOCATION will be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

END OF SECTION 02 42 13

SECTION 02 42 14

COMMUNCATION CABLE RELOCATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Description: This work consists of coordinating with and providing payment to Adesta for the relocation of fiber optic communication lines attached to the existing transverse girders of the CTA Lake Street structure.

B. General Requirements: It is the Contractor's responsibility to contact Adesta to coordinate the relocation of the cables. The Contractor is to contact Mr. Chris Roberts at (630) 739-0546 (office phone) or (815) 405-1358 (cell phone) a minimum of four (4) weeks prior to the relocation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Method of Payment: The contractor will be reimbursed to the exact amount of money as billed by Adesta for relocating the fiber optic cables plus markup of 5% on the first $10,000 and 1% of any amount over $10,000 of the total approved cost of the work. No separate payment will be made for coordination.

B. No markups will be allowed to any subcontractor.

C. Following the approval of the Adesta invoices by the Department, the Contractor must pay all monies to Adesta and must submit to the Department certified and notarized evidence of the amount of payments.

D. Method of Measurement: COMMUNICATIONS CABLE RELOCATION will be measured as an allowance.

E. Basis of Payment: COMMUNICATIONS CABLE RELOCATION will be paid on an allowance basis, based on submitted/audited paid invoices from Adesta, plus mark up. The contractor will not be due the balance any of the monies allocated for this item remaining after final audit or the value of the deposit.

F. The estimated unit price and total cost have been included in the Schedule of Prices under 265000 ELECTRICAL UTILITY SERVICE WORK.

END OF SECTION 02 42 14

SECTION 02 45 00
DUST CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work of this section includes labor, equipment, and materials necessary to safely control dust during construction activities as shown or required. Work includes adhering to applicable codes, regulations, health and safety requirements; performing testing; training personnel; protection of personnel, public, and adjacent surfaces; proper and legal disposal of materials; and any other work as required.

1.3 RELATED DOCUMENTS

A. Drawings and other Specification Sections apply to this Section.

B. Hazardous Building Materials Survey Report.

1.4 RELATED WORK

A. Section 01 33 00, Submittal Procedures.

B. Section 02 41 19, Selective Demolition.

C. Section 02 72 00, Lead Abatement.

1.5 WORK INCLUDED

A. The work includes labor, equipment, materials, disposal materials, services, employee protection, tools, insurance and supplies necessary to control dust migration by the procedures described herein. The Contractor, by submitting a bid for the work, represents itself as knowledgeable and expert in the performance of the work, and includes items usually and customarily necessary to provide a complete and finished job, whether specifically mentioned or not.

B. Procedures used by Contractor shall utilize state of the art techniques including appropriate containment and negative air pressure.

C. Contractor is responsible to ensure there will be no damage to existing and new equipment due to negligence of dust control.

1.6 SUBMITTALS

A. Detailed process plan proposed for the dust control work, including location of the dust control containment, sequencing the work, time frame for completion of work, waste disposal procedures, employee protection requirements, and a detailed description of methods employed to eliminate any dust from being distributed outside the work area. This plan shall also include a detailed procedure for clean up if the containment or negative air pressure system fails.

B. Emergency telephone numbers(s) and contingency plans.

C. Waste disposal site and disposal procedures.

D. Contractor's OSHA compliance program.

E. Materials to be used for the dust control work including worker protection, protection of Commissioner's equipment, etc.

1.7 QUALITY ASSURANCE

A. Contractor shall have experience with the control of dust within operational commercial buildings.

PART 2 - PRODUCTS

2.1 DUST CONTROL MATERIALS

A. Poly sheeting: 6 mil nominal thickness and fire retardant for applications.

B. Wood framing materials: fire resistive.

C. Tape: 2-inch or 3-inch duct tape or other waterproof tape suitable for joining poly seams and attaching poly sheeting to surfaces.

D. Spray adhesives: non-flammable and free of methylene chloride solvents.

E. Negative pressure ventilation equipment: equipped with filters as noted and provide the required volume of air movement.

PART 3 - EXECUTION

3.1 PROTECTION OF PUBLIC AND CTA EMPLOYEES

A. Occupy area as designated, and protect the public by use of barricades, warning signs, and such safety measures as will be effective.

3.2 ACCESS TO THE SITE AND REMOVAL OF EQUIPMENT

A. Be responsible for the movement and transportation of his own materials, tools, and equipment to and from the work site.

B. Materials, tools, and equipment may be transported across the Commissioner's property, to the work site, at such points and under such regulations as the Commissioner may impose for protection of structures, landscaping, pavement, curbs, sidewalks, utilities, fences, and other equipment located on or near the site of the work.

C. Remove surplus tools and equipment on a daily basis. Upon receiving notice from the Commissioner's representative that the work has been completed, remove surplus and waste material. Remove remaining tools and equipment from the premises and shall have these items off the premises within 2 days.

D. Should the Contractor or any Subcontractor fail to abide by these requirements, the Contractor agrees that the Commissioner may, at its discretion, remove said equipment from such locations as it may select and that the cost of such removal shall be deducted from amounts then due to the Contractor.

3.3 EXISTING CONDITIONS

A. The Commissioner and the Contractor shall agree in writing on building fixture condition prior to commencement of work. It shall be the Contractor's responsibility to replace or repair to the Commissioner's satisfaction any items identified as save or protect, prior to close-out of the project.

3.4 WORK AREA ISOLATION AND PREPARATION

A. General: Secure the work area from unauthorized persons. Close off the work site from other portions of the building by closing doors tightly, taping shut when necessary, or with 6 mil poly z-flap curtains over doorways or entrances to the worksite.

1. Furniture, personal items, and other moveable objects in the worksite shall be protected with 6 mil poly sheeting and sealed with tape, or moved from the work site and stored in a location designated by the Commissioner.
2. Turn off forced air ventilation and seal exhaust and intake points in the containment area.

3. Cover objects that cannot be moved, such as radiators, stoves, cabinets, built-in furniture, bookcases, or other stationary items with 6 mil plastic sheeting taped securely in place. Operational equipment that can be damaged by covering with sheeting shall not be enclosed.

B. Containment-The purpose of containment during dust control activities is to limit release of dust into the air and surrounds. In, general, the size of the area helps determine the level of containment. However, dust producing activities such as floor cutting and grinding, concrete demolition, paint and mortar removal shall always require full containment. Choice of containment for each stage of phase of work shall be agreed upon between the contractor and the Commissioner's representative prior to the start of the work. The two types of containment are:

1. Limited Containment
   a. Generally limited to work where dust production and migration is limited to an area within 2 feet of the work area and where no operational equipment could be affected by the accumulation of dust.
   b. The enclosure around the work area should consist of a single layer of 6-mil, fire retardant polyethylene sheeting.
   c. For small areas, the polyethylene sheeting can be affixed to floor and ceiling using duct tape.
   d. In large areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it.
   e. Supply and air vents, doors, chases, and risers within the containment area shall be sealed with polyethylene sheeting.
   f. The containment shall be maintained under negative pressure relative to the surrounding areas.
   g. A HEPA filtered fan unit exhausted outside of the building shall be used to maintain negative pressure.

2. Full Containment
   a. Required for dust control in areas greater than 100 square feet or in any situation in which it appears likely that the occupant space would be affected without full containment.
   b. Double layer of 6-mil polyethylene sheeting shall be used to create a barrier between the work area and other parts of the building.
   c. The containment shall be maintained under negative pressure relative to the surrounding areas.
   d. The egress shall consist of a slit entry with covering flaps ("z" flaps).
   e. Respiratory protection shall be worn until personnel are outside the work area.
   f. In large areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it.
   g. Supply and air vents, doors, chases, and risers within the containment area shall be sealed with polyethylene sheeting.
   h. A HEPA filtered fan unit exhausted outside of the building shall be used to maintain negative pressure.

3.5 WORKER PROTECTION

A. It is Contractors responsibility to provide appropriate worker protection. At a minimum, worker protection shall be provided to meet the latest OSHA standards.

3.6 DUST CONTROL

A. A variety of dust control methods may be used for minimizing damage to building materials, furnishings, and equipment caused by dust accumulation. The specific method or group of methods used will depend on the type of material affected.

B. The following are recommended methods for dust control:

1. Wet / Dry Vacuum

    a. Can be used to remove water and damp material from floors, carpets, and hard surfaces where water has accumulated.
    b. They can be used to vacuum heavy dust accumulations, such as occurs during concrete, gypsum board or mortar demolition.
    c. They should be used when materials are dry in lieu of sweeping.
    d. Tanks, hoses, and attachments of these vacuums should be thoroughly cleaned and dried after use.

2. Damp Wipe

    a. Can be used to remove light dust accumulations from nonporous surfaces.
    b. Dust accumulation areas should be wiped down with damp wipes prior to the removal of the containment.

3. Employee Clothing

    a. Disposable clothing. Shall have excessive dust removed prior to exiting the containment area. Shall be removed and disposed of prior to leaving the walk off mat taking precautions not to spread any dust.
    b. Other clothing. Shall have excessive dust removed prior to exiting the containment area. A clean wet / dry vacuum shall be used to remove remaining dust from the clothing prior to leaving the walk off mat.

4. Tools

    a. Tools shall be thoroughly cleaned prior to removal from the containment area.
    b. Tools shall be clean prior to arriving on site.

5. Materials

    a. Materials shall be brought to the site in their original shipping containers. If removal from the containers could produce dust, the materials shall be removed from the container within the containment area or outside of the substation.

b. Dust producing materials shall be contained when transporting from the containment area to the exterior and vice versa.

6. The containment shall be inspected at least every 4 hours during construction activities within the containment area. Repairs to the containment shall be performed immediately upon detection of damage. Work shall stop in the containment area if dust is noted outside of the containment and shall not resume until the source for the dust has been identified and contained.

3.7 STOPWORK

A. If the Commissioner presents a written stop order, immediately stop work. Do not recommence work until authorized in writing by the Commissioner.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of DUST CONTROL shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of DUST CONTROL shall be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK for applicable work performed with the CIVIL WORK pay item account and STRUCTURAL WORK for applicable work performed with the STRUCTURAL WORK pay item account.

4.3 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

B. Structural Work: 030000.

END OF SECTION

SECTION 02 61 10

SPECIAL WASTE HAULING AND DISPOSAL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This work consists of hauling to a properly permitted landfill all material classified as special waste material as determined by the Commissioner or his representative. This item shall include all materials, labor, permits, licenses, and incidentals required to temporarily store, haul, and dispose of legally off-site of all excavated material classified as special. For the purposes of these specifications the following definitions apply:

"Special waste" is defined as materials which are excavated from onsite which are determined to be contaminated and which are not reused onsite.

B. This work is in addition to, and not in lieu of earth excavation or excavation work included in sewer items. Price should reflect only the additional cost in handling, hauling, and disposing of special waste as compared to that of non-contaminated waste.

1.03 RELATED SECTIONS

1. Section 02 61 00.20: Special Waste Plans and Report
2. Section 02 61 00.40: Soil Disposal Analysis
3. Section 31 20 00: Earth Moving
4. Section 31 23 10: Excavation, Trenching & Backfilling (Utilities)

1.04 REFERENCES

A. Except as modified herein, the work must conform to the applicable requirements of Section 669 of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, Adopted April 1, 2016, or latest edition.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 CONTAMINATED SOILS

A. Contaminated soils will be any soil determined by the Commissioner or his representatives to have a level of Volatile Organic Compounds (VOCs) in excess of 50 ppm or having suspect olfactory and/or visual indications of being contaminated.

B. The Contractor must separate contaminated material from non-contaminated material as directed by the Commissioner or his representatives. At the direction of the Commissioner, the Contractor may be required to stockpile contaminated material at locations onsite. Every effort must be made to reuse this material on site as approved by the Commissioner. The Commissioner will provide an on-site inspector to identify material which is suitable for reuse onsite.

C. Work under this item must be performed in accordance with the State RCRA land disposal requirements of 35 ILL. ADM. Code Parts 721, 722, 724 and 728. Regulations require obtaining an IEPA generator number and transporting the contaminated soil as Special Waste to an approved landfill for disposal following correct manifest procedures.

D. If the Commissioner or his agent suspects locations of contaminated soil, the contractor must not perform any excavation activities in the area without the presence of OSHA trained personnel equipped with Photo Ionization Detector (PID) and Flame Ionization Detector (FID) meters in order to distinguish contaminated soil from uncontaminated soil. The OSHA-trained personnel must be provided by the contractor and considered included in the item SPECIAL WASTE HAULING AND DISPOSAL.

E. The contractor must provide a licensed special waste hauler to load, haul, and dispose of the special waste at a landfill properly permitted to dispose of special waste pursuant to the State RCRA land disposal requirements of 35 ILL. ADM. Code Parts 721, 722, 724 and 728.

F. The special waste must be separated from uncontaminated soil at all times.

G. Prior to transporting the special waste from the site, a special waste manifest must be completed and signed by the Commissioner (or his agent) and the hauler of the special waste as described in the State RCRA land disposal requirements of 35 ILL. ADM. Code parts 721, 722, 724 and 728.

H. In addition, the special waste manifest must be completed by the special waste hauler and the landfill owner upon arrival at the designated disposal site.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of SPECIAL WASTE HAULING AND DISPOSAL will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of SPECIAL WASTE HAULING AND DISPOSAL will be included in the contract lump sum price as shown in the Schedule of Prices for ALLOWANCE FOR DISPOSAL OF REGULATED SUBSTANCES for all applicable work performed with the CIVIL WORK pay item account and ALLOWANCE FOR DISPOSAL OF REGULATED SUBSTANCES for all applicable work performed with the STRUCTURAL WORK pay item account.

4.03 PAY ITEM ACCOUNT NUMBER

A. Special Waste Civil Work: 026100.

B. Special Waste Structural Work: 026100.

END OF SECTION

SECTION 02 61 20

SPECIAL WASTE PLANS AND REPORT

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work under this item shall be in accordance with the Standard Specifications as indicated herein, as shown on the Plans, and as directed by the Commissioner.

B. Related Sections:

1. Section 02 61 00.10: Special Waste Hauling and Disposal

2. Section 02 61 00.40: Soil Disposal Analysis

1.03 REFERENCES

1. Except as modified herein, the work must conform to the applicable requirements of Section 669 of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, Adopted April 1, 2016, or latest edition.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of SPECIAL WASTE PLANS AND REPORT will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of SPECIAL WASTE HAULING AND DISPOSAL will be included in the contract lump sum price as shown in the Schedule of Prices for ALLOWANCE FOR DISPOSAL OF REGULATED SUBSTANCES for all applicable work performed with the CIVIL WORK pay item account and ALLOWANCE FOR DISPOSAL OF REGULATED SUBSTANCES for all applicable work performed with the STRUCTURAL WORK pay

item account.

4.03 PAY ITEM ACCOUNT NUMBER

A. Special Waste Civil Work: 026100.

B. Special Waste Structural Work: 026100.

END OF SECTION

SECTION 02 61 30

NON-SPECIAL WASTE DISPOSAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work under this item shall be in accordance with the Standard Specifications as indicated herein, as shown on the Plans, and as directed by the Commissioner.

1.03 RELATED SECTIONS

A. Section 026110: Special Waste Hauling and Disposal

B. Section 026120: Special Waste Plans and Report

C. Section 026140: Soil Disposal Analysis.

D. Section 312000: Earth Moving

E. Section 312310: Excavation, Trenching, and Backfilling (Utilities)

1.04 REFERENCES

A. Except as modified herein, the work must conform to the applicable requirements of Section 669 of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, Adopted April 1, 2016, or latest edition.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of NON-SPECIAL WASTE DISPOSAL will not be measured for payment.

4.02 PAYMENT

No separate payment will be made for the work covered in this section. Payment for the Work of NON-SPECIAL WASTE DISPOSAL will be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK for all applicable work performed with the CIVIL WORK pay item account and STRUCTURAL WORK for all applicable work performed with the STRUCTURAL WORK pay item account.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

B. Structural Work: 030000.

END OF SECTION 02 61 30

SECTION 02 61 40

SOIL DISPOSAL ANALYSIS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work under this item shall be in accordance with the Standard Specifications as indicated herein, as shown on the Plans, and as directed by the Commissioner.

1.03 RELATED SECTIONS

A. Section 02 61 00.10: Special Waste Hauling and Disposal.

B. Section 02 61 00.20: Special Waste Plans and Report.

C. Section 02 61 00.30: Non-Special Waste Disposal.

1.04 REFERENCES

A. Except as modified herein, the work must conform to the applicable requirements of Section 669 of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, Adopted April 1, 2016, or latest edition.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of SOIL DISPOSAL ANALYSIS will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of SPECIAL WASTE HAULING AND DISPOSAL will be included in the contract lump sum price as shown in the Schedule of Prices for ALLOWANCE FOR DISPOSAL OF REGULATED SUBSTANCES for all applicable work performed with the CIVIL WORK pay item account and ALLOWANCE FOR DISPOSAL OF REGULATED SUBSTANCES for all applicable work performed with the

STRUCTURAL WORK pay item account.

4.03 PAY ITEM ACCOUNT NUMBER

A. Special Waste Civil Work: 026100.

B. Special Waste Structural Work: 026100.

END OF SECTION

SECTION 02 87 13
BIRD EXCREMENT REMOVAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes requirements for bird-excrement removal.

1.03 PRECONSTRUCTION MEETINGS

A. Preconstruction Conference: Conduct conference at the project site.

1. Review methods and procedures related to excrement removal, including, but not limited to, the following:

a. Bird-excrement-removal specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, sequencing, tolerances, and required clearances.
c. Fire-protection plan.
d. Coordination with building occupants.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For bird-excrement-removal specialist and industrial hygienist.

B. Preconstruction Test Reports: For removal materials and methods.

1.05 QUALITY ASSURANCE

A. Bird-Excrement-Removal Specialist Qualifications: A firm that employs personnel experienced and skilled in the processes and operations indicated.

B. Industrial Hygienist Qualifications: Certified as Industrial Hygienist by the American Board of Industrial Hygiene; having Bachelor's degree in industrial hygiene, public health, biological science, occupational health, or environmental and safety discipline; and experienced in work of types specified.

C. Regulatory Requirements: Comply with notification regulations of authorities having jurisdiction before beginning excrement-removal work. Comply with collection and disposal regulations of authorities having jurisdiction.

1.06 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified bird-excrement-removal specialist to perform preconstruction testing on surfaces with accumulations of bird excrement.

1. Use test areas as indicated and representative of proposed materials and existing construction.
2. Propose changes to materials and methods to suit project.

B. Preconstruction Testing: Performed by a qualified bird-excrement-removal specialist to demonstrate effects of removal work on substrate appearance and longevity and set quality standards for materials and execution.

1. Bird-Excrement Removal: Remove excrement from existing structure test areas as indicated within project extents.

a. Test chemicals and methods on samples of adjacent building materials for possible adverse reactions. Do not use chemicals and methods known to have a deleterious effect.
b. Allow a waiting period of not less than seven days after completion of removal work to permit a study of test area for deleterious effects.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Select materials and methods of use based on the following, subject to preconstruction testing:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:

a. Remove, alter, or harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
b. Leave residue on surfaces.

PART 3 EXECUTION

3.01 PROTECTION

A. Comply with temporary barrier requirements in 01 71 13 MOBILIZATION

B. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from excrement-removal procedures.

1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide barricades, dustproof barriers, and temporary directional signage to exclude public from work areas.
3. Contain dust and debris generated by excrement-removal work and prevent it from reaching the public or adjacent surfaces.

C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

3.02 BIRD-EXCREMENT REMOVAL

A. General: Engage a qualified industrial hygienist to perform tests, make recommendations, observe the work. Follow procedures required by authorities having jurisdiction and recommended by industrial hygienist.

B. Removing Bird Excrement: Have bird-excrement-removal work performed by a qualified bird-excrement-removal specialist. Remove exterior bird-excrement accumulations with building windows and other openings in the building closed or sealed off.

1. Use materials and follow procedures as determined by preconstruction testing.
2. Before removal, treat bird excrement to kill pathogens; dampen excrement to prevent particles becoming airborne.
3. Use only nonmetallic tools, such as plastic spatulas and brushes with natural fiber or nylon bristles.
4. Collect excrement debris as it is removed, seal it in durable plastic bags, and legally dispose of it off-site.
5. Repeat removal procedure above where required to produce cleaning effect established by Preconstruction Testing.

C. Removing Bird-Excrement Stain: Clean as required pertaining to cleaning substrate material from which bird excrement was removed.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of BIRD EXCREMENT REMOVAL shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of BIRD EXCREMENT REMOVAL shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000.

END OF SECTION

SECTION 03 10 00

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes formwork and related accessories for cast-in-place concrete work in Section 03 30 00 Concrete, 03 33 00 Architectural Concrete (ACON), and 03 41 00 Precast Concrete Platform.

B. Related Sections: The following sections contain requirements that relate to this Section.

1. Section 03 20 00 – Concrete Reinforcement and Embedded Items.
2. Section 03 30 00 – Cast-in-Place Concrete.
3. Section 03 33 00 – Architectural Concrete (ACON).
4. Section 03 41 00 – Precast Concrete Platform.
5. Specifications within 03 33 00 and 03 41 00 have priority over this Section.

C. Definitions:

1. Definition of project terms and abbreviations are found within Specification Section 01 35 00.

1.03 REFERENCES

A. Acronyms for reference standards are defined in Section 01 42 00.1.

B. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.

C. ACI 301 – Standard Specification for Structural Concrete.

D. ACI 318 – Building Code Requirements for Reinforced Concrete.

E. ACI 347R – Guide to Formwork for Concrete.

F. ACI 305, "Hot Weather Concreting."

G. ACI 306, "Cold Weather Concreting."

1.04 QUALITY ASSURANCE

A. The contractor is solely responsible for the design of shoring systems. All shoring shall be designed and have calculations performed according to the items noted within the Submittals Section C of this Specification and the drawings. In addition to the requirements listed below, shoring plans shall include superimposed loading information as well as location and magnitude of shoring posts and towers.

B. The work of this section shall be performed by a company that specializes in the type of concrete formwork work required for this Project, with a minimum of 10 years of documented successful experience and shall be performed by skilled workmen thoroughly experienced in the necessary crafts.

1. Work shall be performed in compliance with Owner's insurance underwriters' requirements.

C. Testing Agency Services: Required as specified in Section 01 40 00 Quality Control, and herein.

1.05 SUBMITTALS

A. Submit the following according to Conditions of the Construction Contract and Division 1 Specification Sections.

B. Shop Drawings: Sealed and signed by a licensed Structural Engineer registered in the State of Illinois (SSE). Shop drawings shall clearly indicate but not be limited to:

1. Size, type, and quality of form materials including conditions at tops and ends of walls. Form construction indicating structural stability and jointing including special form joints or reveals required by Contract Documents.
2. Layout, procedures, and sequencing of shoring and reshoring that correlates with the information contained in the shoring/reshoring calculations described below.
3. Location and pattern of form tie placement, and other items that affect the appearance of concrete that will remain exposed to view.
4. Form finish clearly indicating proper locations and full coordination with concrete finishes required by Contract Documents.

C. Shoring Calculations: Submit for Record Only. Calculations sealed and signed by a licensed Structural Engineer registered in the State of Illinois. Calculations shall clearly address, but not be limited to, the following:

1. Shoring removal and installation procedure, including timing and sequencing.
2. Concrete age and strength at the time of each shoring removal operation.
3. Description of construction loads assumed including concrete, formwork, and construction live load in accordance with ACI 347.
4. A statement by the Structural Engineer that the total construction load imposed on any level supporting shoring does not exceed the total design load as can

be determined from the structural drawings. The total design load includes the self-weight of the structure, superimposed dead load, and live load and accounts for concrete age and relative strength at time of loading.

5. Description of how the shoring will protect existing utilities and adjacent and subgrade structures from the shoring loading.

D. Product Data: Copies of manufacturers' product data and installation instructions for materials used in exposed concrete work, including form liners, release agents, manufactured form systems, ties, and accessories.

E. Installation Certificate: Contractor shall certify that formwork meets requirements of Contract Documents, including allowable tolerances.

F. Hazardous Materials Notification: In the event no product or material is available that does not contain asbestos, PCB, or other hazardous materials as determined by the Owner, a "Material Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

G. Asbestos and PCB Certification: After completion of installation, but prior to Substantial Completion, Contractor shall certify in writing that products and materials installed, and processes used, do not contain asbestos or polychlorinated biphenyls (PCB) using format in General Conditions.

H. Compatibility Certification: Contractor shall certify that form release agent used is compatible with subsequent architectural finish materials applied to concrete surfaces. Submit along with manufacturer's data.

1.06 DELIVERY, HANDLING, STORAGE

A. Comply with General Conditions and Section 016000 Materials and Equipment, including the following:

1. Store forms and form materials clear of ground and protect from damage.

1.07 WARRANTY

A. Comply with General Conditions, agreeing to repair or replace specified materials or Work that has failed within the warranty period. Failures include but are not limited to the following:

1. Discoloration of concrete scheduled to remain exposed to view.
2. Damage of concrete finishes caused by forms.
3. Noncompliance with form finishes required for designated architectural finishes.
4. Noncompatibility of form release agent with subsequent architectural finish materials applied to concrete surfaces.
5. Excessive and/or noticeable bowing in placed concrete members caused by deflection of formwork during concrete placement.
6. Gaps that cause concrete to visibly drip of protrude from an otherwise smooth surface.

PART 2 - PRODUCTS

2.01 UNAUTHORIZED MATERIALS

A. Materials and products required for work of this Section shall not contain asbestos, polychlorinated biphenyls (PCB), or other hazardous materials identified by the Commissioner.

2.02 ACCEPTABLE MANUFACTURERS

A. Products of the manufacturers specified in this Section establish the minimum functional, aesthetic, and quality standards required for work of this Section.

B. Substitutions: Comply with the conditions specified within Section 01 25 00 Substitution Procedures.

2.03 FORMWORK DESIGN

A. Design of Formwork, Shoring/Reshoring, and its removal is the Contractor's responsibility.

B. Design Requirements:

1. Forms shall be designed for fabrication and erection in accordance with Architect/Engineer's design requirements and recommendations of ACI 301, 303R, 318, and 347R.
2. Design formwork, shoring/reshoring in a manner such that the total construction load does not at any time exceed the total design load of new or existing construction as can be determined from the drawings. The total design load includes the self-weight of the structure, superimposed dead load and live load, and accounts for concrete age and relative strength at time of loading.
3. Design formwork for loads and lateral pressures outlined in Section 2.2, ACI 347R, and wind loads as specified by controlling local building code. This includes loads imposed during construction, including weight of construction equipment, and temporary imbalance or discontinuity of building components.
4. Formwork shall meet construction safety regulations for locality in which this Project is located.
5. Forms shall be removable without impact, shock or damage to concrete surfaces, the structure and adjacent materials.
6. Forms shall be tight-fitting, designed, and fabricated for required finishes and to withstand concrete weight and maintain tolerances as specified in ACI 117 for the following designations:

    a. Concrete surfaces exposed to view at exterior faces of building are designated Class A. See also 03 33 00.1 Cast-In-Place Architectural Concrete.
    b. All other surfaces are designated Class C.

7. Furnish forms in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings, using form materials with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
8. Butt Joints: Shall be solid and complete with backup material to prevent leakage of cement paste.
9. Provide 3/4 in. chamfers at corners of all exposed concrete beams and columns.

C. Form Finishes for Exposed Surfaces:

1. Type: Straight, smooth, free of cement paste leaks at butt-joints, surface imperfections, and other irregularities detrimental to appearance of finished concrete, fully coordinated with requirements for required finish material.

2.04 FORM MATERIALS

A. General: Plywood, fiberglass, metal, metal-framed plywood faced, or other acceptable panel-type materials.

1. Provide materials with sufficient strength to prevent warpage.

B. Plywood: Douglas Fir or Southern Yellow Pine species; of grade suitable for intended use, sound undamaged sheets with clean true edges, minimum 5/8 in. thick, complying with U.S. Product Standard PS-1

1. Other Acceptable Sheet Materials: 14 gauge sheet steel or fibrous glass reinforced resin.

C. Lumber: Southern Yellow Pine species; #2 grade with grade stamp clearly visible without loose knots or other defects.

1. Use only where entire width can be covered with one board 11-1/4 in. or less in width.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to support weight of placed concrete without deformation.

E. Fillets for Form Corners:

1. Types: Chamfer strips of wood, metal, PVC, or rubber fabricated to produce smooth form lines and tight edge joints, 3/4 in. size, maximum possible lengths.
2. Required for all corners of beam and column forms.

F. Form Ties:

1. Type: Factory-fabricated galvanized metal, adjustable length, designed to prevent form deflection and to prevent spalling concrete upon removal.
2. Ties shall not leave metal closer than 1-1/2 in. to exposed surface.
3. When removed, ties shall not leave holes larger than 1 in. diameter in concrete surface.

4. Removable Ties: Use type with tapered cones, 1 in. outside diameter, for concrete walls which will remain exposed to view and scheduled for architectural finishes.
5. Snap-Off Ties: Use for concrete walls below grade and walls which will not remain exposed to view and are not scheduled for architectural finishes.
6. Wire Ties: Not acceptable.
7. Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 in. to the plane of the exposed concrete surface. Provide ties that, when removed, will leave holes not larger than 1 in. in diameter in the concrete surface.

G. Nails, Spikes, Lag Bolts, Thru-Bolts, Anchorages:

1. Type: Of size, strength, and quality to meet the required quality of formwork.

H. Form Release Agent:

1. Type: Commercial formulation form release agent of nonemulsifiable type which will not bond with, stain, or adversely affect concrete surfaces, and be compatible with subsequent architectural finish materials applied to concrete surfaces. Form release agent shall meet, at a minimum, all federal and state requirements for volatile organic compounds (VOCs).
2. For Steel Forms: Nonstaining rust-preventative type.
3. A nonstaining form release agent shall be used on all formwork. Form release agent used shall not damage form liner.

I. Coordinate with materials as specified in Section 03 20 00 Concrete Reinforcement and Embedded Assemblies.

J. Forms for Cylindrical Columns and Supports: Metal, glass-fiber reinforced plastic, or paper or fiber tubes that will produce smooth surfaces without joint indications.

1. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.

K. Reglets: Provide sheet metal reglets formed of same type and gauge as flashing metal, unless indicated otherwise on drawings. Where resilient or elastomeric sheet flashing, or bituminous membranes are terminated in reglets, provide reglets of not less than 26 gauge galvanized sheet metal. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

L. Forms to provide continuous, straight, smooth, exposed surfaces. Furnish forms in largest practicable sizes to minimize number of joints.

M. Wood Forms:

1. Finish No. 1 (for concealed below-grade concrete) exterior plywood B-B concrete form Class II PS-1-74.
2. Finish No. 2 (for smooth exposed concrete) exterior type, resin-coated plywood, high-density concrete form overlay, Class I, PS-I-74.

PART 3 - EXECUTION

3.01 FORMWORK

A. General:

1. Inspect areas to receive formwork.

    a. Immediately report to the Commissioner in writing the conditions that will adversely affect the Work.

2. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level, and plumb work in finished structures.
3. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, drips, bevels, chamfers, blocking, screeds, bulkheads, anchorages, and inserts and other features required in the Work.
4. Comply with shop drawings, ACI 301, 303R, 318, and 347R, and Contract Documents.
5. Maintain formwork and finished work construction tolerances complying with ACI 301 and 117.
6. Erect forms for easy removal without hammering or prying against concrete surfaces.
7. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
8. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.
9. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.
10. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce smooth lines and tight edge joints.
11. Design, erect, support, brace, and maintain formwork and shoring to support loads until such loads can be safely supported by the concrete structure.
12. Upturned beams, curbs, and similar members in connection with slabs shall be formed so that they can be poured integrally with slabs.

B. Concrete Accessories and Embedded Items:

1. Install into forms concrete accessories, sleeves, inserts, anchor bolts, anchorage devices, and other miscellaneous embedded items furnished by other trades or that are required for other work that is attached to or supported by cast-in-place concrete.

    a. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated on drawings.

4. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces.

    a. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

5. Coordinate with Section 032000 Concrete Reinforcement and Embedded Assemblies.
6. Install straight, level, plumb, and secure in place to prevent displacement by concrete placement.
7. Embeds: Set and secure embedded plates, bearing plates, and anchor bolts per approved setting drawings and in such a manner to prevent movement during placement of concrete.
8. Install waterstops at construction joints as indicated on the Contract Drawings in sizes to suit joint.

C. Temporary Openings:

1. Locate temporary openings in forms at inconspicuous locations.
2. For clean-outs and inspection before concrete placement, locate temporary openings where interior area of formwork is inaccessible.
3. For cleaning and inspections, locate openings at bottom of forms to allow flushing water to drain.
4. Securely brace temporary openings and set tightly in forms to prevent loss of concrete.
5. Close temporary openings with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be noticeable on exposed concrete surfaces.

D. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades.

1. Determine size and location of openings, recesses, chases, offsets, openings, depressions, and curbs from trades providing such items.
2. Accurately place and securely support items built into forms.

E. Cleaning:

1. Thoroughly clean forms and adjacent surfaces to receive concrete.
2. Remove chips, wood, sawdust, dirt or other debris just before placing concrete.
3. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
4. Flush with water or use compressed air to remove remaining foreign matter.
5. Verify that water and debris can drain from forms through clean-out ports.

F. Form-Coatings:

1. Before placing reinforcing steel and miscellaneous embedded items, coat contact surfaces of forms with an approved non-residual, low-VOC form-coating compound in accordance with manufacturer's published instructions.
2. Do not allow release agent to accumulate in forms or come into contact with reinforcement or concrete against which fresh concrete will be placed.

a. Coat steel forms with nonstaining, rust-preventative material.
b. Rust-stained formwork is not acceptable.

3. Remove form-coating and residue from reinforcement or surfaces not requiring form coating.

G. Before Placing Concrete:

1. Inspect and check completed formwork, shoring and bracing to ensure that work is in accordance with formwork requirements of this section and Contract Documents, and that supports, fastenings, wedges, ties, and parts are secure.

a. Make necessary corrections or adjustment to formwork to meet tolerance requirements.

2. Form joints in all exposed concrete surfaces shall be securely taped or sealed by other approved means to prevent leakage and loss of paste during placement of concrete.
3. Retighten forms and bracing before concrete placement to prevent mortar leaks and maintain proper alignment.
4. When formwork is complete and clean, notify Testing Agency 24 hrs prior to placing concrete for inspection of forms.

H. During Concrete Placement:

1. Maintain a check on formwork to ensure that forms, shoring, ties, and other parts of formwork have not been disturbed by concrete placement methods or equipment.

I. During Cold Weather:

1. Remove ice and snow from within forms.
2. Do not use deicing salts.
3. Do not use water to clean out completed forms, unless formwork and concrete construction proceed within heated enclosure.
4. Use compressed air or other means to remove foreign matter.

J. Camber Forms:

1. Camber forms for slabs and beams to achieve ACI 301 and ACI 117 tolerances, and as required to meet camber requirements of Contract Documents. When camber of a structural member is specified, adjust screed marks to compensate, such that scheduled depth of member is not reduced by lifting of forms.

K. Surface Defects:

1. Install forms substantially free of surface defects.

L. Footings:

1. Provide forms for footings if soil or other conditions are such that earth trench forms are unsuitable. When trench forms are used, provide additional concrete 1 in. on each side of the minimum design profiles and dimensions indicated.
2. Provide for minimum coverage of reinforcing steel as indicated on Structural Drawings.

M. For slabs-on-grade, secure edge forms in such a manner as to not move under weight of construction loads, construction and finishing equipment, or workers.

3.02 REMOVING FORMS

A. Do not remove forms, shores, or bracing until concrete has gained sufficient strength to carry its own weight, and construction and design loads which are liable to be imposed upon it.

1. Verify strength of concrete by compressive test results.

B. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F (10°C) for 24 hrs after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and providing curing and protection operations are maintained.

C. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than fourteen days or until concrete has attained at least 75% of design minimum compressive strength at twenty-eight days or in accordance with the Structural Drawings.

1. Provide backshores/reshores as required per ACI 347R.
2. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

D. Form-facing material may be removed four days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

E. Remove formwork progressively and in accordance with code requirements and using methods to prevent shock loads or unbalanced loads from being imposed on structure.

1. Comply with ACI 347R.

F. Loosen forms carefully.

1. Do not wedge pry bars, hammers, or tools against concrete surfaces.

G. Reshore structural members where required due to design requirements or construction requirements or construction conditions and as required to permit progressive construction.

1. Coordinate with design requirements.
2. Reshore on same day shoring and forms are removed.

3.03 REUSING FORMS

A. Before forms can be reused, surfaces that will be in contact with freshly poured concrete must be thoroughly clean, damaged areas repaired, and projecting nails withdrawn.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces.
2. Apply new form coating compound as specified for new formwork.

C. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints.

1. Align and secure joints to avoid offsets.

D. Forms for exposed concrete may be reused only if the surfaces have not absorbed moisture and have not splintered, warped, discolored, stained, rusted, or peeled, subject to the Commissioner's acceptance. The Commissioner reserves the right to require the Contractor to remove and reconstruct such formwork as will produce subsequent areas that are acceptable. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to the Commissioner.

3.04 FIELD QUALITY CONTROL

A. General: The Testing Agency shall inspect concrete formwork as Work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Commissioner for final acceptance.

B. Testing Agency shall provide qualified personnel at site to inspect formwork using the latest Drawings and approved shop drawings as follows:

1. Prior to placement of reinforcement, inspect formwork for grade, quality of material, absence of foreign matter, and other imperfections that might affect suitability of concrete placement and tolerances stated herein.
2. Inspect forms for location, configuration, compliance with specified tolerances, block outs, camber, shoring ties, seal of form joints, and compliance with Contract Documents.
3. Verify condition of bond surfaces, locations and sizes of all accessories, embedment items, and anchorage for prevention of displacement.
4. Verify proper use/application of form release agents.
5. Inspect form stripping for conformance with requirements of Section 03 30 00 Cast-in-Place Concrete.

C. Submit inspection, observation, and/or test reports to the Commissioner and provide an evaluation statement in each report stating whether or not concrete formwork conforms to the requirements of Specifications and Drawings. Specifically note deviations.

D. Report deficiencies to Contractor immediately.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of CONCRETE FORMWORK shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of CONCRETE FORMWORK shall be included in the Contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 03 00 00.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCEMENT AND EMBEDDED ASSEMBLIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The Section specifies requirements for furnishing all labor, materials, and equipment required for furnishing, fabricating, and placing reinforcement steel used in concrete slabs and structures, including bars, mesh, ties, supports, chairs, spacers, clips, and all other appurtenant work. All reinforcing bars, mesh and accessories to be galvanized where noted in the drawings.

B. Related Sections: The following sections contain requirements that relate to this Section.

1. Section 03 30 00 – Cast-in-Place Concrete.
2. Section 03 33 00 – Cast-in-Place Architectural Concrete.
3. Section 04 80 00 – Unit Masonry.

C. Definition of project terms and abbreviations are found within Specification Section 01 35 00.

1.03 REFERENCES

A. Except as modified herein, the work shall conform to the applicable portions of the Standard Specifications.

1. ASTM A36 – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Steel Piling.
2. ASTM A82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
3. ASTM A108 – Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
4. ASTM A184 – Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
5. ASTM A185 – Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

6. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
7. ASTM A496 – Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
8. ASTM A497 – Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
9. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
10. ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
11. ASTM A706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
12. ASTM A743 – Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion-Resistant, for General Application.
13. ASTM A775 – Specification for Epoxy-Coated Reinforcing Steel Bars.
14. ASTM A934 – Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
15. ASTM A884 – Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.
16. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
17. ASTM D994 – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
18. ASTM D1751 – Standard Specification for Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Type).
19. ASTM D1752 – Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
20. ASTM E376 – Practice for Measuring Coating Thickness by Magnetic-Field or Eddy- Current (Electromagnetic) Test Methods.
21. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
22. ASTM D3963 – Standard Specification for the Fabrication and Job Site Handling of Epoxy – Coated Reinforcing Steel Bars.
23. ASTM A994 – Standard Test Method for Comparing Bond Strength of Reinforcing Bar to Concrete Using Beam-End Specimens.
24. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.
25. ACI 301 – Standard Specification for Structural Concrete.
26. ACI 315 – Details and Detailing of Concrete Reinforcement.
27. ACI 318 – Building Code Requirements for Structural Concrete.
28. ACI SP-66 – ACI Detailing Manual.
29. CRSI Manual of Standard Practice.
30. CRSI – Placing Reinforcing Bars
31. AWS D1.1 – Structural Welding Code-Steel.
32. AWS D1.4 – Structural Welding Code - Reinforcing Steel.
33. AWS D12.1 – Recommended Practices for Welding Reinforcing Steel Metal Inserts, and Connections in Reinforced Concrete Construction.

B. American Railway Engineering and Maintenance-of-Way Association AREMA Manual (2012).

C. CTA Structural chapter of the Infrastructure Design Criteria Manual (IDCM), Revision 4, dates March 2013.

D. CRD - C 572 – Specification for Polyvinylchloride Waterstops.

E. Where reference is made to one of the above standards, the version in effect at the time of bid opening shall apply.

1.04 SUBMITTALS

A. Prior to performing the work, the Contractor shall submit to the Commissioner, in accordance with Specification 01 30 00 Submittals, a list of materials and product data for concrete reinforcement. Include all bars, mesh, and accessories.

B. Submit Shop Drawings for Approval: Shall include, but not be limited to:

1. All details, dimensions, and information required for fabrication and placement of concrete reinforcement in accordance with Contract Documents, prepared in accordance with ACI 315 recommendations.
2. Elevations, plans, sections, and dimensions of concrete work with required reinforcement clearances.
3. Ledges, brackets, openings, sleeves, embedment plates, inserts, shear connectors, electrical conduit, and items of other trades including interference with reinforcing materials.
4. Sizes, grade designations, spacing, locations, and quantities of wire fabric reinforcing steel, temperature and shrinkage reinforcement dowels.

    a. Do not use dimensions scaled from Contract Drawings to determine bar lengths.
    b. Hooks and bends not specifically dimensioned shall be detailed per ACI 318.

5. Bending and cutting schedules, assembly diagrams, splicing, and connection requirements, details, and laps.
6. Each type of supporting and spacing devices, including miscellaneous accessories.
7. Construction joint type, details, and locations.
8. Placement drawings of concrete accessories and embedded items, including fabrication details of items to be placed. Drawings shall consolidate the work of all trades and shall be coordinated by the Contractor.
9. Embedment and anchors for miscellaneous metals or anchorage for other trades shall be coordinated on the reinforcement shop drawings. Calculations signed and sealed by a licensed structural engineer from the Contractor's SSE shall be included with the submittal.
10. Reproduction of structural drawings is not permitted.

C. The Contractor shall submit certified copies from the supplier indicating the grade of steel being furnished, and reports on mill tests for chemical analysis, tensile strength, and bend tests for reinforcing bars and welded wire fabric. The Contractor shall certify, in writing, that material supplied meets or exceeds specified requirements.

Supplier of reinforcing to certify the grade of steel being supplied meets these requirements.

D. Provide reinforcing steel placing drawings for each portion of the work. Show all splice locations and lap lengths. Show the placement of all required additional reinforcement such as around openings, at corners, etc., as shown on the drawings or as otherwise required or recommended.

E. Provide specifications for epoxy coating of reinforcing, mesh, and accessories. Provide certified copies of test results for epoxy-coated reinforcing steel and accessories. The test reports shall indicate that the epoxy coating meets or exceeds ASTM A775. The certificates must be signed by the reinforcing fabricator or supplier and contain a detailed description of the material processed.

F. If applicable, provide manufacturer's data for synthetic reinforcing fibers. Identify all placements that are to contain synthetic reinforcing fibers. The amount of fibers per cubic yard to be used for each placement shall be noted.

G. Submit Welder Qualification for Record.

H. Submit Product Data for Approval: Shall be clearly marked to indicate all technical information which specifies full compliance with this section and Contract Documents, including published installation instructions ,and I.C.B.O. reports, where applicable, for products of each manufacturer specified in this Section.

I. Submit Hazardous Materials Notification for Record: In the event no product or material is available that does not contain asbestos, PCB, or other hazardous materials as determined by the Owner, a "Material Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

J. Submit Asbestos and PCB Certification for Record: After completion of installation, but prior to Substantial Completion, Contractor shall certify in writing that products and materials installed, and processes used, do not contain asbestos or polychlorinated biphenyl (PCB) using format in General Conditions.

K. Submit, for every epoxy bar or fabric delivery, an up-to-date copy of the epoxy coating fabrication plants CRSI Epoxy Coating Plant Certificate, that shows the plant is up to date and in good standing with the CRSI Epoxy Certification requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Store all reinforcing steel (epoxy coated and otherwise) on padded supports above ground, cover and keep it clean and dry.

1. Maintain surfaces (steel or epoxy coated) free from materials that may impair bond with concrete.
2. Protect against corrosion or deterioration of any kind.

B. Epoxy-Coated Reinforcing: Deliver, store, and handle epoxy coated reinforcing in a manner to protect the epoxy coating from damage and in accordance with accepted industry standards.

C. Reinforcing steel shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in legible manner with waterproof markings showing the same "mark" designations as those shown on the submitted Placing Drawings. Tags shall show bar size, bar length, and information to identify placement location.

D. Store epoxy-coated reinforcing off the ground to allow air circulation and to prevent the formation of wet storage stain.

E. Deliver and store welding electrodes in accordance with AWS D1.4.

F. Immediately remove from site materials not complying with Contract Documents or determined to be damaged.

1.06 QUALITY ASSURANCE

A. The work of this section shall be performed by a fabricator specializing in reinforcing steel fabrication of type for cast-in-place concrete work required for this Project, with a minimum of 10 years of documented successful experience, and have the facilities capable of meeting all requirements of Contract Documents.

1. Welders shall be qualified in accordance with AWS D1.1, within 12 months before starting the work.
2. Work shall be performed in compliance with Commissioner's insurance underwriters' requirements.

B. Manufacturers shall specialize in manufacturing the types of concrete accessories required for cast-in-place concrete work, with a minimum of 10 years of documented successful experience and shall have the facilities capable of meeting all requirements of Contract Documents as a single-source responsibility and warranty for each type of accessory.

C. Coordinate and schedule the following quality related items in a timely manner with the Testing Agency:

1. Verify reinforcing steel for quantity, size, location, and support.
2. Verify proper reinforcing steel concrete coverage.

D. Testing Agency: The Contractor shall submit a minimum of three names and qualifications of Testing Agency to the Commissioner for approval prior to start of Construction. All quality control, testing, and related submittals and reports within the Contract Documents (including field quality control and field testing) shall be the responsibility of the Testing Agency.

PART 2 - PRODUCTS

2.01 UNAUTHORIZED MATERIALS

A. Materials and products required for work of this Section shall not contain asbestos, polychlorinated biphenyl (PCB), or other hazardous materials identified by the Commissioner.

2.02 ACCEPTABLE MANUFACTURERS

A. Products of the manufacturers specified in this Section establish the minimum functional and quality standards required for work of this section.

B. Substitutions: Comply with General Conditions using form in Section 012500 Substitution Procedures

2.03 REINFORCING BARS, FABRIC, AND ACCESSORIES

A. Uncoated Reinforcing Steel:

1. Type: Deformed billet steel bars, ASTM A615, Grade 60.
2. Size: As indicated on the Structural Drawings.
3. Where indicated on the drawings, reinforcing steel shall be hot-dipped galvanized after fabrication in accordance with ASTM A767, Class II, with galvanizing material protected from embrittlement during galvanizing process in accordance with ASTM A143. Galvanized finish shall meet the bend and shear test requirements of ASTM A615

B. Uncoated Reinforcing Wire Fabric:

1. Type: Steel wire, plain finish, ASTM A82.
2. Type: Steel wire, deformed, ASTM A496.
3. Size: As indicated on the Structural Drawings.
4. Where indicated on drawings, reinforcing wire fabric shall be hot-dipped galvanized after fabrication in accordance with ASTM A767, Class II, with galvanizing material protected from embrittlement during galvanizing process in accordance with ASTM A143.
5. Plain Steel Welded Wire Fabric: ASTM A185.
6. Deformed Steel Welded Wire Fabric: ASTM A497.

C. Epoxy-Coated Reinforcing Steel and Welded Wire Fabric:

1. Meet the requirements of reinforcing steel and reinforcing wire fabric above.
2. Epoxy-Coated Reinforcing Steel: ASTM A775.

    a. Bend bars before epoxy coating is applied.
    b. Bend bars by cold forming only. Heated bending of bars is not permitted.
    c. Repair damaged epoxy coating in accordance with AST A775.
    d. Bars shall not be straightened or rebent.

3. Epoxy-Coated Wire Fabric: ASTM A884, Class A.
4. Coating material shall be any one of the epoxy resin powders which have been prequalified by the National Bureau of Standards and approved by the Authority.
5. The coating applicator shall furnish to the Authority at the time of shipment written certification that the coated reinforcement bars were cleaned, coated, and tested in accordance with the requirements of AASHTO M284.
6. Epoxy-coated reinforcement bars shall be tied with plastic or epoxy-coated annealed wires, 16 gauge or heavier. No. 9 tie down wires shall be epoxy coated.
7. Bar supports shall conform to the "Bar Support Specifications" contained in "Manual of Standard Practice" as published by the Concrete Reinforcing Steel Institute and shall be Class C, Plastic Protected Bar Supports. Precast concrete block bar supports shall be used underneath bottom bars in foundations.
8. Fabrication of reinforcement shall be in compliance with the CRSI Manual of Standard Practice and ACI 315 and ASTM A143, A384, and A385, except as specified herein. Bars shall be cold bent. Avoid fabrication techniques that could cause distortion or embrittlement of steel. Bend bars before epoxy coating is applied to avoid damage to the epoxy coating. Bars shall not be straightened or rebent.
9. Touch-up Epoxy Coating for Field Repairs:

    a. 3M Scotchkote Liquid Epoxy 413/215 and 413/215 Cold Weather Grade Patch Compounds.
    b. Valspar Greenbar Patch Kits.
    c. An approved equal.

2.04 ACCESSORIES

A. Tie Wire:

1. Type: Minimum 16 gauge annealed steel wire, ASTM A82.
2. Wire Bar Type: Comply with CRSI.

B. Splicing System:

1. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tying tightly with wire in accordance with requirements of ACI 318 for minimum lap of spliced bars.
2. For mechanical tension and compression splices of reinforcing steel where specifically detailed on drawings, use Cadweld (C-series) splice, Dayton BAR-GRIP, NMB splice sleeve or Erico Lenton splices installed in strict compliance with manufacturer's requirements.
3. For welded splices, comply with ACI 318.
4. Tensile splicers shall be capable of developing 125% of the reinforcing steel ASTM specified minimum yield strength.
5. Compression splicers shall be the mechanical type such that the compression stress is transmitted by end bearing held in concentric contact.

C. Supports for Uncoated Reinforcement:

1. Types: Bolsters, chairs, spacers, clips, chair bars, and other devices for properly placing, spacing, supporting, and fastening the reinforcement, hot-dip galvanized after fabrication, in accordance with ASTM A123, or epoxy coated to match supported reinforcement.
2. For Contact with Forms: Use types with not less than 3/32 in. of plastic between metal and concrete surface.

    a. Plastic tips shall extend not less than 1/2 in. on metal legs.

3. Individual and continuous slab bolsters and chairs shall be of type to suit various conditions encountered and must be capable of supporting 300 pound load without damage or permanent distortion.
4. Unless otherwise indicated on drawings, bottom reinforcing bars in footings shall be supported by precast concrete bricks or individual high chairs with welded sand plates on bottom.
5. For Slabs-on-Grade: Use supports with sand plates or horizontal runners where base material will not support chair legs.
6. Provide bar supports and other accessories in accordance with CRSI "Recommended Practice for Placing Reinforcing Bars," unless otherwise specified. Where used over moisture barriers in slab on grade, provide precast concrete supports (dobies) or other type supports having bearing sand plates to prevent damaging moisture barrier,
7. Provide support to hold reinforcing bars in proper position while concrete in being places.

D. Bar Supports and Accessories for Use with Epoxy-Coated Reinforcing:

1. In addition to the general requirements for bar supports, comply with the following for use with epoxy-coated reinforcing.
2. Wire Supports: Coated with dielectric material such as epoxy or plastic, compatible with concrete, for a distance at least 2 in. from the point of contact with the epoxy-coated reinforcing bars.
3. Precast Concrete Block Supports (Dobies): May be used for footing foundations and slabs-on-grade. Precast concrete blocks, if containing reinforcement, the metal reinforcement shall be coated with dielectric material such as epoxy, compatible with concrete.
4. Plastic Supports: All plastic assembly, dielectric, compatible with concrete.
5. Provide spreader bars, bar clips and spreaders, and other accessories coated with dielectric material such as epoxy compatible with concrete.

E. Deformed Bar Anchors:

1. Type: D6L A706 welded stud by Nelson Stud or approved equal.
2. Size and Grade: As indicated on Structural Drawings.

F. Adhesive Anchoring System for Reinforcing Dowels into Existing Concrete:

1. Acceptable products include, but are not limited to:

    a. HIT HY-200 injectable adhesive supplied by Hilti, Inc., Tulsa, Oklahoma.

b. Approved equal conforming to ACI 355.4 requirements.

2. Preferred anchor system is specified on the General Notes of the Contract Drawings. Contractor shall provide calculations by a licensed structural engineer in the State of Illinois (SSE) for alternate adhesive anchor system to demonstrate it is equal or better than the product specified on the drawings.

2.05 ANCHORAGE ACCESSORIES

A. General: Miscellaneous anchorage accessories for anchoring structural, architectural, electrical, and mechanical items to poured concrete shall include, but not be limited to, the following:

1. Concrete Anchors: Headed or bent studs or deformed anchors, ASTM A108/Grade 1015 through 1020, minimum yield strength of 50,000 psi, minimum tensile strength of 60,000 psi flux cored, conforming to AWS D1.1.
2. Anchor Bolts: ASTM A307, unless noted otherwise on drawings.
3. Threaded Inserts: Manufactured by Dayton/Richmond Screw Anchor Co., or approved equal.
4. Wedge Inserts: Peerless type manufactured by Dayton/Richmond Screw Anchor Co., or approved equal.
5. Chemical Anchorage System: Manufactured by Hilti Corp/Tulsa, Oklahoma or approved equal.
6. Expansion Bolts: Manufactured by Hilti Corp/Tulsa, Oklahoma or approved equal.
7. Inserts and Coil Rods: Yield strength 65,000 psi, ASTM B633, manufactured by Dayton Superior Corp/Miamisburg, Ohio or approved equal.
8. Welding Electrodes: AWS 5.5, Series E70.
9. Welded Deformed Bar Anchors: Welded by full-fusion process, as furnished by TRW Nelson Stud Welding Division or approved equal.

B. Chemical Bond Anchor Bolt:

1. Provide sizes and types of bolts as indicated on the drawings.
2. Construction Documents developed using the following embedded anchor systems:

a. HIT HY-200 injectable adhesive supplied by Hilti, Inc.
b. Approved equal conforming to ACI 355.4 requirements.

3. Alternate allowable embedded anchor systems. Systems listed require calculation submittal verifying that the anchor system meets or exceeds the HVA adhesive anchor system. Refer to the General Notes for additional information:

a. HVA adhesive anchor supplied by Hilti, Inc.
b. Preferred anchor system is specified on the General Notes of the Contract Drawings. Contractor shall provide calculations by a licensed structural engineer in the State of Illinois (SSE) for alternate adhesive anchor system to demonstrate it is equal or better than the product specified on the drawings.

C. Types and Sizes: Each type of anchor shall be manufactured of structural quality steel, designed for cast-in-place concrete applications and be of sizes to suit Project conditions and requirements, complete with washers, nuts, plates, and miscellaneous accessories required to meet Contract Document requirements.

D. Dovetail Anchor Slots:

1. Acceptable products include but are not limited to, formed 22 gauge galvanized steel manufactured by Heckmann Building Products/Chicago, Illinois or Hohmann and Barnard/Hauppauge, New York.
2. Location of Use: Continuous installation of anchor slots, full height of masonry walls, where masonry walls abut poured concrete walls.
3. Fill slot with temporary filler or cover face opening to prevent intrusion of concrete or debris.
4. Finish: Hot-dip galvanized or zinc-plated steel for adhesive or expansion post-installed anchors.
5. Stainless steel anchors are acceptable for adhesive or expansion post-installed anchors.

2.06 JOINT FILLERS

A. Permanent Compressible Joint Filler:

1. Type: Sonneborn/Minneapolis, Minnesota "SONOFLEX F" polyethylene closed-cell expansion joint filler, ultraviolet stable, extremely-low-moisture absorption, nonimpregnated, nonstaining and nonbleeding, inert and compatible with cold-applied sealants.
2. Location of Use: Slabs and curbs as indicated on drawings or required.
3. Thickness: As indicated on drawings or required.
4. Other Acceptable Brands include, but are not limited to:

    a. Ceramar Flexible Foam Expansion Joint Filler" by W.R. Meadows/Elgin, Illinois.

B. Temporary Compressible Joint Filler:

1. Type: White molded polystyrene beadboard.
2. Location of Use:

    a. In slabs, curbs, and walls which must be removed prior to joint sealant installation.
    b. Vertically to isolate walls from columns or other walls.

C. Asphalt-Impregnated Joint Filler:

1. Acceptable products include but are not limited to: W.R. Meadows/Elgin, Illinois "SEALTIGHT" Asphalt Expansion Joint Filler, preformed, ASTM D994.
2. Thickness: As indicated on drawings or required.
3. Location of Use: Sidewalks at foundation walls and as indicated on drawings or required.

D. Earth Dams:

1. Acceptable products include but are not limited to: W.R. Meadows/Elgin, Illinois "SEALTIGHT" Premolded Membrane - #740.

E. Construction Joints:

1. Roughen surfaces to amplitude of 1/4 in. and conforming to Surface Preparation 10 (CSP10) by the International Concrete Repair Institute (ICRI) Guideline No. 03732. See structural drawings for construction joint details.

2.07 WATERSTOPS

A. Preformed Bentonite Waterproofing Strips:

1. Acceptable products include but are not limited to: "WATERSTOP-RX" especially formulated for concrete cold joints at footings, walls, or slabs and manufactured by American Colloid Company/Arlington Heights, Illinois.
2. Size: 3/4 in. by 3/8 in. strips, 25 ft long, and weighing at least 0.165 lbs/ft.
3. Location of Use: Concrete cold joints at footings, walls, and slab joints.

B. Preformed Bituminous Plastic Gaskets:

1. Acceptable products include but are not limited to: "SYNKO-FLEX J-1078" free of asbestos and PCB, nonoxidizing, nonevaporating, chemically-resistant characteristics, free of solvents, irritating fumes, and obnoxious odors, with high adhesive and cohesive properties, manufactured by Synko-Flex Products Inc./Houston, Texas.

C. Polyvinyl Chloride Waterstops:

1. Type: CRD C 572.

D. Flexible Rubber Waterstop: CECRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory-fabricated corners, intersections, and directional changes.

1. Acceptable manufacturers include, but are not limited to:

a. Greenstreak.
b. Williams Products, Inc.

2. Profile: Flat, dumbbell with center bulb unless shown otherwise.
3. Dimensions: 6 in. by 3/8 in. thick unless shown otherwise.

2.08 FABRICATION

A. Reinforcing Steel Fabrication:

1. Fabricate in accordance with approved shop drawings, ACI 315 and Contract Documents.
2. Bending and Straightening: Except for #3 dowel bars as approved by the Commissioner, will not be permitted after partial embedment in concrete.
3. Heating of Reinforcement: Will be permitted only with specific prior approval of the Commissioner.
4. Welding: Comply with ANSI/AWS D1.4; use E9018 electrodes or approved electrodes.
5. Tolerances: Comply with ACI 117.
6. Unacceptable Materials: Reinforcement with any of following defects will not be permitted in Work.

    a. Bar lengths, depths, and bends exceeding ACI fabrication tolerances.
    b. Bends or kinks not indicated on drawings or final shop drawings.
    c. Bars with reduced cross-section due to excessive rusting or other cause.

B. Welded Wire Fabric:

1. Type: As fabricated in accordance with CRSI, unless otherwise noted.

C. Templates:

1. Required for all footing and column dowels, and where required for proper alignment of reinforcing.

D. Assemblies:

1. Fabricate and assemble structural steel items in shop in conformance with AISC and AWS D1.1. Shearing, flame cutting, and chipping shall be done carefully and accurately. Cut, drill, or punch holes at right angles to the surface of the metal. Do not make or enlarge holes by burning. Holes shall be clean-cut without torn or ragged edges.
2. Welding of deformed bar anchors and headed stud anchors shall be installed by full-fusion process equivalent to Nelson Stud Welding Division or demonstrated equal process. See Section 051030/Structural Steel.
3. Welding of reinforcement shall be done in strict accordance with AWS requirements. Do not weld reinforcing bars larger than No. 9. Welding shall be performed subject to the observance and testing by the Testing Agency.
4. Coatings where required, shall be applied after fabrication and prior to casting concrete.
5. Welding of crossing bars (tack welding) for assembly of reinforcement is not permitted.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the areas to receive the Work and the conditions under which the work will be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

B. Surface condition, bending, spacing, and tolerances of placement of reinforcement shall comply with the CRSI Manual of Standard Practice and ACI 301. The Contractor shall be solely responsible for providing an adequate number of bars and maintaining the spacing and clearances shown on the Drawings.

C. Comply with applicable portions of Section 420.09 and 420.10 of Standard Specifications for Road and Bridge Construction, Illinois Department of Transportation, adopted Jan. 1, 2007.

D. Prior to placing reinforcement, all grease, dirt, mortar, and other foreign substances shall be removed from all surfaces of reinforcing.

3.02 PLACING REINFORCING BARS

A. General: Install and place reinforcing in accordance with approved reinforcing placement shop drawings, ACI 318, Contract Documents, and in accordance with "Manual of Standard Practice" as published by the Concrete Reinforcing Steel Institute.

B. Accurately position, support, and secure reinforcement in a manner to prevent displacement before and during placement of concrete.

1. Place reinforcing bars within tolerances specified in ACI 117, unless more stringent on the drawings.
2. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, hangers. and other accessories for fastening reinforcing bars and welded wire fabric in place.
3. Before placing concrete, clean reinforcement of foreign particles and coatings.

C. If bars are displaced beyond specified tolerance when relocating the bars to avoid interference with other reinforcement or embedded items, notify the Commissioner for approval prior to concrete placement.

D. Avoid cutting or puncturing vapor retarder/barrier during reinforcement placement.

1. Notify the Commissioner and repair damages before placing concrete.

E. Unless indicated otherwise on the drawings, all reinforcing bars shall have at least 2 in. of protective concrete cover.

1. Maintain the following surface clearance dimensions plus 1/4 in.:

a. Concrete cast against and permanently exposed to earth, 3 in.
b. Slabs-on-grade, 2 in.
c. Concrete surfaces in contact with water or exposed to weather, 2 in.
d. Concrete not exposed to earth, water, or weather: 1 in. for slabs, 1-1/2 in. for beams and columns.

F. Reinforcing bars shall extend 12 bar diameters but not less than 12 in. beyond bend unless noted otherwise.

G. Support and secure reinforcing with accessories and epoxy-coated tie wire to prevent displacement before and during concreting. Concrete shall not be poured if bars are not properly and securely placed with adequate supports. Reinforcing is not permitted to be "floated into position."

H. Reinforcement bars shall be supported, as specified herein, and their distances from faces of forms shall be maintained by means of approved blocks or epoxy-coated ties, hangers, or other supports.

I. Ties: Bars should be securely tied to prevent displacement during concreting operation with epoxy-coated tie wire, as required. After cutting, turn tie wires to the inside of section and bend so that concrete placement will not force ends to be exposed at face of concrete.

J. All bar bends and hooks shall be in accordance with ACI 318 unless indicated otherwise on the drawings.

K. No reinforcing steel bars shall be welded after being epoxy coated.

L. No reinforcing steel bars shall be welded unless specifically shown on the drawings, specified herein, or unless approved in writing by the Authority. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work. When welding of reinforcement is approved or called for, it shall comply with AWS D1.4.

M. Reinforcing steel interfering with the location of other reinforcing steel, conduits, or embedded items may be moved within the specified tolerances or 1 bar diameter, whichever is greater. Greater displacement of bars to avoid interference shall only be made with the approval of the Authority. Do not cut reinforcement to install inserts, conduits, mechanical openings, or other items without the prior approval of the Authority.

N. Reinforcing steel bars shall not be field bent except where specifically authorized in writing by the Authority. If authorized, bars shall be cold-bent around the standard-diameter spool specified in the CRSI. Attempt to bend without damaging the epoxy coating. Do not heat bars. Closely inspect the epoxy coating and reinforcing steel for breaks. If the epoxy coating or reinforcing steel is damaged, replace. Upon approval of the Authority, coated reinforcing steel bars that are field bent may have the damage to the epoxy coating repaired in accordance with the applicable ASTM Standard. Do not bend reinforcement after it is embedded in concrete unless specifically shown otherwise on the drawings.

O. When coated reinforcing steel bars are cut in the field, the ends of the bars shall be coated with the same material used for repair of coating damage.

P. Placement of Wire Fabric:

1. Install in lengths as long as practicable.
2. Support in position during placement of concrete.
3. Overlap the wire fabric 6 in. or panel widths + 2 in., whichever is larger.

    a. Securely tie together with wire.

4. Offset laps of adjoining widths to prevent continuous laps in either direction.
5. Locate wire fabric in the top third of slabs, unless noted otherwise on Structural Drawings.

Q. At Construction Joints:

1. Reinforcing bars and wire fabric shall be continuous through construction joints, unless otherwise indicated on drawings.

R. At Expansion Joints:

1. Reinforcing bars and wire fabric shall NOT be continuous through expansion joints, unless otherwise indicated on drawings.

S. Splicing:

1. Comply with requirements specified in this section under "Splicing System".
2. Do not splice reinforcement except as indicated on Structural Drawings.
3. Tension couplers may be used and installed per manufacturer's specifications where indicated on drawings.

T. Dowels in Existing Concrete:

1. Install dowels and dowel adhesive in accordance with supplier's recommendations.
2. Minimum embedment length shall be 12 bar diameters, unless noted otherwise.

3.03 REINFORCEMENT AROUND OPENINGS

A. Unless specific additional reinforcement around openings is shown on the drawings, provide additional reinforcing steel on each side of the opening equivalent to one-half of the cross-sectional area of the reinforcing steel interrupted by an opening. The bars shall have sufficient length to develop bond at each end beyond the opening or penetration.

3.04 ACCESSORIES

A. Determine, provide, and install epoxy-coated accessories such as chairs, chair bars, and the like in sufficient quantities and strength to adequately support the

reinforcement and prevent its displacement during the erection of the reinforcement and the placement of concrete.

B. Use precast concrete blocks (dobies) where the reinforcing steel is to be supported over soil.

C. Stainless steel bar supports or epoxy-coated steel chairs with stainless steel tips shall be used where the chairs are set on forms for a concrete surface that will be exposed to weather or water. Use of galvanized or plastic tipped metal chairs is permissible in all other locations unless otherwise noted on the drawings or specified herein.

D. Install concrete accessories in accordance with manufacturer's published instructions and Contract Documents.

1. Inspect locations to receive concrete accessories.
2. Immediately report to the Commissioner in writing of conditions that will adversely affect the Work or fails to meet Contract Document requirements.
3. Do not place concrete until reinforcement, accessories, and other built-in items have been inspected and accepted by the Testing Agency.

E. Construction and Control Joints:

1. Construction and control joints indicated on drawings are mandatory and must not be omitted.

    a. Provide construction joints in accordance with ACI 318.
    b. Roughen surfaces to amplitude of 1/4 in. and conforming to CRSI Surface Preparation 10 (CSP10) by the International Concrete Repair Institute (ICRI) Guideline No. 03732. See Structural Drawings for construction joint details.

2. Provide waterstops in construction joints as indicated.
3. Install waterstops to form continuous diaphragm in each joint.
4. Support and protect exposed waterstops during progress of Work.
5. Field-fabricate joints in waterstops according to manufacturer’s printed instructions.

F. Coordinate the installation of pipes, bolts, hangers, anchors, flashing, and other embedded items with the work of other trades.

3.05 SPLICES

A. Bar Splices: Bar splices shall be permitted only where shown on the drawings. Should the Contractor desire to splice bars at locations other those shown on the drawings, written permission must be obtained from the Authority. Such splices shall be distributed or located at points of low tensile stress. Splices shall not be permitted unless a minimum of 2 in. can be provided between the spliced bar and the nearest adjacent bar. All splices for bars shall be made by use of a mechanical connector or by placing the bars in contact and wiring them together for the length of the splice.

B. Lap Splices: All spliced bars shall have a minimum lap splice length as indicated on the drawings or longer as otherwise required by ACI standards or codes; ACI Standard Class B for Top/Bottom Bars. Where bars of different sizes lap, provide lap splice length for larger bar.

C. Provide standard reinforcement splices by lapping ends, placing bars in contact, and wiring tightly together.

D. Where dowels are indicated but not sized, provide dowels that match size and location of main reinforcement and lap splice with the main reinforcement.

E. Welded wire fabric shall be lapped at least 8 in., or one wire space, whichever is greater, at ends and edges as well as wired together.

3.06 INSPECTION

A. In no case shall any reinforcing steel be covered with concrete until the installation of the reinforcement, including the size, spacing, and position of the reinforcement has been observed by the Authority and the Authority's release to proceed with the concreting has been obtained. The Authority shall be given ample prior notice of the readiness of placed reinforcement for observation. The forms shall be kept open until the Authority has finished observations of the reinforcing steel.

1. If the reinforcement is not placed according to the tolerances noted herein, the Authority shall require the Contractor to reposition the reinforcing.
2. All concrete placed in violation of this provision shall be rejected; removed and corrective work shall be at no cost to the Authority.

B. General: The Testing Agency shall test and inspect concrete reinforcement and embedded assemblies as Work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate Architect/Engineer for final acceptance.

C. Testing Agency shall provide qualified personnel at site to inspect reinforcement and embeds using the latest drawings and reviewed shop drawings, as follows:

1. Prior to placement, inspect reinforcement and embeds for grade, quality of material, absence of foreign matter, and for suitable storage.
2. Provide continuous inspection of reinforcement and embedded assemblies during placement and immediately prior to concreting operations for size, quantity, vertical and horizontal spacing and location, correctness of bends and splices, clearances, compliance with specified tolerances, security of supports and ties, and absence of foreign matter.
3. Inspect epoxy-coated reinforcement for coating damage and required applied coatings.

D. Testing Agency shall submit inspection, observation, and/or test reports to the Architect/Engineer as required herein and shall provide an evaluation statement in each report stating whether or not concrete placement conforms to requirements of Specifications and Drawings and shall specifically note deviations therefrom.

E. Report deficiencies to Contractor immediately.

3.07 REPAIR OF REINFORCING

A. General: Repair or remove and replace damaged epoxy-coated reinforcing, as approved by the Authority.

B. Repair of Epoxy Coating: Repair damage to epoxy coating and apply epoxy coating to the cut ends. Clean the surfaces and apply epoxy repair coating in accordance with coating manufacturer's recommendations. Coat damaged areas larger than 0.1 sq in. Coat the cut ends, welds, and mechanical splice devices regardless of the dimensions or area of the affected surface. When damage to epoxy coating exceeds a maximum 2% of the bar surface, including repaired and unrepaired area, but not including repair coated cut ends or welds and mechanical splice devices, the bar shall be considered defective and replaced in lieu of repairing the epoxy coating.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of CONCRETE REINFORCEMENT AND EMBEDDED ASSEMBLIES shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of CONCRETE REINFORCEMENT AND EMBEDDED ASSEMBLIES shall be included in the Contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1, "Terms and Conditions for Construction", Book 2, "Instructions and Execution Documents", Additional Special Conditions, and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes cast-in-place concrete for all concrete components (including, but not limited to, foundations, platform slabs, sidewalks, etc.) for the new Damen Green Line CTA Station. Structural members include, but not limited to, this scope are listed below:

1. Pile Caps.
2. Transfer Beams and Supports.
3. Spread Footings.
4. Continuous Footings.
5. Subgrade Walls.
6. Above-Grade Walls.
7. Shear Walls.
8. Columns, Piers, and Pilasters.
9. Slab-on-Grade and Curbs.
10. Formed and Supported Concrete Slabs.
11. Nonstructural Cover Concrete.
12. Other concrete elements indicated in the drawings.

B. This section also includes provisions for 03 33 00 Architectural Concrete (ACON), and 03 41 00 Precast Concrete Platform. For construction of these concrete items, the Contractor shall follow this Specification in addition to the provisions listed for ACON and Precast.

C. Furnish all sampling and testing as required for qualification of proposed materials and establishment of design mixes and performing field testing of all concrete by a qualified testing laboratory acceptable to the Commissioner and engaged by and at the expense of the Contractor.

D. Related Sections: The following sections contain requirements that relate to this Section.

1. Section 03 10 00 – Concrete Formwork.
2. Section 03 20 00 – Concrete Reinforcement and Embedded Assemblies.

3. Section 03 33 00 – Cast-In-Place Architectural Concrete (ACON).
4. Section 03 41 00 – Precast Concrete Platform.
5. Section 07 90 00 – Joint Sealers.
6. Section 31 20 00 – Earthwork.

E. Definitions:

1. Definition of project terms and abbreviations are found within Specification Section 01 35 00.
2. Architectural Concrete (ACON): Refer to Specification Section 03 30 00 for information specific to this type of concrete, in addition to all of the requirements listed herein.
3. Corrosive Environment: For the purpose of this specification section, "Corrosive Environment" is defined as all concrete exposed to the atmosphere or ground.
4. Normal-Weight Concrete: Design the mix to produce the strength indicated on the drawings with a dry weight of 145 lbs/ft^3 (+/- 3 lbs.) after twenty-eight days.
5. Lightweight Concrete: Design the mix to produce the strength and modulus of elasticity as indicated, with a split-cylinder strength factor (Fsp) of not less than 5.5 and a dry weight of 115 +/- 3 lbs/ft^3 after twenty-eight days.
6. Supplementary Cementitious Materials (SCM): One or more of the following: blended hydraulic cement, fly ash and other pozzolans, slag cement, and silica fume; subject to compliance with requirements.
7. Mass Concrete: A placement of structural concrete with a minimum dimension equal to or greater than 3 ft including but not limited to pile caps, other foundation elements, and shear walls.

1.03 REFERENCES

A. Comply with provisions of the following codes, specifications, and standards herein, except where more-stringent requirements are shown or specified. Where reference is made to one of the standards below, the revision in effect at the time of bid opening shall apply.

B. Acronyms for reference standards are defined in Section 01 42 00.1.

C. AASHTO M171 – Sheet Materials for Curing Concrete.

D. AASHTO T161 – Standard Method of Test for Resistance of Concrete to Rapid Freezing and Thawing.

E. AASHTO T237 – Testing Epoxy Resin Adhesive.

F. AASHTO T277 – Standard Method of Test for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.

G. AASHTO T260 – Test for Sampling and Testing for Total Chloride Ion in Concrete and Concrete Raw Materials.

H. AASHTO TP23 – Proposed Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying.

I. AREMA – American Railway Engineering and Maintenance-of-Way Association Manual (2012).

J. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.

K. ASTM C33 – Standard Specification for Concrete Aggregates.

J. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

K. ASTM C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

L. ASTM C94 – Standard Specification for Ready-Mixed Concrete.

M. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete.

N. ASTM C150 – Standard Specification for Portland Cement.

O. ASTM C156 – Standard Test Method for Water Retention by Concrete Curing Materials.

P. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.

Q. ASTM C172 – Practice for Sampling Freshly Mixed Concrete.

R. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

S. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

T. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

U. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

V. ASTM C403 – Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.

W. ASTM C469 – Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.

X. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.

Y. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

Z. ASTM C666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

AA. ASTM C979 – Color Pigment for Concrete.

BB. ASTM C1064 – Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

CC. ASTM C1202 – Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.

DD. ASTM C1260 – Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).

EE. ASTM C1293 – Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction.

FF. ASTM C1567 – Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).

GG. ASTM C 138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.

HH. ASTM C672 – Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.

II. ASTM C192 – Standard Method of Making and Curing Concrete Test Specimens in the Laboratory.

JJ. ASTM C595 – Standard Specification for Blended Hydraulic Cement.

KK. ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

LL. ASTM C939 – Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).

MM. ASTM C989 – Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortar.

NN. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).

OO. ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

PP. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.

QQ. ASTM D648 – Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

RR. ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastics.

SS. ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

TT. ACI 117, Standard Tolerances for Concrete Construction and Materials.

UU. ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

VV. ACI 301, Specifications for Structural Concrete for Buildings.

WW. ACI 304, Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

XX. ACI 305, Hot Weather Concreting.

YY. ACI 306, Cold Weather Concreting.

ZZ. ACI 308, Standard Practice for Curing Concrete.

AAA. ACI 308, Standard Practice for Curing Concrete.

BBB. ACI 309, Standard Practice for Consolidation of Concrete.

CCC. ACI 318, Building Code Requirements for Reinforced Concrete.

DDD. ACI 347, Recommended Practice for Concrete Formwork.

EEE. ACI 360 – Design of Slabs on Grade.

FFF. CTA (Chicago Transit Authority) Infrastructure Design Criteria Manual (IDCM), Structural Chapter, Revision 4, dated March 2013.

GGG. CRSI (Concrete Reinforcing Steel Institute) Manual of Standard Practice.

HHH. CRSI Placing Reinforcing Bars.

III. CoE (Corps of Engineers) CRD-C 611 – Corps of Engineers Method for Flow of Grout Mixtures (Flow Cone Method).

JJJ. CoE CRD-C 621 – Corps of Engineers Specification for Non-shrink Grout.

KKK. IDOT (Illinois Department of Transportation) Standard Specification for Road and Bridge Construction.

LLL. Contractor shall keep available on the site the above codes and standards for reference at all times.

MMM. Any and all applicable OSHA requirements.

1.04 QUALITY ASSURANCE

A. The concrete placement within this section shall be performed by a company which specializes in the type of concrete work required for this Project, with a minimum of 10 years of documented successful experience and shall be performed by skilled workmen thoroughly experienced in the necessary crafts.

1. Work shall be performed in compliance with Owner's insurance underwriters' requirements.

B. Pre-Concrete Conference

1. At least thirty days prior to submittal of the concrete design mixes, the Contractor shall hold a meeting to review the detailed requirements for preparing the concrete design mixes and to determine the procedures for producing proper concrete construction. The Contractor shall require responsible representatives of every party who is concerned with the concrete work to attend the conference, including, but not limited to, the following:

a. Contractor’s Quality Control Manager.
b. Manufacturer responsible for the concrete design mix.
c. Commissioner’s Agency responsible for field quality control.
d. Concrete Subcontractor.
e. Ready-mix concrete producer.
f. Admixture manufacturer(s).
g. Concrete pumping equipment manufacturer.

2. The agenda of the meeting shall be prepared by the Contractor and shall include, but not be limited to, the following:

a. Review of concrete mix designs.
b. Concrete placing sequence and schedule.
c. Formwork, shoring, reshoring, and stripping procedures.
d. Surveys of embedded structural steel columns.
e. Placing, jointing, and finishing procedures.
f. Mass concrete, cold-weather and hot-weather concreting procedures.
g. Construction of control and isolation joints, joint-filler strips, and semi-rigid joint fillers.
h. Construction of pour strips.
i. Vapor-retarder installation.
j. Anchor rod, anchorage device, and embedment installation and tolerances.
k. Steel reinforcement installation.
l. Installing sleeves furnished by other trades and penetration coordination drawings.
m. Curing and protection procedures.
n. Slab flatness and levelness criteria and measurement.
o. Coordination with architectural concrete requirements and polished concrete finishes. (See Section 03 33 00.)
p. Review and approval of architectural and polished concrete mockups.
q. Review of independent special inspection and testing and inspecting agency procedures for field quality assurance.

3. At least two days prior to the first pour of each type of concrete mix design, the Commissioner shall hold a meeting to review the detailed requirements of the particular concrete placement.

C. Proposed Schedule of Concrete Placement. Contractor shall keep a permanent log of the dates and times of concrete placement and where on the project the concrete was cast. This log shall be made available to the Commissioner, Architect, and SER for inspection, upon request

D. Materials and installed work may require testing and retesting at any time during progress of work, as directed by the Commissioner. Tests, including retesting of rejected materials for installed work, will be done at Contractor's expense.

E. The concrete mix designs shall be produced by a company with a minimum of 10 years of documented successful experience on projects worth $20,000,000 dollars or more. The concrete mix design manufacturer shall submit for record at least 10 projects where they supplied more than 1 million cubic yards of concrete. In addition, the concrete mix design manufacturer shall have a representative to the project that is a registered design professional, licensed as a Structural Engineer in the State of Illinois with a minimum of 10 years of experience in concrete design.

F. Reinforced concrete shall comply with the latest ACI codes: ACI 301, Specification for Structural Concrete; ACI 304, Guide for Measuring, Mixing, Transporting, and Placing Concrete; ACI 311, ACI Concrete Inspection Manual; ACI 315, ACI Detailing Manual; ACI 318, Building Code and Commentary; and ACI 347, Guide to Formwork for Concrete. The most stringent requirement of the codes, standards, building codes, and this Section shall apply when conflicts exist.

G. Proportion mixes by laboratory trial batch or field experience methods, using materials to be employed on the job for each type of concrete required, in compliance with ACI 318 (Chapter 4). In addition, documentation shall be provided demonstrating that the proposed concrete proportions will produce an average compressive strength at least 15% higher than the herein specified minimum compressive strengths.

H. Testing Agency: The Contractor shall submit a minimum of (3) three names and qualifications of Testing Agency to the Commissioner for approval prior to start of Construction. All quality control, testing, and related submittals and reports within the Contract Documents (including field quality control and field testing) shall be the responsibility of the Testing Agency. Provide quality assurance according to Section 1020 of the IDOT Standard Specifications.

I. See also Section 01 48 80 Testing and Inspection Service.

J. Mass Concrete Thermal Control Plans: The Contractor shall employ an independent consultant, acceptable to the Commissioner, to develop the thermal control plans for all mass concrete placements on the project

1.05 SUBMITTALS

A. Submit the following according to Conditions of the Construction Contract and Division 1 Specification Sections.

B. Mix Design: Six weeks before placing concrete, submit mix designs and specification submittal form for each type and strength of concrete required for this Project.

1. If mix designs are not already preapproved by the Commissioner, the mix designs shall be prepared or reviewed by an approved Testing Agency retained by the Contractor in accordance with requirements of ACI 301 and ACI 318, signed by a registered professional engineer in the State of Illinois, carefully coordinated with design requirements and Contract Documents.
2. Submit complete mix design data for each separate mix to be used on the Project in a single submittal to Commissioner.
3. Data shall be from the same production facility that will be used for this Project.

C. Mix Design Data: To include, but not be limited to, the following:

1. Design Compressive Strength: As indicated on the drawings.
2. Proportions: ACI 301 and ACI 318.
3. Gradation and quality of each type of ingredient including fresh unit weight, aggregates sieve analysis.
4. Water/cement ratio.
5. Class of fly ash, if approved by Commissioner.
6. Slump: ASTM C143.
7. Certification and test results of the total water-soluble chloride ion content of the design mix – AASHTO T260.
8. Air content of freshly mixed concrete by the pressure method, ASTM C231, or the volumetric method, ASTM C173.
9. Unit Weight of Concrete: ASTM C138.
10. Freeze-Thaw Durability Test: Between 4.5% and 7.5% air content, 90% minimum durability factor after 300 cycles per AASHTO T161 or ASTM C666.
11. Permeability: Less than 2,000 coulombs at fifty-six days per AASHTO T277 or ASTM C1202.
12. Shrinkage: Refer to CIP concrete within Specification Section 03 33 00.
13. Scaling: Refer to CIP concrete within Specification Section 03 33 00.
14. Modulus of Elasticity: Measured and submitted per ASTM C469. Shall be greater than 3,800 ksi.
15. Strength at Seven and Twenty-Eight Days: ASTM C39.

    a. Document strength based on basis of previous field experience or trial mixtures per ACI 301. Proportioning by Water-Cement Ratio is not permitted.
    b. Submit strength test records, mix design materials, conditions, and proportions for concrete used for record of tests, standard deviation calculation, and determination of required average compressive strength.

16. For mass concrete, also submit compressive strength at fifty-six days in accordance with Item 10 above.
17. Manufacturer's brand name and type of admixtures, if approved by the Commissioner.
18. Locations on the Project where each type and strength of concrete is to be used, including a key plan, if requested.
19. All information indicating compliance with Contract Documents, including method of placement and method of curing.
20. Shrinkage tests shall be made in the field to verify the specified shrinkage limit.

a. One set of shrinkage tests shall be made from every 10,000 sq ft of floor slab area.

21. Certify that each admixture is compatible with others used.
22. Certification of Nonreactivity of Aggregates: Include supplier's certificate demonstrating that aggregate is nonreactive in the presence of alkalis in accordance with ASTM C1260 or ASTM C1293.

D. Mass-Concrete Submittals:

1. Mass-concrete provisions shall apply to all concrete that is equal to or greater than 3 ft in its least dimension.
2. Thermal Control Plan: The Contractor shall submit to the Commissioner (along with each mix design) a plan for complying with the specified temperature restrictions. The plan shall include:

a. Complete descriptions of the concrete, curing blankets, integral cooling (if used), anticipated ambient conditions, methods for precooling the concrete, and placement measures to be used.
b. Heat of hydration analysis for the proposed concrete using adiabatic or semi-adiabatic heat signature (AHS) tests on 6 in. x 12 in. concrete cylinders or large (4 x 4 x 4 ft) heavily insulated blocks).
c. Simulation studies indicating the rate and extent of concrete temperature, maturity and strength developed under the anticipated weather conditions, mix design, placing procedures, placing temperature, and curing methods to be used. A description of the software and hardware the Contractor proposes to use for the simulation studies shall be submitted for review by the Commissioner prior to submission of the thermal control plan.
d. Anticipated temperatures at the specified monitoring locations. Submit computations for the batch temperature, including the assumed temperature increase due to mixing, delivery, and placement, and the measured temperatures of the aggregate, water, cement, and pozzolans. The quantity of ice to be batched as mix water shall be listed.
e. Submit a report and plot the laboratory-measured initial and final set of the mass-concrete mix in accordance with ASTM C403.
f. Description and manufacturer product sheets for thermocouples and data-loggers proposed for use to monitor temperatures in the mass concrete placements.
g. Furnish continuous mass-concrete temperature records, including at least 72 hrs of data after the removal of thermal protection.
h. Submit a sketch of the proposed placement sequence, limits, and volumes. Include location and number of thermal couples coordinated with all other reinforcement and embedded items.

E. Qualifications of an independent mass concrete thermal plan development consultant showing 5 years of experience with this type of concrete installation and a list of recent project examples and references

F. Product Data: Shall be clearly marked to indicate all technical information which specifies full compliance with this section and Contract Documents, including

published application instructions, product characteristics, compatibility, and limitations for each of the following:

1. Each type of admixture.
2. Bonding agent.
3. Curing compound and floor hardener. Furnish a written statement guaranteeing that the compound will not leave discoloration on concrete to be left exposed or affect the bond for paint or other applied finishes. Include provision in written statement that in the event of failure of applied finishes to bond to membrane cured concrete, to remove the curing compound and leave suitable surfaces for bonding such finishes.
4. Absorptive covers and moisture-retaining covers.
5. Self-leveling concrete topping.
6. Concrete Joint Location Schedule: Include plans and schedule indicating locations and details of construction joints, waterstops, sleeves, embedments, etc.
7. Forming materials and accessories.
8. Form release agents.
9. Patching compounds.
10. Bonding agents.
11. Joint systems.
12. Curing compounds.
13. Others as requested.

G. Survey of As-Built Conditions: Survey and report levelness, flatness, and final elevations of finished floors. Include testing of one half the gross area for each floor, with tested bays selected at regular spacing. At the tested bays, provide top of concrete elevation survey at 2 ft grids each way.

H. Structural Repairs: Material type and procedures.

I. Patching Defective Concrete Finishes: Approved product patching material.

J. Certificate from concrete supplier that the materials delivered and used at the Project meet applicable ASTM Standards.

K. Hazardous Materials Notification: In the event no product or material is available that does not contain asbestos, PCB, or other hazardous materials as determined by the Owner, a "Material Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

L. Asbestos and PCB Certification: After completion of installation, but prior to Substantial Completion, Contractor shall certify in writing that products and materials installed, and processes used, do not contain asbestos or polychlorinated biphenyls (PCB), using format in General Conditions.

M. Provide material certificates in lieu of material laboratory test reports, when permitted. Certificates shall be signed by the manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements.

N. Provide delivery tickets for all ready-mixed concrete.

O. Provide product data, specifications, installation instructions, installation recommendations, samples, and other information for the following, if applicable for this project:

1. Adhesive for reinforcing dowels.
2. Joint filler and isolation joint materials.
3. Vapor retarder.
4. Concrete sealer.
5. Slip resistant polymer overlay for floor slab.

P. Provide compatibility test results between adjacent sealants and curing and sealing materials.

Q. As-Built Requirements: Provide as-built drawings indicating actual locations and elevations of all foundations, foundation elements, openings, and other features upon completion of the project.

R. Provide two copies of test reports from the Testing Agency verifying concrete strength.

1.06 SOURCE QUALITY CONTROL

A. The Testing Agency shall conduct concrete quality evaluations for compliance with Specifications as follows:

1. Review and test Contractor's proposed materials.
2. Review and test Contractor's proposed concrete mix designs.
3. Secure and test production samples at plants or stockpiles.
4. Check batching and mixing operations to extent deemed necessary to assure compliance with Specifications.

1.07 FIELD QUALITY CONTROL

A. Refer to Specification Section 3.23.

1.08 PROJECT CONDITIONS

A. Comply with manufacturer’s written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete performance.

B. Principal opening sizes and locations are indicated on the drawings. Additional smaller openings and sleeves may be required by other disciplines and shall be constructed according to details submitted to the Commissioner for approval.

1.09 COORDINATION

A. Coordinate work of this Section with other subcontractors to verify required dimensions and locations including for inserts, anchors, anchor bolts, plates, conduit, and other items to be embedded in the concrete or installed with the concrete.

B. Coordinate the delivery of embedded items or items to be installed with the concrete so as to avoid delays to the installation of the new concrete work.

1.10 DELIVERY, STORAGE AND HANDLING

A. Comply with General Conditions and Section 01600 Materials and Equipment.

B. Storage:

1. Store materials in accordance with ACI 304R.
2. Store cement in weathertight buildings, bins, or silos that will exclude moisture and contaminates.
3. Store admixtures to avoid contamination, evaporation, damage, and in accordance with manufacturer's temperature and other recommendations.
4. Keep packaged material in original containers with seals unbroken and labels intact until time of use.

C. Handling:

1. Handle fine and coarse aggregates as separate ingredients.
2. Arrange aggregate stockpiles to avoid excessive segregation, and prevent contamination with other materials or with other sizes of like aggregates.
3. Do not use frozen or partially frozen aggregates.
4. Allow sand to drain until it has reached relatively uniform moisture content before use.
5. Protect liquid admixtures from freezing and temperature changes that would adversely affect characteristics, and in accordance with manufacturer's recommendations.

D. Sheet Curing Materials: Store in weathertight buildings or off the ground and under cover.

E. Liquid Curing Compounds: Store in closed containers.

F. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.11 WARRANTY

A. Comply with General Conditions, agreeing to repair or replace specified materials or Work that has failed within the warranty period. Failures include, but are not limited to, the following:

1. Oily, waxy, or loose residue which may interfere with the bonding or discoloration of various applied Architectural finish materials.
2. Discoloration of concrete surfaces scheduled to remain exposed as a finish.
3. Areas which show surface failure or defects.
4. Areas which puddle water.
5. Areas which are not properly prepared to receive Architectural finish materials. If necessary, the Contractor, at his own expense, shall have the Testing Agency perform appropriate tests for bond and discoloration.
6. Patches that become crazed, cracked, or sound hollow when tapped.
7. Self-leveling concrete topping that has cracked, spalled, and not performed in accordance with manufacturer's design criteria.

PART 2 - PRODUCTS

2.01 CLASS SI CONCRETE

A. All concrete defined by this specification shall be normal weight, Class SI Concrete having a compressive strength as shown on the drawings, or if not shown, as indicated herein, and conform to the requirements of Sections 503 and 1020 of the Standard Specifications.

B. Cement:

1. Domestic Portland cement complying with ASTM C150, Type I.
2. Provide the same brand of domestically produced Portland cement from a single source throughout the project, as required to meet Commissioner’s design requirements.
3. Provide Portland cement that is uniform in color.

C. Fine Aggregate: Washed inert natural sand conforming to the requirements of ASTM C33. Provide aggregates from a single source throughout the project for exposed concrete. Free of materials with deleterious reactivity to alkali in cement.

D. Coarse Aggregate: Maximum size aggregate shall be maximum 3/4 in. nominal. Well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33 with a total water-soluble chloride ion content below 0.02%. Grading requirements shall be as listed in ASTM C33 for the specified coarse-aggregate size number. Provide aggregates from a single source throughout the project for exposed concrete. Aggregates shall be free of materials with deleterious reactivity to alkali in cement.

E. Aggregate shall be nonreactive in the presence of alkalis in accordance with ASTM C1260 or ASTM C1293. Aggregates will be acceptable as nondeleteriously reactive if the aggregate produces ASTM C1567 expansion values of less than 0.1% at fourteen days using the same source material and relative proportions of cementitious materials proposed for use in the mix design.

F. Water: Potable water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances.

2.02 MIXES

A. Select proportions of ingredients to meet the design strength and materials limits specified and to produce concrete having proper placeability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.

B. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

C. Water/Cement Ratio:

1. The water-cementitious materials ratio shall not exceed values indicated, including any water added to meet specified slump in accordance with the requirements of ASTM C94.
2. Weight of supplementary cementitious materials (fly ash or other) or pozzolanic admixtures shall be included with the weight of cement used to determine the water-cementitious materials ratio. Fly ash and other pozzolans conforming to ASTM C618 shall constitute no more than 25% of the total weight of the cementitious materials. Silica fume shall constitute no more than 10% of the total weight of the cementitious materials. Total of fly ash or other pozzolans, slag, and silica fume shall constitute no more than 50% of the total weight of the cementitious materials.
3. For all concrete mix designs, assume it is placed in an exposed to weather or deicing salts or other corrosive environment and conform to exposure category F3. For specific mix design including required water/cement ratio, refer to the Structural Drawings (see the general notes).

D. Slump:

1. Contractor shall provide slump guidelines adhering to strength and water/cement ratio requirements.
2. Proportion and design mixes to result in concrete slump values noted below at point of placement.
3. Design concrete with a maximum slump of 4 in. and a minimum slump of 1 in., except as noted on the Structural Drawings (see general notes).

    a. Ramps, Slabs, and Sloping Surfaces: 3 in. maximum, 1 in. minimum.
    b. Reinforced Foundations and Walls: 3 in. maximum, 1 in. minimum.

4. If a slump greater than 4 in. is desired, it shall be achieved with a midrange or high-range water reducer as follows:

    a. Normal-weight concrete mixes using a midrange water reducer:

        1) A starting slump of 2 to 3 in., prior to addition of reducer.
        2) A final slump not to exceed 6 in., after addition of reducer.

b. Normal-weight concrete mixes using a high-range water reducer:

1) A starting slump of 2 to 3 in., prior to addition of reducer.
2) A final slump not to exceed 8 in., after addition of reducer.

E. Air Entraining Admixture:

1. For normal-weight or lightweight concrete exposed to weather or deicing chemicals, provide entrained air content of 6% ± 1.5%, unless otherwise noted on the drawings (see the Structural General Notes).
2. Entrained air content noted above shall occur at point of delivery.

F. Water-Reducing Admixture (Superplasticizer): Provide for exterior exposed concrete and concrete with a water-cement ratio of 0.50 or less. Type as specified or approved by Commissioner. Type "A" water-reducing admixture, added in compliance with the manufacturer's recommendations – with no reduction in the specified cement content. (Type "D" water-reducing admixture may be used in lieu of Type "A" during hot weather concreting.)

G. Admixtures containing chlorides shall not be used in the concrete.

H. Chloride Ion Content:

1. The total water-soluble chloride ion content of the mix including all constituents shall not exceed 0.06% by weight of cement, unless corrosion inhibitors are added to the mixture to offset the additional chloride.
2. If the specified level of water-soluble chloride ion content cannot be maintained, appropriate level of calcium nitrite admixture shall be added to the mix in accordance with the calcium nitrite manufacturer's recommendation to offset the excess amount of chloride at no additional cost to the Commissioner.

I. Unauthorized Materials: Materials and products required for work of this Section shall not contain asbestos, polychlorinated biphenyls (PCB), or other hazardous materials identified by the Commissioner.

J. Supplementary Cementitious Materials (SCM):

1. Fly ash conform to ASTM C618. When used, the fly ash content shall be neither less than 15% nor more than 25% of the total cement, by weight.
2. Slag Cement: ASTM C989, Grade 100 or 120. Slag may not be sourced from a plant co-fired with hazardous waste, medical waste, or tire-derived fuel.
3. Silica Fume: ASTM C1240 amorphous silica.
4. Limit total overall SCM to 50% of total cement content.

K. Adjustments to Concrete Mixes: Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by the Commissioner. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Commissioner before using in the work.

L. No other admixtures shall be added without written approval from the Commissioner. The use of calcium chloride and other chloride containing agents is prohibited.

Additives such as accelerators, retarders, antiwashout agents (AWA) may be used if approved by the Commissioner.

2.03 READY-MIXED CONCRETE

A. Provide ready-mixed concrete in accordance with ASTM C94 and as specified. When air temperature is between 85°F (30°C) and 90°F (32°C), reduce mixing and delivery time from 90 min. to 75 min., and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 min.

1. If an approved high-range water reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 min.
2. Do not use concrete in the work if it undergoes initial set or is not deposited within 90 min. after the water is introduced. Do not add water to unworkable concrete at delivery end unless the testing laboratory accepts the procedure.

B. Provide an official ticket for each ready-mix truck delivery indicating all pertinent data for that load.

2.04 MASS CONCRETE

A. A placement of structural concrete with a minimum dimension equal to or greater than 3 ft.

B. The mix design for mass concrete shall limit the maximum concrete temperature and also the maximum temperature differential between any points in the interior of the concrete element and any surface of the concrete element as outlined in the concrete placement section. SCMs may be used to replace cement to reduce the heat generated.

C. Mass concrete for the pile caps shall have a minimum compressive strength of 6,000 psi at twenty-eight days, except as indicated on the drawings. Maximum coarse aggregate size shall not exceed 1 in. Aggregates shall be normal weight, shall conform to ASTM C33, and shall be nonreactive with the cementitious materials in the mix. Concrete shall be non-air-entrained. Slump shall be satisfactory for the proposed methods of placement and consolidation. Water-reducing and high-range water-reducing compounds may be used. Accelerators shall not be used. Retarders may be used.

D. Concrete temperature at time of placement is limited to a minimum of 55ºF and a maximum of 80ºF.

E. Refer to Paras. 3.11.T and 3.17.F for additional mass-concrete requirements.

2.05 REINFORCING MATERIALS

A. Refer to Section 03 20 00 Concrete Reinforcement of these Specifications for concrete-reinforcing materials.

B. Provide slip-resistant polymer overlay for new concrete floor slab.

2.06 ADMIXTURES

A. General:

1. Admixtures specified below can be used only when established in the mix design with Commissioner's prior written approval.
2. Each admixture approved by the Commissioner shall be used in strict compliance with manufacturer's published instructions.
3. Manufacturer shall certify all admixtures to be compatible with each other.

B. Air Entraining Admixture:

1. ASTM C260.
2. Acceptable Product: Master Builders "MICRO-AIR" or "MB-AE-90."
3. Acceptable Product: W.R. Grace's "Darex Series" or "Daravair Series."
4. Acceptable Product: Sika's "Sika AEA-14", "Sika AEA-15", or "Sika Air."

C. Water-Reducing Admixture:

1. ASTM C494, Type A.
2. Acceptable products include, but are not limited to:

a. Master Builders' "POZZOLITH 220-N."
b. Euclid Chemical's "EUCON WR 75" or "EUCON WR 91."

D. Retarding Admixture:

1. ASTM C494, Type B.
2. Acceptable products include, but are not limited to:

a. Master Builders POZZOLITH 100-XR."
b. The Euclid Chemical Company "EUCON RETARDER 100."

E. Accelerating Admixture:

1. ASTM C494, Type C.
2. Acceptable products include, but are not limited to:

a. Master Builders "POZZUTEC 20."
b. The Euclid Chemical Company "ACCELGUARD 80" or "ACCELGUARD 90."

F. Water-Reducing and Retarding Admixture:

1. ASTM C494, Type D.
2. Acceptable products include, but are not limited to:

a. Master Builders "POZZOLITH 100-XR."
b. The Euclid Chemical Company "EUCON RETARDER 75."

G. Water-Reducing and Accelerating Admixture:

1. ASTM C494, Type E.
2. Acceptable products include, but are not limited to:

a. Master Builders "POZZUTEC 20."
b. The Euclid Chemical Company "ACCELGUARD 80" or "ACCELGUARD 90."

H. High-Range Water-Reducing Admixture:

1. ASTM C494, Type F.
2. Acceptable products include, but are not limited to:

a. Master Builders "RHEOBUILD 1000."
b. Euclid Chemical's "EUCON 37."

I. High-Range Water-Reducing and Retarding Admixture:

1. ASTM C494, Type G.
2. Acceptable products include, but are not limited to:

a. The Euclid Chemical Company "EUCON 537."

J. Corrosion-Inhibiting Admixtures:

1. ASTM C494, Type C.
2. Minimum of 2 gal/cu yd of a 30% calcium nitrite solution.
3. Acceptable products include, but are not limited to:

a. W.R. Grace's "DCI or DCI-S."
b. The Euclid Chemical Company's "EUCON CIA."

4. For concrete exposed to weather or deicing chemicals. This includes all concrete that is above grade.

K. Shrinkage-Reducing Admixtures:

1. ASTM C157.
2. Acceptable Products include, but are not limited to:

a. W.R. Grace's "Eclipse Plus," or "Eclipse Floor."

2.07 ADHESIVES

A. Bonding agents are not permitted on this project under any circumstances.

2.08 CURING COMPOUNDS AND SEALERS

A. Interaction with Cover Material:

1. Use only curing and sealer compounds that are compatible with cover material.
2. Manufacturer's certification is required.
3. Complying with ASTM C309, Type I, Class A; water-based acrylic coating.

B. Curing and Sealing Compound:

1. ASTM C1315, Type I, Class B and ASTM C309 Type I, Class A or B.
2. Acceptable Product: Euclid Chemical's "Super Aqua-Cure Vox."
3. Acceptable Product: Sonneborn "Kure-N-Seal 30."
4. Acceptable Product: Symons "Cure and Seal 1315."
5. Acceptable Product: Euclid Chemical's "KUREZ DR VOX."
6. VOC Compliant, 700 g/l.

2.09 SEALERS

A. Horizontal Surface Sealer:

1. ASTM C309, Type I, Class A or B.
2. Acceptable products include, but are not limited to:

    a. BASF Hydrozo 100 Plus.

B. Vertical Surface Sealer:

1. IDOT Standard Specifications Section 1026.
2. Acceptable products include, but are not limited to:

    a. BASF Hydrozo 100 Plus.

C. Liquid Densifier/Sealer (at Mezzanine Level with Steel Trowel Finish):

1. Acceptable products include, but are not limited to:

    a. The Euclid Chemical Company "Euco Diamond Hard."
    b. Sonneborn "Kure-N-Harden."

2. The liquid densifier compound shall be a siliconate-based sealer which penetrates concrete surfaces, increases abrasion resistance, and provides a "low-sheen" surface that is easy to clean and eases the problem of tire mark removal.

2.10 HARDENERS

A. Mineral Aggregate Hardener:

1. The specified mineral aggregate hardener shall be formulated, processed, and packaged under stringent quality control at the manufacturer's owned and controlled factory. The hardener shall be a factory-blended mixture of specially processed graded mineral aggregate, selected Portland cement, and necessary plasticizing agents.

2. Acceptable products include, but are not limited to:

    a. The Euclid Chemical Company's, "Surflex."
    b. Master Builders', "Mastercron."

3. Curing Compound: Euclid Chemical, "Kurez DR VOX" (for use with "Surflex").
4. Curing Compound: Master Builders, "Masterkure 200W" (for use with "Mastercron").

B. Nonoxidizing Metallic Hardener:

1. The specified nonoxidizing metallic floor hardener shall be formulated, processed, and packaged under stringent quality control at the manufacturer's owned and controlled factory. The hardener shall be a mixture of specially processed nonrusting aggregate, selected Portland cement, and necessary plasticizing agents.
2. Acceptable products include, but are not limited to:

    a. The Euclid Chemical Company's, "Diamond-Plate."
    b. Acceptable Product: MasterBuilders', "MasterPlate 200" or "MasterPlate FF" (for flat floor applications).

3. Curing Compound: Euclid Chemical, "Kurez DR VOX" (for use with "Diamond-Plate").
4. Curing Compound: MasterBuilders', Masterkure 200W (for use with "MasterPlate").

2.11 MISCELLANEOUS CONCRETE PRODUCTS

A. Nonshrink Grout:

1. ASTM C1107, Grade B.
2. Acceptable Product: Master Builders "MASTERFLOW 928."
3. Acceptable Product: Euclid Chemical's "HI-FLOW GROUT."
4. Acceptable Product: Five Star Products "Five Star Grout."
5. Provide prepackaged natural aggregate grout, high-precision, nonshrink, ready-to-use, complying with the following requirements:

    a. Grout shall have minimum compressive strength of 6,000 psi at seven days and 8,000 psi at twenty-eight days.
    b. Grout shall conform to most current version of ASTM C1107, Grade B, when tested at a fluid consistency of 25 to 30 sec per ASTM C939 at temperature extremes of 45°F and 90°F and an extended working time of 30 min.
    c. All material used, including water, mixer, and prepackaged grout, must be initially at the 45°F and 90°F limits when testing is initiated.

2.12 MISCELLANEOUS PRODUCTS

A. Flexible Polyurethane Grout (for insulating column at ground):

1. Acceptable products include, but are not limited to:

    a. Sika Chemical Corporation "Icosit KC 340."

        1) Sole Source: HJ Skelton (Canada) Ltd., 519-679-9180, www.skelton-metals.com

B. Evaporation Retarder: Provide evaporation retarder that is resistant to deterioration when tested according to ASTM E154 such as polyethylene sheet not less than 6 mils thick.

1. Acceptable products include, but are not limited to:

    a. Master Builders "CONFILM."
    b. Euclid Chemical "Eucobar."

C. Moisture-Retaining Covers:

1. Acceptable products, include but are not limited to:

    a. Polyethylene Sheeting: AASHTO M171.
    b. Polyethylene-coated burlap.

D. Sand Cushion: Clean, manufactured or natural sand.

E. Vapor Barrier:

1. ASTM E1745.
2. For installation follow ASTM E1643.
3. Acceptable products include, but are not limited to:

    a. Thin polyethylene minimum thickness 30 mils.
    b. Florprufe 120 by Grace Construction Products.

F. Expansion Joint Filler: Bituminous preformed joint filler conforming to ASTM D1751.

1. Strips to be full depth of concrete and 3/4 in. thick unless noted otherwise.
2. Acceptable Product: Euclid Chemical "Euco 700."
3. Acceptable Product: Euclid Chemical " Euco 800."
4. Acceptable Product: Euclid Chemical "Euco QWIKjoint."
5. Acceptable Product: Sika Chemical Corporation "Sikadur 51 SL."

G. Isolation Joint:

1. Isolation joints are to be 1/2 in. wide.
2. Acceptable products include, but are not limited to:

    a. BASF Sonolastic SL-2 expansion joint filler.

2.13 CONCRETE REPAIR MATERIALS

A. Polymer Repair Mortar:

1. Acceptable Products (Horizontal Repairs): The Euclid Chemical Company's, "Thin Top Supreme" (for 1/16 in. to 3/8 in. thickness), or "Concrete Top Supreme" (for 3/8 in. to 2 in. thickness).
2. Acceptable Products (Horizontal Repairs): Sika Chemical Corporation's, "Sikatop 121 Plus" or "Sikatop 122 Plus."
3. Acceptable Products (Vertical and Overhead Repairs): The Euclid Chemical Company's, "Verticoat or Verticoat Supreme."
4. Acceptable Products (Vertical and Overhead Repairs): Sika Chemical Corporation's, "Sikatop 123 Plus."
5. These patching mortars may be used when color match of the adjacent concrete is not required.
6. Prior approval by the Commissioner is required.

B. High-Strength Flowing Repair Mortar:

1. For forming and pouring structural members, or large horizontal repairs, provide the flowable one-part, high-strength microsilica modified repair mortar with 3/8 in. aggregate.
2. Acceptable products include, but are not limited to:

    a. The Euclid Chemical Company's, "Eucocrete."

3. The product shall achieve 9,000 psi @ twenty-eight days at a 9 in. slump.
4. Prior approval by the Commissioner is required for cold weather applications.

C. Repair Topping:

1. Latex and microsilica modified cementitious mortar topping, which meets or exceeds the bond strength requirements of ASTM C1059.
2. Acceptable products include, but are not limited to:

    a. The Euclid Chemical Company, "Thin-Top Supreme."

PART 3 - EXECUTION

3.01 PREPARATION

A. Subgrade:

1. Determine that subgrades, excavations, and other surfaces where concrete is to be placed are of proper bearing capacity, of solid material, undisturbed, of proper compaction if filled.
2. Determine that excavations are of proper size, at proper depth, and properly located.
3. Excavations and subgrades where concrete is to be placed must be clean and dry. Do not place concrete on frozen ground.

4. Dampen subgrades not covered with membrane by sprinkling immediately before placing concrete.

    a. Omit when subgrade is already damp.

B. Forms:

1. Coordinate with Section 03 10 00 Concrete Formwork.
2. Provide openings in concrete formwork to accommodate work of other trades. Coordinate with all other trades.
3. The Contractor is required to use a surveyor to properly locate the formwork, including elevations.
4. The Contractor shall use smooth surfaced forms with tight joints for any concrete work that will remain exposed to view, either partially or fully, as determined prior to installation of the forms.
5. Remove dirt, sawdust, nails, and other foreign material from formed space.
6. Dampen wood forms by sprinkling immediately before placing.
7. Cool metal forms by sprinkling immediately before placing.

C. Concrete Accessories:

1. Coordinate with Section 03 20 00 Concrete Reinforcement and Embedded Assemblies.

D. Dewatering:

1. Remove water from concrete formwork.
2. Divert any flowing water to sump and remove by pumping.

E. Vapor Retarder/Moisture Barrier Placement:

1. Place vapor retarder/moisture barrier under all new slabs-on-grade in position with longest dimension parallel with direction of pour.
2. Joints: Lap 1 ft minimum and seal with manufacturer's recommended mastic or pressure-sensitive tape.
3. Prevent damage to moisture barrier.
4. If moisture barrier is damaged, place a piece of moisture barrier over damaged area (6 in. larger all around), and tape in place with type of tape recommended by moisture barrier manufacturer.
5. Seal laps and intersections of walls with compatible trowel mastic or pressure-sensitive sealing tape.
6. Seal around pipes and other penetrations with compatible trowel mastic.

3.02 PLACING REINFORCEMENT

A. See Section 03 20 00 Concrete Reinforcement. Reinforcement to be clean and free of rust, scale, dirt, and ice. Accurately position, support, and secure reinforcement. Place reinforcement to maintain minimum coverage for concrete protection. Install bars and welded fabric in longest lengths practicable, lapping at all splices. Offset laps to prevent continuous laps in either direction.

B. Reinforcement shall have the following minimum cover, unless noted otherwise:

1. Surfaces Not Formed: 3 in.
2. Formed Surfaces in Contact with Soil or Water: 3 in.
3. Formed Surfaces Not in Contact with Soil or Water: 2 in.

C. Corner bars matching interior and exterior wall face horizontal bars shall be provided at all wall intersections. See drawings.

D. All lap splices are to be ACI Standard Class B tension lap splices. Where bars of different sizes lap, provide lap splice length for the larger bar.

E. Where dowels are indicated but not sized, provide dowels that match size and location of main reinforcement and lap splice with the main reinforcement.

F. Grouted reinforcing anchors shall use Hilti HY-200 adhesive or an equal system approved by the Commissioner.

G. The Contractor is to notify the Commissioner when reinforcing bars are installed. Placement of concrete shall not commence until the Commissioner has inspected and approved the reinforcement placement.

3.03 JOINTS

A. Construction Joints: Locate and install construction joints as shown on the drawings or so they do not impair the strength or appearance of the structure, as acceptable to the Commissioner.

B. Roughen Surface: Roughen all construction joint surfaces, common joint surface with new concrete, bulkheads, and interface between walls and footings, to an amplitude of 1/4 in. and conforming to Concrete Surface Profile 10 (CSP 10) by the International Concrete Repair Institute (ICRI) Guideline 03732.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.

D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

E. For Joint Fillers: Coordinate with Sections 03 20 00 Concrete Reinforcement and Embedded Assemblies and Section 07 90 00 Joint Sealers.

F. Construction, control, and isolation joints are located and detailed on drawings.

1. Comply with ACI 301.
2. Tool slab joints at time of finishing.
3. Saw-cut control joints with Soft-Cut Saw to a depth of 1-1/4 in. or conventional saw to 1/4 slab depth. Proper profile is required for an elastomeric sealant.
4. Place construction joints perpendicular to main reinforcement.

G. For slabs on deck, the Contractor shall be sure to use a bulkhead at all pour stops, and extend all slab reinforcing through bulkhead.

H. Only those construction joints shown on the drawings will be allowed unless approved otherwise by the Commissioner.

3.04 EXPANSION JOINTS

A. Provide expansion joints where indicated on the drawings. Expansion joints to be continuous and for the full depth of the concrete except for space for sealant.

B. Coordinate with Section 03 20 00 Concrete Reinforcement and Embedded Assemblies.

3.05 ISOLATION JOINTS

A. Provide isolation joints where shown or required. Isolation joints to be 1/2 in. unless noted otherwise. Isolation joints to be continuous and for the full depth of the concrete except for a 1/4 in. space for sealant.

B. Coordinate with Section 03 20 00 Concrete Reinforcement and Embedded Assemblies.

3.06 WATERSTOPS

A. Install waterstops where shown or required to form a continuous diaphragm. Install in longest lengths practical. Support and protect exposed waterstops during progress of the work. Field fabricate joints in waterstops by sealing according to manufacturer's written instructions.

B. Coordinate with Section 03 20 00 Concrete Reinforcement and Embedded Assemblies.

3.07 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. All exposed concrete corners shall be softened with a 3/4 in. x 3/4 in. chamfer or should match existing or adjacent work.

C. Place steel plates, angles, anchor bolts, plate and Nelson stud assemblies, etc., as shown into concrete before it sets. Position embedded anchor bolts using templates.

D. Unless otherwise shown or approved, conduits and pipes embedded within a slab, wall or beam shall have a maximum outside dimension no greater than one-third the

overall thickness of the slab, wall, or beam; and spacing shall be greater than or equal to three diameters or widths on center.

E. Provide continuous waterstops at each construction joint of any concrete element exposed to soil or water below grade. Roughen surface on both sides of waterstop in accordance with Roughened Surface section above.

F. Electrical and communication conduits shall not be placed in concrete without prior approval by the Commissioner.

3.08 PREPARING FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.

B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

C. All exposed concrete edges shall have a 3/4 in. chamfer.

3.09 MEASURING MATERIALS

A. Concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, water, and admixtures as specified and shall be produced by a concrete mixing plant acceptable to the Commissioner. All constituents, including admixtures, shall be batched at the plant.

B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified.

C. Measure the amount of free water in fine aggregates within 0.3% with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as-batched on printed batching tickets.

3.10 MIXING AND TRANSPORTING

A. All concrete shall be ready-mixed conforming to ASTM C94 except as follows:

1. Provide concrete materials, proportions and properties as herein specified in lieu of ASTM C94 Section 4.
2. Water, beyond that required by the mix design, shall not be added at the Project site.
3. Furnish delivery ticket with each load of concrete delivered to the site to the Contractor. In addition to the requirements of ASTM C94 Section 16, provide the following information on the delivery tickets:

    a. Type and brand of cement.
    b. Cement content per cubic yard of concrete.

c. Microsilica admixture content per cubic yard of concrete.
d. Admixtures.
e. Type and maximum size aggregate.
f. Total water content.
g. Air entrainment.
h. Slump.
i. Water-cementitious materials ratio.
j. Fly ash content per cubic yard of concrete.

B. High-range water-reducing agents (superplasticizer), if added at the batch plant, may be added again at the Project site. Slump tests must be performed on concrete prior to addition of water-reducing agents to ensure quality both before and after addition of water-reducer admixture.

1. If superplasticizers are added at the batch plant, the concrete mix design must account for the delivery time, workability, finishability, and setting time required on the jobsite for proper placing and finishing procedures.
2. If the superplasticizer is redosed at the jobsite in air entrained concrete, air content must be checked after mixing.

C. Concrete shall be ready-mixed concrete; no hand mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions at mixing speeds.

D. Ready-mix concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the name plate.

E. Keep the water tank valve on each transit truck locked at all times. Any addition of water must be directed by the Commissioner. Added water shall be incorporated by additional mixing of at least 35 revolutions. All added water shall be metered and the amount of water added shall be shown on each delivery ticket.

F. All central plant and rolling stock equipment and methods shall comply with ACI 318 and ASTM C94.

G. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Metal or metal-lined nonaluminum discharge chutes shall be used and shall have slopes not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 ft long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.

H. Retempering (mixing with or without additional cement, aggregate, or water) of concrete or mortar which has reached initial set will not be permitted.

I. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

J. Furnish a delivery ticket for ready mixed concrete to the Commissioner as each truck arrives. Each ticket shall provide a printed record of the weight of cement and each aggregate as batched individually. Use the type of indicator that returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cement and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of the truck mixer.

K. Temperature and Mixing Time Control:

1. In cold weather, do not allow the as-mixed temperature of the concrete and concrete temperatures at the time of placement in the forms to drop below 40°F.
2. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90°F.
3. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90°F. If necessary, substitute well-crushed ice for all or part of the mixing water.

L. The maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms with concrete agitated shall not exceed the following:

1. If the air or concrete temperature (whichever is higher) is between 80°F and 90°F, the maximum time shall not exceed 45 min.
2. If the air or concrete temperature (whichever is higher) is between 70°F and 79°F, the maximum time shall not exceed 60 min.
3. If the air or concrete temperature (whichever is higher) is between 40°F and 69°F, the maximum time shall not exceed 90 min.
4. If an approved high-range water reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 min.

M. Concrete Stain: Apply concrete stain to installed cured concrete according to manufacturer's written instructions for areas to receive stained concrete. Verify locations for color concrete. Concrete to be stained to be clean, dry, and cured. Mix stain and apply as directed by manufacturer. Follow manufacturer's recommendations for installation.

3.11 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. No concrete shall be placed without 24 hr advance notice to the Commissioner, or before the formwork and setting of reinforcement has been inspected and approved by the Commissioner.

C. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

D. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, excess water, dirt, and other foreign materials from forms and exposed concrete joints. Voids in sleeves, inserts, etc., shall be filled temporarily with readily removable material to prevent entry of concrete. Confirm that reinforcement and other embedded items are securely in place. Have a competent workman at the location of the placement who can ensure that reinforcing steel and embedded items remain in designated locations while concrete is being placed. Sprinkle semi-porous subgrades or forms to eliminate suction of water from the mix. Seal extremely porous subgrades in an approved manner.

E. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.

F. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 in. and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 in. into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
3. Place concrete continuously without interruption between predetermined construction and control joints in walls.
4. When vibrators are used, coatings must be present on vibrator to protect epoxy coating.

G. Consolidate concrete by mechanical vibration, puddling, spading, rodding, or forking so that concrete is thoroughly worked around reinforcement, embedded items, and openings and into corners of forms. Puddling, spading, etc., shall be continuously performed along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting, or planes of weakness.

H. Vibrators are to be used to consolidate properly placed concrete but shall not be used to move or transport concrete in the forms. Vibration shall continue until:

1. Frequency returns to normal.
2. Surface appears liquefied, flattened and glistening.
3. Trapped air ceases to rise.
4. Coarse aggregate has blended into surface but has not disappeared.

I. Pumping of concrete will be permitted. Use a mix design and aggregate sizes suitable for pumping and submit for approval.

J. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only when made of galvanized metal or concrete and if prior approval has been obtained.

K. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs, and/or walls) has reached adequate strength.

L. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms with a suitable tool to bring the full surface of the mortar against the form. Prevent the formation of excessive surface voids.

M. All exposed concrete edges shall have a 3/4 in. chamfer.

N. Provide concrete footings, walls, slabs, steps, pits, thickened slabs, piers for light poles and bollards, and other concrete installations as shown on the drawings. Form and provide for pockets for rails, trench drains, and drop concrete at doors as shown on the drawings. Provide dowels where new concrete meets existing as detailed on the drawings.

O. Placing Concrete Slabs:

1. All new slabs shall be placed on minimum 6 in. engineered fill compacted to 95% relative density.
2. After suitable bulkheads, screeds and jointing materials have been positioned, place concrete continuously without interruption between predetermined construction and control joints in floors.

    a. Place slabs on grade by the long strip cast method. Refer to ACI 302 and 360 for recommended methods of placement.

3. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
4. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
5. Bring slab surfaces to correct level with a straightedge and strike off.
6. Use highway bull floats or darbies to smooth surface free of humps or hollows.
7. Do not disturb slab surfaces prior to beginning finishing operations.
8. Maintain reinforcing in proper position on chairs during concrete placement.
9. During periods of setting, materials shall not be placed, and loads shall not be imposed on slabs.

P. Placing Concrete at New and Existing Construction Joints:

1. To secure full bond at construction joints, horizontal surfaces of concrete already placed shall be thoroughly cleaned of foreign materials and laitance, roughened with tools such as chipping hammers or wire brushes to a minimum surface profile of ICRI, CSP 7, and recleaned by stream of water or compressed air.

2. Before new concrete is placed, dampen joints with water.
3. After water disappears from surfaces, coat the joints with a cement grout or bonding agent mixed to the consistency of very heavy paste.

    a. The grout mix shall be composed of 1 part cement, 1-1/2 parts of fine sand, and a 50:50 mixture of approved bonding admixture and water, mixed to a consistency of a very heavy paste.
    b. For approved bonding agents, refer to section 2.4 and follow manufacturer's guidelines.

4. Surface shall receive coating of at least 1/8 in. thick, scrubbed in with stiff bristle brush.

    a. New concrete shall be deposited before the bonding grout dries.

Q. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

R. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings.

S. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

T. Mass-Concrete Placement Requirements:

1. Concrete shall be placed in horizontal layers, not exceeding 2 ft in thickness. Each layer shall be placed while the underlying layer is still responsive to vibration. Layers shall be sufficiently shallow to permit the two layers to be knitted together by proper vibration into the lower layer.
2. Thermal Requirements:

    a. Maximum allowable concrete temperature: 150°F
    b. Maximum allowable differential temperature: 35°F (as measured between the point of maximum temperature and a point 2 in. from the coolest exterior face, including effects of corners, ground, and edges, of the concrete.

3. Measure concrete temperature using embedded thermocouples at 1 hr (maximum) intervals using self-contained, automated recording devices until internal concrete temperature is within 20°F of average ambient temperature. Temperature recorders shall be located at a minimum of three sections of the concrete (center, quarter point, and near-edge, with a minimum of four recorders at each section (center, top edge, bottom edge, and side)). Contractor shall supply drawing indicating proposed temperature recorder locations.
4. For massive elements covering large areas, the concrete shall be placed in a step method to minimize the risk of occurrence of cold joints, exposing only small areas of concrete in the lower lifts at any time.

5. Precooling or active cooling may be used to prevent excessive heat build-up caused by heat of hydration. Acceptable means of precooling include use of chilled water; providing some mixing water in the form of chipped, shaved, or flaked ice; cooling the aggregate; and cooling the mix with liquid nitrogen prior to placing. Ice, if used, shall be completely melted in the mix prior to concrete arrival at the jobsite. Submit method of precooling or active cooling as part of the thermal control plan.

3.12 COLD WEATHER CONCRETING:

A. "Cold weather" is defined as a period when for more than three successive days, the average daily outdoor temperature drops below 40°F. The average daily temperature shall be calculated as the average of the highest and the lowest temperature during the period from midnight to midnight.

B. Cold weather concreting shall conform to ACI 306.1 and with the applicable provisions of the Standard Specifications. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

C. Discuss a cold weather work plan with the Commissioner. The discussion shall encompass the methods and procedures proposed for use during cold weather including the production, transportation, placement, protection, curing, and temperature monitoring of the concrete. The procedures to be implemented upon abrupt changes in weather conditions or equipment failures shall also be discussed. Cold weather concreting shall not begin until the work plan is acceptable to the Commissioner.

D. When air temperature has fallen to or is expected to fall below 40°F (4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C) and not more than 80°F (27 °C) at point of placement.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

E. During periods of cold weather, concrete shall be protected to provide continuous warm, moist curing (with supplementary heat when required) for a total of at least 350 degree-days of curing.

1. Degree-days are defined as the total number of 24 hr periods multiplied by the weighted average daily air temperature at the surface of the concrete (e.g., five days at an average 70°F = 350 degree-days).
2. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50°F as 0°F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.

F. Salt, manure, or other chemicals shall not be used for protection.

G. The protection period for concrete being water cured shall not be terminated during cold weather until at least 24 hrs after water curing has been terminated.

3.13 HOT WEATHER CONCRETING

A. "Hot weather" is defined as any combination of high air temperatures, low relative humidity, and wind velocity which produces a rate of evaporation estimated in accordance with ACI 305R, approaching or exceeding 0.2 lbs/sq ft/hr.

B. Concrete placed during hot weather shall be batched, delivered, placed, cured, and protected in compliance with the recommendations of ACI 305 and the additional requirements specified herein.

C. Temperature of concrete being placed shall not exceed 90°F and every effort shall be made to maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set, or cold joints.

D. All necessary precautions shall be taken to promptly deliver, to promptly place the concrete upon its arrival at the site and to provide vibration immediately after placement.

E. The Commissioner may direct the Contractor to immediately cover plastic concrete with sheet material.

F. Discuss with the Commissioner a work plan describing the methods and procedures proposed to use for concrete placement and curing during hot weather periods. Hot weather concreting shall not begin until the work plan is acceptable to the Commissioner.

G. Hot-Weather Placement:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90°F (32°C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Commissioner.

H. Do not apply unbalanced loads, such as hydrostatic pressure or backfill against structural components until the concrete has attained its design strength.

3.14 CONCRETE STAIRS

A. Pitch stair treads and landings forward for drainage purposes. Use minimum slope of 0.1% without reducing the thickness of the stair slabs and landings.

3.15 DOWELS BETWEEN NEW CONCRETE AND EXISTING CONCRETE

A. At joint between new concrete slab and existing concrete, provide and install the following, unless noted otherwise:

1. Provide a 3/4 in. preformed joint filler entire joint, including polysulfide sealant at top.
2. Provide 1/2 in. in diameter 18 in. long smooth dowels 12 in. o.c.; drill and grout 9 in. into existing concrete and extend 9 in. into new slab.

3.16 CONCRETE FINISHES

A. General:

1. Comply with recommendations for concrete finishing established by ACI 302.1R and ACI 304R.
2. Comply with dimensional tolerance limitations given by ACI 117.

B. Finish for monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile and other bonded applied cementitious finish flooring material, and where indicated:

1. Scratch Finish:

a. After placing slabs, finish surface to tolerances of FF=15 (floor flatness) and FL=13 (floor levelness) measured according to ASTM E1155.
b. Slope surfaces uniformly to drains where required.
c. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.

C. Finish for monolithic slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated:

1. Float Finish:

a. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating.
b. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both.
c. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units.
d. Finish surfaces to tolerances of FF=20 (floor flatness) and FL=17 (floor levelness) measured according to ASTM E1155.

e. Cut down high spots and fill low spots.
f. Uniformly slope surfaces to drains.
g. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

D. Finishes for Pedestrian Sidewalks and Steps and As Indicated:

1. Sidewalks and Curbs: Light-to-medium broom finish applied with fiber-bristle broom perpendicular to direction of main traffic route immediately after float finishing.
2. Cast-in-Place Mezzanine Slab: Medium broom finish shall meet the following standard:

a. Mezzanine walking surface shall be aggressively sandblasted in the factory in accordance with PCI's "Heavy Blasting" and to match the sample approved by the Authority.
b. Slip Resistance: Mezzanine walking surface finish to have a minimum value of 0.42 DCOF (Dynamic Coefficient of Friction) measured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.
c. Perform test a minimum of once on the walking surface of every 100 sq ft of walking surface.

E. Rough Formed Finish:

1. Acceptable for formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated.
2. Concrete surface shall have texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 in. in height rubber down or chipped off.

F. Smooth Formed Finish:

1. Required for formed concrete surfaces exposed to view, or scheduled to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp proofing, veneer plaster, painting, or other similar system.
2. Surface is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
3. Repair and patch defective areas with fins and other projections completely removed and smoothed.

G. Smooth Rubbed Finish:

1. "Smooth Rubbed" finish shall consist of a finish free of fins, joint marks smoothed off, blemishes removed and surfaces left smooth and unmarred.
2. Provide smooth rubbed finish to scheduled concrete surfaces, which have received smooth form finish treatment not later than one day after form removal.
3. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced.

a. Do not apply cement grout other than that created by the rubbing process.

H. Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.17 CONCRETE CURING AND PROTECTION

A. Curing shall be in accordance with the applicable portions of Section 1020.13 of the IDOT Standard Specifications. Concrete placed in foundations shall have cured at least fourteen days before structure load is placed on the concrete.

B. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material.

C. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than seven days.

D. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.

1. Moisture Curing: Provide moisture curing by continuous water-fog spray or cover concrete surface with approved absorptive cover and thoroughly saturate cover with water. Begin wet cure as soon as concrete attains an initial set and maintain wet cure 24 hrs a day, for a minimum of seven days.
2. Sheet Material Curing: Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.
3. Liquid Membrane Curing: Apply over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall NOT be placed on any concrete surface where additional concrete is to be placed, where concrete sealers or surface coatings are to be used, or where the concrete finish requires an integral floor product. Curing compound shall be applied as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Application shall be in compliance with the manufacturer's recommendations. Apply curing compound on exposed interior slabs and on exterior slabs as soon as final finishing operations are complete (within 2 hrs and after surface water sheen has disappeared). Apply uniformly in continuous operation according to manufacturer's directions.

E. Specified Applications of Curing Methods:

1. Slabs for Water Containment Structures and Chemical Spill Basins: Water curing only.
2. Slabs-on-Grade and Footings (not used to contain water): Water curing, sheet material curing, or liquid membrane curing.
3. Structural Slabs (other than water containment): Water curing or liquid membrane curing.
4. Horizontal Surfaces which Will Receive Additional Concrete, Coatings, Grout, or Other Material that Requires Bond to the Substrate: Water curing.
5. Formed Surfaces: None if nonabsorbent forms are left in place seven days. Water cure if absorbent forms are used. Sheet cure or liquid membrane cure if forms are removed prior to seven days. Exposed horizontal surfaces of formed walls or columns shall be water cured for seven days or until next placement of concrete is made.
6. Concrete Joints: Water cured or sheet material cured.

F. Curing for Mass Concrete:

1. Mass concrete shall be moist cured for a minimum of seven days.

    a. Do not cure mass concrete with cold water that would cause the temperature differential to exceed 35°F between the interior of the concrete and its surfaces. If weather becomes inclement, protect the placement from excessive water from rain or snow. Do not use steam or other protection that will add heat to the concrete unless included in thermal control plan and approved by the Commissioner and SER.
    b. As soon as the surface achieves initial set and the finishing process is completed, cover completely with saturated absorbent materials and polyethylene sheets. Place insulation blankets on top of the polyethylene sheets when needed to control temperature differential. No subsequent application of water is required, provided that the absorbent material, polyethylene sheet, and insulation are kept tightly in place for the curing period.
    c. Place absorbent materials and membrane sheet only on moist concrete surfaces. If the surface appears dry, wet it by fine spray. The proof of acceptable curing using sheet material shall be the presence of moisture on the concrete surface at all times during the moist curing period.

2. When weather creates conditions where moist curing of mass concrete is impractical or infeasible, mass concrete shall be cured by other methods as provided in this specification, using materials and with restrictions as specified.
3. Curing shall only be removed at such a time that the rate of surface cooling will not exceed 20°F per day. Unless explicitly considered in thermal control plan, formwork shall not be removed until end of thermal protection period.

G. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

H. The Contractor shall provide all necessary measures to prevent any water, frost, or ice from penetrating the concrete prior to and after placement of concrete and until the concrete has obtained required strength.

3.18 REMOVING FORMS

A. General: Formwork not supporting weight of concrete may be removed after cumulatively curing at not less than 50°F (10°C) for 24 hrs after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

B. Forms shall not be removed before the concrete has attained a strength of at least 30% of its specified design strength. Shores shall not be removed until the concrete has attained at least 60% of its specified design strength and also sufficient strength to support safely its own weight and construction live loads.

3.19 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Commissioner. Perform patchwork in accordance with ACI 301.

B. After Stripping Forms:

1. Immediately after stripping forms, patch all honeycombing, defective joints, voids, etc., before the concrete is thoroughly dry.
2. Remove all burrs, fins, and ridges before the concrete is thoroughly dry.
3. Remove stains from rust, grease and oils, from release agents, etc.
4. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color.

    a. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching.

5. When finished, color and texture of all patches shall match adjoining surfaces.

C. Defective Areas:

1. Chip away defective areas, honeycomb, rock pockets, voids over 1/4 in. in any dimension and holes left by tie rods and bolts, down to solid concrete but in no case to a depth less than 1 in. and saw-cut edges to prevent feather edging of fill material.
2. Apply a brush-coat of specified bonding agent.
3. Mix dry-pack mortar, consisting of 1 part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.
4. Immediately fill prepared areas with concrete or dry-pack material consisting of 1: 1-1/2 mixture of cement and concrete and mixed slightly damp to touch.
5. Thoroughly compact the fill material into place until excess paste appears on surface.
6. Leave slightly higher than surrounding surface.
7. Leave fill material undisturbed to permit initial shrinkage.
8. When cured, finish all patches to match adjoining surface.

D. Repairing Formed Surfaces:

1. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Commissioner.
2. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
3. Flush out form tie holes and fill with dry pack mortar or precast cement cone plugs secured in place with bonding agent.
4. Repair concealed formed surfaces, where possible, containing defects that affect the durability of concrete.
5. If defects cannot be repaired, remove and replace concrete.

E. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish.
2. Correct low and high areas herein specified.
3. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.
4. Repair finished unformed surfaces containing defects that affect durability of concrete.

    a. Surface defects include crazing and cracks in excess of 0.01 in. wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.

5. Repair defective areas, except random cracks and single holes not exceeding 1 in. in diameter, by cutting out and replacing with fresh concrete.

    a. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4 in. clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
    c. Mix patching concrete of same materials to provide concrete of same type or class as original concrete.
    d. Place, compact, and finish to blend with adjacent finished concrete.
    e. Cure in same manner as adjacent concrete.

F. Depressed spots and high spots in concrete surfaces which are in excess of specified tolerances shall be leveled and ground-smooth.

1. Correct high areas in unformed surfaces by grinding after concrete has cured at least fourteen days.
2. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.
    b. Proprietary underlayment compounds may be used when acceptable to Commissioner.

3. Leveling materials shall be approved by the Commissioner.

G. If honeycomb exists around reinforcement, chip to provide clear space at least 3/4 in. wide all around steel to afford proper ultimate bond.

1. For areas less than 1-1/2 in. deep, patch shall be made in same manner as described above for filling form tie holes.

a. Carefully and adequately use fill materials to prevent sagging.

2. Thicker repairs shall require buildup in successive layers, each layer being applied as described including polymer repair mortars.
3. High-strength repair mortar shall be used in formed repairs.
4. To aid strength and bonding of multiple layer repairs, nonshrink metallic aggregate shall be used as an additive.

H. Contractor shall be responsible for repairing all cracks wider than 0.02 in. in concrete superstructure floor slabs by epoxy injection or routing and sealing as required by the Commissioner.

1. Use epoxy adhesive, Eucopoxy Injection Resin by The Euclid Chemical Company, Masterbuilders SCB Concresive 1370, or Sikadur 35, LV, LPL according to manufacturer's recommendations.

a. Repair methods not specified above may be used, subject to acceptance of the Commissioner.
b. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place.

2. Mix, place, and cure concrete as specified to blend with in-place construction.
3. Provide other miscellaneous concrete filling shown or required to complete Work.

I. For Structural Repairs: Materials and method must be accepted by the Commissioner before repairs are performed. Contractor shall report all structural repairs to the Commissioner immediately. Contractor shall bear all cost for structural repairs. The Commissioner has the right to require a licensed professional engineer in the State of Illinois to prepare documentation of structural repairs prior to any repair work being performed.

J. Concrete superstructure floor slab cracks to be repaired shall have a "reasonable level of cracking" limited to 3% maximum of the surface area of floor slab panels, whose borders are formed by saw-cutting, construction joints, slab edges, or some combination. Floor slab panels with a cracking frequency exceeding 3% shall be rejected at the discretion of the Commissioner. Rejected slab panels or sections shall be removed and replaced.

3.20 CONCRETE SEALER

A. All exposed concrete slabs shall receive a coat of concrete sealer meeting requirements of IDOT Standard Specifications Article 1026, Concrete Sealer. Sealer shall be clear and not discolor the concrete surface to which it is applied.

B. Penetrating Liquid Floor Treatment: Prepare, apply and finish penetrating liquid floor treatment according to manufacturer's written instructions. Apply to all concrete floor slabs. Apply after concrete has been stained, where applicable, and stain has fully dried.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than seven days old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry.
4. Apply a second coat in a similar manner for floors to remain exposed or if the surface is rough or porous.

3.21 SURFACE TREATMENT

A. Exposed concrete walls shall receive a coat of concrete sealer. Apply according to manufacturer's directions and recommendations.

3.22 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The Contractor will employ and pay for a testing laboratory to obtain sets of field control cylinder specimens during the progress of the work in compliance with ASTM C31, to perform tests and to submit test reports as directed by the Commissioner. See Section 01 45 80 Testing and Inspection Service. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set per day, nor less than one set for each 100 cu yd of concrete nor less than one set for each 5,000 sq ft of surface area for slabs or walls.

1. A "set" of test cylinders consists of four cylinders: two to be tested at seven days and two to be tested and their strengths averaged at twenty-eight days. The fifth may be used for a special test at three days or to verify strength after twenty-eight days if twenty-eight-day test results are low.
2. When the average twenty-eight-day compressive strength of the cylinders in any set falls below the specified design strength or below proportional minimum seven-day strengths (where proper relation between seven and twenty-eight-day strengths have been established by tests), proportions, water content, or temperature conditions shall be changed to achieve the required strengths.

B. Testing Agency is responsible for monitoring and testing of concrete placements.

1. Testing Agency shall provide qualified personnel at site to monitor concreting operations as follows:

a. Record temperature of concrete at time of placement.
b. Record weather conditions at time of placement, including temperature, wind speed, relative humidity, and precipitation.
c. Record types and amounts of admixtures added to concrete batches, including that added after departure of concrete trucks from batch plant.
d. Record amounts of and monitor dosing of high-range water-reducing admixtures added at site for site-added admixtures and redosing for plant-added admixtures.
e. Monitor consistency and uniformity of concrete.
f. Monitor preparation for concreting operations, placement of concrete, and subsequent curing period for conformance with Specifications for following procedures:

1) Concrete curing.
2) Hot weather concreting operations.
3) Cold weather concreting operations.
4) Mass concrete.

C. Testing Agency shall conduct tests of concrete as follows:

1. Slump Test, ASTM C 143:

a. Test each mix at random every 100 cu yd, once per day, or as often as deemed necessary by the Testing Agency to ensure conformance with the Specifications, whichever is most frequent.
b. Each test shall include samples at a minimum of three (3) separate locations: immediately upon arrival at the job site out of the truck chute, at the end of the pump hose, and in situ after vibration has occurred.
c. Test any concrete mix enhanced with high-range water reducer both before and after addition of reducer. Conduct slump tests for concrete enhanced with high-range water-reducing admixtures as follows:

1) Concrete with plant added high-range water-reducing admixtures shall be sampled immediately upon arrival at jobsite. Batches delivered to site with slump in excess of 9 in. shall be rejected.
2) Concrete with site added high-range water-reducing admixtures shall be sampled immediately upon arrival at jobsite for conformance to slump requirements.

d. Testing Agency shall maintain a slump moving average, comprised of the average of all batches or most recent five (5) batches tested, whichever is fewer.

2. Air Content Test:

a. Test each mix at random every 150 cu yd or once per day, whichever is more frequent.
b. Test normal-weight concrete according to ASTM C231.
c. Test lightweight concrete according to ASTM C173.
d. For any concrete mix using fly ash, increase testing frequency to every 50 cu yd or once per day, whichever is more frequent.

3. Water Content Tests:

    a. Test each mix at random every 150 cu yd or once per day, whichever is more frequent.
    b. Test according with AASHTO TP 23.

4. Concrete Temperature: ASTM C1064.

    a. One test hourly when air temperature is 40°F (4°C) and below, when 80°F (27°C) and above, and one test for each set of compressive-strength specimens.
    b. Mass Concrete: As required elsewhere in Section 3.11.T.

5. Yield (Unit Weight) Tests:

    a. Test each mix at random every 150 cu yd or once per day, whichever is more frequent.
    b. Test normal-weight concrete according to ASTM C138.
    c. Test lightweight concrete according to ASTM C567.

6. Strength Tests:

    a. Conduct strength tests (composed of five standard cylinders) at random, every 100 cu yd, or once per day, whichever is most frequent.
    b. Secure composite samples in accordance with ASTM C172.
    c. Mold cylinders in accordance with ASTM C31 and cure under standard moisture and temperature conditions in accordance with ASTM C31, Section 7 (a).
    d. Test two cylinders at seven days, and two cylinders at twenty-eight days in accordance with ASTM C39. Twenty-eight-day test result shall be average strength of two cylinders. One cylinder shall be retained in reserve for later testing if required.
    e. When high early strength is required, additional cylinders shall be made and tested at three days.
    f. When required by Testing Agency's contract with Contractor, or as required by the Commissioner, conduct additional cylinder tests for the following:

        1) To assist construction operations, such as formwork removal.
        2) Changes in materials or proportions requested by Contractor after initial mix design reviews.
        3) Additional testing of questionable concrete specified herein.
        4) If one cylinder in a test manifests evidence of improper sampling, molding, or other damage, discard cylinder and base test results on that of remaining cylinder.

    g. Testing Agency shall maintain a compressive strength moving average, comprised of three (3) consecutive strength test results, for each mix design used in Work.
    h. Strength level of concrete will be considered satisfactory provided averages of all sets of three (3) consecutive strength test results (i.e., moving average) equal or exceed specified twenty-eight-day strength,

and no individual strength test result falls below specified twenty-eight-day strength by more than 500 psi.

i. If strength tests fail to meet minimum requirements, concrete represented by such tests shall be considered questionable and shall be subject to further evaluation by core testing as specified herein.

D. Additional Tests: The Testing Agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Commissioner. Testing Agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed.

1. Core Tests: Conduct core tests on questionable concrete as follows:

a. Take at least three representative cores from each member or area of concrete in place that is considered questionable. Location of cores shall be determined by Commissioner so as to least impair strength of structure. Before testing cores, replace any that show evidence of having been damaged subsequent to or during removal from structure or which have reinforcement present.

b. Cores from structure exposed to soil or constant moisture in service (e.g., basement walls, retaining walls, slab-on-grade, piers, footings, etc.) shall be tested wet. Cores for all other concrete may be tested dry. Prior to commencement of coring, verify with Commissioner whether cores are to be tested wet or dry.

c. Test cores in accordance with ASTM C42.

d. Fill core holes with low slump concrete or mortar with a strength equal to or greater than that specified for area cored.

e. Concrete in area represented by core test will be considered adequate if average strength of cores is equal to at least 85% of, and if no single core is less than 75% of, specified compressive strength.

E. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the required strengths, the Commissioner shall have the right to require changes in proportions outlined to apply to the remainder of the work. Furthermore, the Commissioner shall have the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such additional curing shall be at the Contractor's expense. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Commissioner shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the Contractor. In such cases of failure to meet strength requirements the Contractor and Commissioner shall confer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in ASTM C94 is the Contractor in this Section.

F. When the tests on control specimens of concrete fall below the specified strength, the Commissioner will order check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In the case

of cores not indicating adequate strength, the Commissioner, in addition to other recourses, may require, at the Contractor's expense, load tests on any one of the concrete structures in which such concrete was used. Tests need not be made until concrete has aged sixty days.

G. Compression Test Reports: In addition to reporting as outlined in ASTM C39, present the following data in tabular form and distribute after recording test results:

1. Identity of project, Contractor, supplier.
2. Identity of mix and required strength.
3. Pour location of sampled concrete.
4. Slump, air content, truck number, time and date sampled, weather conditions, air temperature, concrete temperature, consistency.
5. Total water quantity and types and quantities of admixtures added to concrete batches.
6. Hot weather concreting operations.
7. Cold weather concreting operations.
8. Curing history.
9. Date tested.
10. Compressive strength.
11. Type of fracture.
12. Compliance with specification.

H. Report deficiencies to the Contractor immediately.

I. At the Commissioner's direction, concrete shown by test not to meet the specified strength requirements shall be removed and replaced at no additional cost to the Commissioner.

J. Slip Resistance Testing:

1. Perform one test for every 100 sq ft of mezzanine slab surface. Concrete walking surface finish to have a minimum value of 0.42 DCOF (Dynamic Coefficient of Friction) measured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of CONCRETE shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of CONCRETE shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 03 00 00.

END OF SECTION

SECTION 03 33 00
CAST-IN-PLACE ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Cast-in-place architectural concrete including, but not limited to: formwork, reinforcement accessories, concrete materials, concrete mix design, embedded plates, interface with waterproofing components, placement procedures, mockups, and finishes.

B. Related Sections:

1. Concrete Formwork: Section 03 10 00.
2. Concrete Reinforcement and Embedded Assemblies: Section 03 20 00.
3. Cast-In-Place Concrete: Section 03 30 00.
4. Sheet Metal Flashing and Trim: 07 62 00.
5. Joint Sealants: Section 07 92 00.
6. Graffiti Resistant Coatings: Section 09 96 23.

1.3 DEFINITION

A. Cast-in-Place Architectural Concrete (ACON): Formed concrete that is designated as architectural and that requires special concrete materials, formwork, placement, and/or finishes to obtain specified architectural appearance. The Drawings indicate the location of ACON.

B. Design Reference Sample: Sample designated by Commissioner that reflects acceptable surface quality and appearance of cast-in-place architectural concrete. The sample is located on the site. Arrange to see the Design Reference Sample with the Commissioner.

1.4 DESIGN REQUIREMENTS

A. ACON Mix Design Requirements:

1. Include corrosion inhibitor as per the Structural Drawings.
2. Meet Severe Weather exposure.
3. Limit measured shrinkage.

B. Joint pattern and location indicated on Drawings.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of manufactured material and product used.

B. Shop Drawings: Show formwork construction including form-facing joints, rustications, construction and contraction joints, form joint sealant details, form cone tie location and patterns, reinforcement, inserts and embedments, cutouts, cleanout panels, and other items that visually affect ACON.

1. Prepare separate shop drawings for mockup.

C. Samples: For each of the following materials:

1. ACON Samples: 12 inches by 12 inches by 2 inches, of finishes, colors, and textures to match Design Reference Sample.
2. Repair Mix Design Samples: 12 inches by 12 inches by 2 inches, of finishes, colors, and textures to match ACON samples.

D. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.7 INFORMATIONAL SUBMITTALS

A. Include manufacturer's literature and installation instructions for materials to be used in the patching and repair work.

B. Qualification Data: For Installer.

1. Provide a minimum of three references that the Commissioner can contact for examples of Installer’s architectural concrete work.
2. Provide written evidence of qualifications and experience. Include locations, descriptions and photographs of completed projects substantiating the quality of the Installer’s experience.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced cast-in-place architectural concrete installer as evidenced by not less than ten consecutive years’ experience specializing in installing cast-in-place architectural concrete similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance.

B. Installer is to retain a quality control inspector, experienced in inspecting cast-in-place architectural concrete, who is an ACI certified Concrete Quality Technical Manager or is certified by ICC as a Reinforced Concrete Special Inspector.

C. Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready mixed concrete products complying with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer: According to the National Ready Mixed Concrete Association, Certification of Ready Mixed Concrete Production Facilities.

D. Source Limitations for Cast-in-Place Architectural Concrete: Obtain each color, size, type, and variety of concrete material and concrete mix from one manufacturer with resources to provide cast-in-place architectural concrete of consistent quality in appearance and physical properties.

E. Verify compatibility of form-facing materials, concrete materials, curing materials, and repair materials with one another.

F. ACI Standards: Comply with ACI 303.1, Specification for Cast-in-Place Architectural Concrete; ACI 301, Specification for Structural Concrete; and ACI 117, Specifications for Tolerances for Concrete Construction and Materials, unless more stringent provisions are indicated.

G. Reference Standards: Comply with the applicable portions of latest editions of the following standards. When conflicts arise between standards and this specification provide the more stringent.

1. ACI 224.3 "Joints in Concrete Construction."
2. ACI 303, "Guide to Cast-In-Place Architecturally Exposed Concrete Practice."

H. Mockups: Before casting architectural concrete, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in the location and of the sizes indicated on the Drawings:
   a. One of 5 inch thick wall section.
   b. One of 36 inch thick wall section.
   c. One of bus stop wall and roof.
2. Notify Commissioner seven days in advance of dates and times when mockups will be constructed.
3. Mockups shall include:
   a. Reveals at actual spacing.
   b. Minimum of one cold joint complete with embedded water stop.
   c. A cast drip edge on one side of the panel.
   d. Corner chamfer according to the Drawings.
   e. Include embed EP-1 and reinforcement.
   f. Tie holes indicated for use in ACON.
   g. Sloping top surface.

h. Use intended materials, including but not limited to, form-facing materials, concrete materials, curing materials, reinforcing, and embedded conduit.
i. Apply Graffiti Resistant Coating over bottom half of each mockup.

4. Demonstrate curing, sealing, coating, cleaning, and protecting of cast-in-place architectural concrete, finishes, rustications, ties, and contraction joints, as applicable.

I. The mockup installation will be reviewed by the Commissioner. Make additional mockups or corrections to the mockup after the first and subsequent reviews, as directed by the Commissioner prior to final review.

1. Following acceptance, mockup will have locations permanently marked by the Commissioner denoting areas for test repairs and graffiti removal (length, width, and depth).
   a. Mockup shall then be permanently damaged / blemished at the marked locations using light weight chipping hammers.
   b. Mockup shall then be graffitied at the marked locations using paint as selected by the Commissioner.
2. Submit a detailed description of the proposed patching and repair techniques and materials for each type of patch or repair to be used in the installation.
3. Provide 12 inches by 12 inches by 2 inches samples of repair mix design if it deviates any way from the original mix design. Show that uniformity of color and texture of the small samples can be consistent to the large samples.
4. Repair damage using approved patching and repair techniques and materials for each type of patch or repair to be used in the installation.
5. Conversations during mockup review evaluations are not final decisions unless specifically noted otherwise. After each on-site review, distribute meeting minutes of discussions held during the mockup evaluations. Meeting minutes shall provide direction for issues resolved on site and provide next steps or action items and responsibilities for work to be completed.
6. For issues requiring replacement of mockup components, within 7 days of receipt of the Commissioner’s response, provide a schedule indicating when the reassembled mockup will be complete and ready for review and re-evaluation.
7. Document final decisions made during mockup review on the Record Shop Drawings for mockups as required. Deviations from decisions made during mockup review, indicated on the fabrication Shop Drawings shall be grounds for rejection of the same.
8. Demonstrate cleaning procedures for ACON for the Commissioner as recommended by the Graffiti Removal Coating manufacturer in writing. Provide a maintenance manual for cleaning ACON. Include as a minimum:
   a. Recommended timing for cleaning.
   b. Equipment required for cleaning.
9. Obtain Commissioner's approval of mockups before casting ACON.
10. Maintain mockups during construction in an undisturbed condition as a standard to judge the quality and workmanship for the remainder of the Work.
    a. Demolish and remove mockups when directed.

1.9 TESTING SERVICES

A. Refer to Section 01 40 00 Quality Requirements.

B. Testing Agency shall be responsible for conducting and interpreting tests, stating within an executive summary at the beginning of each report items that are in non-conformance to the Contract Documents, and specifically noting any deviation therein.

C. Cooperate with testing agency personnel, provide access to Work and manufacturer's operations, and provide and deliver to the laboratory adequate quantities of samples. Samples shall be representative of materials proposed for use which require testing.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle and store material at the job site in such a manner as to prevent damage. Provide packaged material in original containers with seals unbroken and labels intact until time of use. Provide wrapped or bundled material bearing the name of the manufacturer and the product. Remove damaged or otherwise unsuitable material, when so ascertained from the job site.

B. Comply with ASTM C 94/C 94M and ACI 301.

C. ACON shall be manufactured, transported, mixed, and placed at stable consistent temperatures as described herein.
   1. Allowable air temperature surrounding ACON shall be maintained between 50 deg F and 85 deg F.
   2. Air temperatures surrounding ACON shall not deviate by more than +/- 20 deg F from the air temperature at the start of manufacturing through curing.
   3. Air temperature at time of placement shall be a minimum of 65 deg F and rising.
   4. Contractor shall keep a log of daily high and low temperatures throughout the manufacture, mixing, transportation, placement and curing process.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Source Limitations: Obtain each type form-facing material from single source from single manufacturer.

B. Form-facing Panels: Nonabsorptive panel materials that will provide continuous, true, and smooth architectural concrete surfaces.

   1. Exterior grade plywood panels, 3/4 inch thick panels in sizes to cover surface areas between joint lines shown on the drawings:
      a. Plastic coated, birch plywood, "FinnForm" (Plywood & Door Corp.).

C. Rustication Strips: Rigid plastic with sides beveled and back kerfed; nonstaining.

D. Chamfer Strips: Rigid plastic or elastomeric rubber, nonstaining.

E. Form Joint Sealant: Elastomeric sealant complying with ASTM C 920, Type M or S, Grade NS that adheres to form joint substrates.

F. Wood Form Sealer: Penetrating, clear, polyurethane wood sealer formulated to reduce absorption of bleed water and prevent migration from wood of set retarding chemicals.

G. Form Release Agent: Commercially formulated form release agent that will not bond with, stain, or adversely affect architectural concrete surfaces and will not impair subsequent treatments of those surfaces.

H. Form Ties: Factory fabricated, glass fiber reinforced plastic ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish ties with tapered tie cone spreaders that, when removed, will leave holes not larger than 1-1/4 inches in diameter on architectural concrete surface.

2.2 REINFORCEMENT ACCESSORIES

A. General: Comply with Section 03 20 00 Concrete Reinforcement and Embedded Assemblies for steel reinforcement and other requirements for reinforcement accessories.

2.3 CONCRETE MATERIALS

A. Portland Cement: As specified in Section 03 30 00 – Cast-in-Place Concrete.

B. Normal Weight Coarse Aggregate: As specified in Section 03 30 00 – Cast-in-Place Concrete.

C. Normal Weight Fine Aggregate: As specified in Section 03 30 00 – Cast-in-Place Concrete.

D. Water: As specified in Section 03 30 00 – Cast-in-Place Concrete.

E. Fly Ash: The same source of fly ash shall be used for architecturally exposed concrete throughout the project, unless approved otherwise in writing by the Commissioner.

F. Slag and Silica Fume: Slag and Silica Fume are known to have potential for color variation. These products shall not be used in architectural concrete unless the material supplier certifies that the material will achieve a uniform color appearance to the satisfaction of the Commissioner, and the Contractor will replace at the Contractor's own cost if it does not meet the Commissioner's satisfaction.

G. Admixtures: As specified in Section 03 30 00 – Cast-in-Place Concrete and certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

H. Include the following admixtures in ACON:

1. Corrosion Inhibiting Admixture: ASTM C 494, Type C, minimum of 2 gallons per cubic yard of a 30 percent calcium nitrite solution. Acceptable Products include:
   a. "DCI or DCI-S" (GCP Applied Technologies).
   b. "EUCON CIA" (The Euclid Chemical Company).
2. Shrinkage Reduction Admixture: Provide to meet 0.04 percent maximum according to ASTM C127 modified for a 7-day wet cure. Acceptable Products include:
   a. "Eclipse 4500" (GCP Applied Technologies).

2.4 CURING

A. Curing compounds are prohibited.

2.5 REPAIR MATERIALS

A. Materials accepted during the mockup repair process to be used in the patching and repair work.

B. Color Range of Repair Materials: To match color range of ACON.

2.6 CONCRETE MIXES

A. Concrete Mixtures: For basic requirements refer to section 03 30 00 – Cast-In-Place Concrete.

B. For mix design refer to Structural Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Tolerances for forming, placing, installing, and finishing concrete denoted as ACON shall be one-half of those denoted within ACI 117 "Standard Tolerance for Concrete Construction and Materials."

3.2 FORMWORK INSTALLATION

A. General: Comply with Section 03 10 00 – Concrete Formwork for formwork, embedded items, and shoring and reshoring.

B. Limit deflection of form-facing panels to not exceed one-half of ACI 301 requirements.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, to Class A, except 1/16 inch.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-in-place surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf rustication strips and chamfer strips for easy removal.

E. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

F. Chamfer exterior corners and edges of ACON as indicated on the drawings.

G. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

H. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

I. Seal form joints and penetrations with form joint sealant to prevent leakage.

J. Retighten forms and bracing before placing concrete, as necessary to prevent leakage and maintain proper alignment.

K. Coat contact surfaces of forms with form release agent, according to manufacturer's written instructions, before placing reinforcement, anchoring devices, and embedded items.

3.3 REINFORCEMENT AND INSERT INSTALLATION

A. General: Comply with Section 03 20 00 Concrete Reinforcement and Embedded Assemblies, for fabricating and installing steel reinforcement.

B. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.4 REMOVING AND REUSING FORMS

A. Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, provided concrete is hard enough not to be damaged by form removal operations and provided curing and protection operations are maintained.

1. Schedule form removal to maintain surface appearance that matches approved mockups. Verify surface appearance and color is achieved before removal of forms.
2. Cut off and grind glass fiber reinforced plastic form ties flush with surface of concrete.

B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete, in place until concrete has achieved at least 70 percent of 28-day design compressive strength. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

C. Clean and repair surfaces of forms to be reused in the Work. Do not use split, frayed, delaminated, or otherwise damaged form-facing material. Apply new form release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for ACON surfaces.

3.5 JOINTS

A. Construction Joints: Install construction joints true to line with faces perpendicular to surface plane of ACON so strength and appearance are not impaired, at locations indicated on the Drawings.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
2. Form flush panel joints and control joints as indicated.
3. Locate joints as indicated.
4. Cold joints shall be detailed as a typical control joint.
5. Joints shall have an embedded waterstop installed according to the Structural Drawings.

3.6 CONCRETE PLACEMENT

A. Refer to section 03 30 00 – Cast-In-Place Concrete.

B. ACON shall be manufactured, transported, mixed, and placed in accordance with Project Conditions specified herein.

1. Maintain a log of daily high and low temperatures throughout the manufacture, mixing, transportation, placement, and curing process.

3.7 FINISHES - GENERAL

A. ACON Finish: Match the final approved mockup.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

C. Maintain uniformity of ACON finishes over construction joints, unless otherwise indicated.

3.8 AS-CAST FORMED FINISHES

A. Smooth Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/16 inch in height.

B. Rubbed Finish: Apply the following to smooth formed finished concrete:

1. Smooth Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

3.9 CONCRETE CURING

A. Comply with Section 03 30 00 Cast-In-Place Concrete using identical curing procedures to that used for mockups.

B. Provide a minimum 7 day wet cure for architectural concrete.

3.10 FIELD QUALITY CONTROL

A. General: Comply with Section 03 30 00 – Cast-in-Place Concrete, for field quality control requirements.

B. Shrinkage Test

1. Comply with ASTM C127 modified for a 7-day wet cure.
2. Shrinkage measured shall be less than 0.04 percent maximum.

C. Make protected ACON available for viewing upon request of the testing agency, the Commissioner, and their agents.

3.11 REPAIRS

A. Repair damaged finished surfaces of ACON.

B. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mockups.

C. Remove and replace ACON that cannot be repaired to Commissioner's approval.

3.12 PROTECTION AND CLEANING

A. Protect corners, edges, and surfaces of ACON from damage according to protection methods from the mockup during remainder of construction period.

B. Protect ACON from staining, laitance, and contamination according to protection methods from the mockup during remainder of construction period.

C. Clean ACON surfaces after finish treatment to remove stains, markings, dust, and debris.

D. Wash and rinse ACON surfaces according to concrete finish applicator's written recommendations. Protect other work from staining or damage due to cleaning operations.

1. Do not use cleaning materials or processes that could change the appearance of ACON finishes.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The Work of CAST-IN-PLACE ARCHITECTURAL CONCRETE shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of CAST-IN-PLACE ARCHITECTURAL CONCRETE shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER Architectural Work: 090000

END OF SECTION

SECTION 03 41 00

PRECAST CONCRETE PLATFORM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies requirements for Precast Concrete Platform system. The work under this Section shall consist of furnishing all labor, materials, and equipment required to provide and install the Precast Concrete Platform system, including hoisting and attachment plates and accessories, expansion joints, edge options, sealer, etc., at the locations shown on the drawings and as shown on the drawings, specified herein and as otherwise required for a complete installation including all accessories other appurtenant work required to complete this work.

B. Related Sections: The following sections contain requirements that relate to this Section.

1. Section 03 20 00 – Concrete Reinforcement and Embedded Assemblies.
2. Section 03 30 00 – Cast-in-Place Concrete.
3. Section 03 33 00 – Cast-In-Place Architectural Concrete
4. Section 07 90 00 – Joint Sealers.
5. Section 09 30 10 – Tactile Edge.

C. Definitions:

1. Definition of project terms and abbreviations are found within Specification Section 01 35 00.

1.03 REFERENCES

A. Acronyms for reference standards are defined in Section 01 42 00.1.

B. Precast and Prestressed Concrete Institute PCI MNL 117 – Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

C. Testing: In compliance with applicable provisions of Prestressed Concrete Institute PCI MNL 117 – Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

D. Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, latest edition.

E. AASHTO T160 – Standard Method of Test for Length Change of Hardened Hydraulic Cement Mortar and Concrete.

F. ACI 117 – Specification for Tolerances for Concrete Construction and Materials.

G. ACI 301 – Specifications for Structural Concrete.

H. ACI 318 – Building Code Requirements for Reinforced Concrete.

I. AWS D1.1 & D1.5 – Structural Welding Code.

J. Chicago Building Code.

K. ANSI B 101.1 – Test Method for Measuring Wet Static Coefficient of Friction of Common Hard-Surface Floor Materials.

L. ANSI B 101.3 – Test Method for Measuring Wet Dynamic Coefficient of Friction of Common Hard-Surface Floor Material.

M. ANSI A 326.3 – American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

N. ASTM C157 – Standard Test Method for the Length Change of Hardened Hydraulic-Cement Mortar and Concrete.

O. ASTM C672 – Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.

P. ASTM E303 – Standard Test Method for Measuring Surface Functional Properties Using the British Pendulum Tester.

1.04 PERFORMANCE REQUIREMENTS

A. Concrete platform walking surface test on samples of concrete platform with specified finish for the project.

1. Slip Resistance: Test each concrete surface finish to be used for walking surfaces. Slip resistance tests must be performed by a qualified independent testing agency approved by the Authority and the tests to be done according to ANSI B 101.3, Test Method for Measuring Wet DCOF (Dynamic Coefficient of Friction) of Common Hard Surface Floor Materials using the BOT-3000E digital tribometer measuring device and/or according to ASTM E303 using the British pendulum tester. The test device and method to be as selected by and approved by the Commissioner. The dynamic coefficient of friction shall have a minimum value of 0.42 measured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.

2. Final design of all precast shall be the sole responsibility of the Contractor. Contractor's SSE experienced in precast prestressed concrete design shall submit design calculations for approval by the Commissioner.

1.05 SUBMITTALS

A. Submit, in accordance with Section 01 25 00 Submittals, shop drawings, product data, and samples as required below:

1. Erection Shop Drawings shall include:

a. Plans and/or elevations locating and defining all material to be furnished by the manufacturer.
b. Sections and details showing connections, cast-in items, design reinforcement, and their relationship to the structure.
c. Description of all loose, cast-in and field hardware.
d. Details showing blockouts, insets, corner finishes, and edge finishes.
e. Field installation and/or location drawings.
f. Erection sequences and handling requirements.
g. All dead, live, and other applicable loads used in the design.
h. Signed and sealed calculations.
i. Shop drawings shall be submitted for approval.

2. Piece drawings shall include:

a. Elevation view of each member.
b. Sections and details indicating quantities and position of reinforcing steel, anchors, inserts, etc.
c. Erection and lifting inserts.
d. Dimensions and finishes.
e. Prestress for strand and concrete strengths.
f. Estimated cambers.
g. Method of transportation.
h. Edge options.
i. Expansion joint details and materials.
j. Detail for tactile edge.
k. Detail for edges between panels including backer rod and sealant.
l. Reinforcement layout, dimensions and spacings.
m. Form sizes, layout, details, type, inserts and projections.
n. Piece drawings shall be submitted for record, and not approval.

3. Product Data:

a. The Contractor shall submit design calculations that indicate conformance with the following design requirements:

1) Initial handling and erection stresses.
2) 25 psf wind load, acting either inward or outward, or upward and downward.
3) All other loads specified for member where they are applicable.

b. Provide product data and specifications for the concrete mix design and any additives.
c. Provide product data and specifications for reinforcing and any inserts.
d. Provide concrete pour requirements including environmental conditions and concrete curing requirements.
e. Provide product data, specifications, and installation instructions for expansion joint system including cover, backer rod, sealant, and other accessories.
f. Provide product data, specifications, and installation instructions for concrete sealer.
g. Provide product data, specifications, and installation instructions for sealant and backer rod to be used at joints between panels.
h. Product data for the concrete embedded tactile warning strip.

4. Design calculations of products not completed on the contract drawings shall be performed by a Licensed Structural Engineer in the State of Illinois, experienced in precast prestressed concrete design and submitted for approval upon request.
5. Samples:

a. Prior to fabrication of all the units, the Contractor shall provide a minimum of ten samples of precast concrete material as specified herein to determine an acceptable range of color and texture for the completed installed Precast Concrete Platform deck.

6. Mockups:

a. Cast and finish two (2) 4 ft square panel samples to be reviewed and approved by the Commissioner. Casting and finishing methods shall be the same as those to be used for the actual platform deck panels.
b. Provide mockup of expansion joint.
c. Include detail for tactile edge.
d. Provide mockup of any optional edge details.
e. Provide mockup of any optional edge details.
f. Provide sample finish for precast concrete walking surface.
g. Include within mockup the tactile warning strip product approved by the Commissioner.
h. Do not proceed with installation until mockups have been inspected and approved by the Commissioner.
i. Retain approved mockups and bid sample for 1 year following completion of project to be used as a quality standard during and after construction.
j. Contractor will provide detailed schedules for all mockup reviews by the Commissioner and their agents.
k. Conversations during mockup review evaluations are not final decisions unless specifically noted otherwise. After each on-site review, Contractor will distribute meeting minutes of discussions held during the mockup evaluations and will distribute the same for record. Meeting minutes will provide direction for issues resolved on site and provide next steps or action items and responsibilities for work to be completed.
l. For issues requiring replacement of mockup components, the Contractor will, within seven days of receipt of the Commissioners response, provide

a schedule indicating when the reassembled mockup will be complete and ready for review and re-evaluation.

m. Fully document final decisions made during mockup review on the Record Shop Drawings for each preconstruction mockup as required in the Submittals article of this Section. Any deviations indicated on the Fabrication Shop Drawings from decisions made during mockup review shall be grounds for rejection of the same.

B. Test Reports:

1. Reports of tests on concrete and other materials according to all requirements of 03 30 00.
2. Test report for coefficient of friction for precast concrete walking surface. Once testing method and criteria for approval have been approved by the Commissioner, submit minimum five test results with mix design submittal for precast.
3. Shrinkage testing using ASTM C157 or AASHTO T160 modified for a seven-day wet cure.
4. Scaling Testing: Visual rating equal or less than 2 after 50 cycles per ASTM C672. Submit results for a minimum of four tests at the time of mockup.

C. Concrete Sealer: Provide product data, specifications, and installation instructions for concrete sealer.

D. Provide specifications, installation instructions, and manufacturer's recommendations for sealant, backer rod, and expansion joint materials.

E. Certifications: Submit copies of current certifications in good standing from PCI for both the proposed fabricator of the precast concrete panels and the proposed erector of the precast concrete panels for the Authority's verification and approval prior to contracting with the respective subcontractor.

F. Expansion Joint Cover Installer: Provide certification from manufacturer of expansion joint system stating that installer of the system is approved to install the manufacturer's system.

G. Sealant Installer: Provide certification from manufacturer of sealant stating that installer of sealant is approved to install the manufacturer's sealant.

1.06 QUALITY ASSURANCE

A. Acceptable Manufacturers: A company specializing in providing precast concrete products and services associated with the industry for at least 5 years. Written evidence shall be submitted documenting experience and plant adequacy to fulfill the contract requirements. Precaster must be PCI certified.

B. Installer Qualifications: An authorized representative who is trained and approved by the manufacturer.

1. Installer of the panels shall be regularly engaged for at least 5 years in the erection of precast structural concrete products similar to the requirements of this contract. Erector must be PCI certified.
2. Installer of the expansion joint cover assembly and the installer of the sealant and backer rod at joints between panels must be experienced in the installation of their respective systems and must be approved by the respective manufacturers for proper installation of the materials.

C. Testing Agency: The Contractor shall submit a minimum of three (3) names and qualifications of Testing Agency to the Commissioner for approval prior to start of Construction. All quality control, testing, and related submittals and reports within the contract documents (including field quality control and field testing) shall be the responsibility of the Testing Agency.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling: Precast members shall be lifted and supported only at lifting or supporting points, or both, and with the approved lifting devices during manufacturing, stockpiling, transporting and erecting operations. All lifting devices shall have a minimum safety factor of 4.

B. Storage:

1. Minimize on-site storage of stockpiled materials.
2. Store all units off ground.
3. Place stored units so that identification marks are discernable.
4. Separate stacked members by battens across full width of each bearing point.
5. Stack so that lifting devices are accessible and undamaged.
6. Do not use upper member of stacked tier as storage area for shorter member or heavy equipment.

1.08 COORDINATION

A. Coordinate work of this section with other subcontractors to verify required dimensions and locations including for inserts, anchors, anchor bolts, plates, conduit, and other items to be embedded in the concrete or installed with the concrete.

B. Coordinate the delivery of embedded items or items to be installed with the precast concrete so as to avoid delays to the installation of the new work.

1.09 WARRANTY

A. Concrete Precast Platform Panels: Furnish a 20 year from date of final acceptance written warranty in form stipulated by the Authority, signed by the Contractor, agreeing to repair or replace work which has failed in resistance to abrasion, weather, discoloration, or otherwise failed as a result in materials or workmanship. Failure includes deflection of the panels, cracking of the concrete, and spalling at the concrete surface. Upon notice of such defects, within the warranty period, make

necessary repairs or replacement as approved by the Authority and at no cost to the Commissioner.

B. Expansion Joint Assemblies: Furnish a 1 year from date of final acceptance written warranty in form stipulated by the Authority, signed by the manufacturer and installer of the expansion joint assembly, agreeing to repair or replace work which has failed to provide airtight or watertight joints, failed in resistance to abrasion and weather or otherwise failed as a result in materials or workmanship. Failures also include degradation of the finish, dislodging of the components, bending, denting, cracking and its attachment to the substrate failing or loosening. If applicable, the warranty shall also cover the elastomeric parts of the assembly. The manufacturer and installer shall repair or replace the expansion joint cover assembly to the Commissioner's satisfaction and at no cost to the Commissioner.

C. Joint Sealant: Furnish a 5 year from date of final acceptance written warranty in form stipulated by the Commissioner, signed by the Contractor, Sealant Manufacturer, and Sealant Installer; agreeing to repair or replace work which has failed to provide airtight or watertight joints, failed in adhesion or cohesion, failed in resistance to abrasion, weather, extrusion, migration, staining, or otherwise failed as a result in materials or workmanship. Upon notice of such defects, within the warranty period, make necessary repairs or replacement as approved by the Authority and at no cost to the Commissioner

PART 2 - PRODUCTS

2.01 MATERIALS

A. Portland Cement: ASTM C150, domestically produced.

1. Type I, normal Portland cement.
2. Type III, high-early-strength Portland cement. All provisions of the specifications shall apply except that the seven-day compressive strength shall equal the twenty-eight-day strength required for normal concrete.

B. The same brand and type of Portland cement shall be used for exposed concrete throughout the project unless approved otherwise in writing by the Commissioner.

C. Coarse Aggregate: ASTM C33. Recycled aggregate is prohibited.

D. Fine Aggregate: ASTM C33.

E. Water-Reducing Admixture:

1. ASTM C494, Type A.
2. "Pozzolith 322N" (Master Builders Co.).
3. "WRDA" (W.R. Grace & Co.).
4. "Plastocrete 161" (Sika Chemical Corp.).

F. Fly Ash: ASTM C618.

G. Calcium Chloride: Shall not be used.

H. Water: Should be potable.

I. Reinforcing Steel: Shall be in accordance with Section 03 20 00 Concrete Reinforcement, and shall be galvanized.

J. Strand: Uncoated 7-wire, Stress-Relieved Strand: ASTM A416 – Grade 270K.

K. Anchors and Inserts:

1. Materials:

a. Structural Steel: ASTM A36.
b. Malleable Irons: ASTM A47.
c. Stainless Steel: ASTM A316.

2. Finish: Hot-Dipped Galvanized: ASTM A153.

L. Grout: Shall be nonmetallic, nongaseous, non-shrink type in accordance with ASTM C1107 and GRD-C 621, Corps of Engineers specification for nonshrink grout. Compressive strength of grout shall be a minimum of 7,500 psi in accordance with ASTM C109. Duragrout (L&M Construction Chemical), NS Grout (Euclid) or set grout (Master Builders Co.).

M. Expansion Joint Cover Assemblies: See Specification Section 07 95 13.

N. Joint Sealers: See Specification Section 07 90 00.

2.02 CONCRETE MIXES

A. Twenty-Eight-Day Compressive Strength: Minimum of 6,000 psi.

B. Release Strength: Minimum of 5,000 psi.

C. Use of calcium chloride, chloride ions, or other salts will not be permitted.

D. Maximum concrete slump shall be 3 in.

E. Admixtures shall conform to ASTM C260 and be approved by the Commissioner.

F. Corrosion-inhibiting admixtures shall be included in all precast:

1. ASTM C 494, Type C.
2. Minimum of 2 gal pcy of a 30% calcium nitrite solution.
3. Acceptable products include, but are not limited to:

a. W.R. Grace's "DCI or DCI-S."
b. The Euclid Chemical Company's "EUCON CIA."

G. Shrinkage Reduction Admixture: Provide to meet 0.04% maximum shrinkage according to ASTM C127 modified for a seven-day wet cure.

1. Acceptable products include, but are not limited to:

a. GCP Applied Technologies "Eclipse 4500."

2.03 FABRICATION

A. Manufacturing procedures shall be in accordance with PCI MNL-117 and as necessary to fulfill the requirements specified herein.

B. Dimensional Tolerances of Finished Units: Comply with PCI MNL-117. Overall height and width measured at face adjacent to mold at time of casting:

1. 10 ft or Under: Plus or minus 1/8 in.
2. 10 ft to 20 ft: Plus 1/8 in. and minus 3/16 in.
3. Out of Square (difference in length of two diagonal measurements): 1/8 in. per 10 ft.
4. Thickness: Plus or minus 1/8 in.
5. Tolerances of Other Dimensions Not Otherwise Indicated: Plus or minus 1/16 in. per 10 ft.

C. Slope or Bow: Provide camber as required to allow panels to lay flat after installation compensating for deflection and depending upon actual span and loading. Provide any slope at top surface of panels shown on drawings for drainage in direction of drainage.

D. Position Tolerances: For cast-in items measured from datum line locations as shown on shop drawings.

1. Anchors and Inserts: Within 3/8 in. of centerline location.
2. Blockouts and Reinforcements: Within 1/4 in. of position shown on the shop drawings.
3. Bearing Plates: Within 1/4 in. transverse (measured perpendicular to platform stringers) and 3/8 in. longitudinal (measured parallel to platform stringers) of position shown on the shop drawings.

E. Fabrication:

1. Fabricate units, smooth, and true to line, size, and shape, with exposed edges and precise and square corners, unless otherwise indicated. Provide notches or box-outs in the Precast Concrete Platform panels as required for the installation of the expansion joint systems according to recommendations and dimensions supplied by the expansion joint system manufacturer.
2. The finished surface shall be even in texture and uniform in color. Pointing or patching surfaces, lines, or corners shall not be permitted. Precast units which are warped, cracked, broken, spalled, stained, badly formed, have surface imperfections, or are otherwise defective will not be accepted.

F. Built-in Items: Provide slots, holes, and other precast accessories in units to receive attachments and other similar work as indicated below and as required by the drawings.

1. Provide stainless steel or galvanized steel inserts and sleeves cast into units for attachment of loose hardware, connection of structural members, or installation of miscellaneous components.
2. Provide ASTM A36 steel bearing plates with welded studs cast into units for field attachment of the Precast Concrete Platform to the supporting members.

G. Anchorages: Provide loose stainless steel, galvanized steel, or primed steel items such as plates, shims, clip angles, seat angles, anchors, dowels, clamps, hangers, and other miscellaneous steel shapes not provided by other trades, as necessary to secure precast unit to supporting and adjacent members as required by the drawings.

H. The color and surface texture of the Precast Concrete Platform shall be similar for the entire project. All panels for the station shall be supplied by the same precast manufacturer.

I. Finishes:

1. Exposed Walking Surfaces:

a. Precast Concrete Platform walking surface shall be aggressively sandblasted in the factory in accordance with PCI's "Heavy Blasting" and to match the sample approved by the Authority.
b. Slip Resistance: Concrete platform walking surface finish to have a minimum value of 0.42 DCOF (Dynamic Coefficient of Friction) measured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.
c. Perform test a minimum of once on the walking surface of every piece of precast.

2. Nonwalkable Surfaces: Result of casting against approved steel forms. Normal color variations permitted. Minor indentations, minor chips, and spalls will not be permitted. No major imperfections, honeycombing, or other defects will be permitted.
3. Exposed Vertical Ends: Strands shall be recessed and the corners of the members shall have 3/4 in. chamfers as shown on the drawings.

J. Openings: The manufacturer shall provide additional reinforcing for those openings 10 in. round or square or larger as shown on the drawings. The Contractor shall be responsible for providing and coordinating all openings necessary for all systems. Openings not shown to be provided in the casting process shall be field located and drilled or cut by the trade after the precast products have been erected.

K. Edge Recess: The manufacturer shall control the depth of the tactile edge strip recess as required to conform to tolerance requirements for finish installation.

L. Patching: Patching is not acceptable without the prior approval of the Commissioner. In no case shall the Contractor install patching that compromises the structural performance or appearance of the installed product.

M. Fasteners: The manufacturer shall cast in structural inserts, bolts, and plates as detailed or required by the drawings.

2.04 DECK JOINTS

A. Expansion Joints: The Contractor shall provide expansion joints between adjacent Precast Concrete Platform panels and at locations shown on the drawings. The installed Precast Concrete Platform or the installed expansion joint system shall not bridge or impede the expansion or contraction movements of the structural framing members.

1. The Contractor shall provide a Type SS6FS-2 expansion joint system as manufactured by the Balco/Metalines Co. or approved equal.
2. Provide all required materials and accessories to ensure a complete installation.

B. Control Joints: The Contractor shall provide all materials and accessories required for the installation of sealed control joints as detailed on the drawings. Provide scored joints if indicated on the drawings; at locations shown on the drawings. Size to match actual joints between panels.

C. Joints between panels shall have a design width of 3/8 in. Provide a backer rod and sealant at joints between panels. Sealant shall be continuous and joint shall be waterproof. Sealant shall be installed strictly in accordance with sealant and backer rod manufacturer's recommendations and instructions for conditions for installation, preparation of the materials, installation, depth of sealant in relation to width of joint, and curing. See sealant specification section.

1. Recommended Sealants for Joints between Precast Concrete Platform panels:

   a. Sikaflex-2c NS or SL as manufactured by the Sika Corporation.
   b. Vulkem 45 SSL as manufactured by Tremco.
   c. MasterSeal SL 100 as manufactured by BASF Corporation.
   d. Approved equal.

2. Sealant color shall match the substrate.

2.05 TACTILE TILE

A. The manufacturer of the Precast Concrete Platform shall coordinate with the Tactile Tile supplier to obtain the final tile dimensions and any other special conditions required by the Tactile Tile supplier for a successful installation of the tile.

B. The Tactile Tile shall conform to the requirements of the specification section for the Tactile Platform Edge Tile.

2.06 CONCRETE COATING

A. The Precast Concrete Platform shall be sealed with a clear, water-based penetrating sealer for protection against water, chloride ions, and stains. Sealer shall be clear and not discolor the concrete surface to which it is applied.

B. Sealer to be VOC compliant and abrasion-resistant.

C. Materials:

1. MasterProtect H200 (formerly Enviroseal 20) as manufactured by BASF Specialty Chemicals.
2. SIL-ACT ATS-22 VOC as manufactured by Advanced Chemical Technologies.
3. Approved equal.

2.07 SHIMS

A. Shims used to level the precast panels shall be made from inert plastic with a compressive strength in excess of 5,000 psi.

B. Materials:

1. Korolath Shim Packs as manufactured by Korolath of New England.
2. Shimmers Shim Packs as manufactured by JVI, Inc.
3. Approved equal.

PART 3 - EXECUTION

3.01 FABRICATION

A. Construction methods and testing shall be in accordance with the applicable provisions of the specification section, "Cast-in-Place Concrete" and with Section 504, Precast Concrete Structures of the Standard Specifications unless otherwise specified herein.

1. Precast Concrete Platform panels to be of dimensions and thickness as shown on drawings and approved shop drawings.
2. Provide cut out for canopy columns and other construction. Size and location as shown on approved shop drawings. Depress surfaces as shown and detailed on the drawings.
3. Provide block out or recess as required for flush installation of expansion joint cover assembly for those panels at either side of an expansion joint.

3.02 ARCHITECTURAL SURFACE TEXTURE

A. The architectural surface texture and finish of all precast members shall match the surface and texture of the approved sandblasted test panels specified herein.

3.03 CURING

A. The Precast Concrete Platform panels shall be kept in their casting position until they are cured sufficiently to meet the handling stresses during installation. Cracked, spalled, chipped, or damaged panels shall be replaced at the Contractor's own expense.

3.04 ERECTION

A. Preparation: The General Contractor shall be responsible for:

1. Providing true, level bearing surfaces on all field-placed bearing walls and other field-placed supporting members.
2. The placement and accurate alignment of anchor bolts, plates, stringers, required shim plates, and other field-placed supporting members. Coordinate with precast supplier.

B. Precast panel supplier shall inspect and approve support structure for precast panels. Verify dimensions and location and size of openings. Any discrepancies between approved shop drawings and actual installation shall be resolved prior to installation of the panels.

C. Installation: Installation of the Precast Concrete Platform panels shall be performed by a competent erector approved by the manufacturer. Members shall be lifted by means of suitable lifting devices at points provided by the manufacturer. Temporary shoring and bracing, if necessary, shall comply with the manufacturer's recommendations.

D. Alignment: Members shall be properly aligned and leveled as required by the approved shop drawings. Variations between adjacent members shall be within the tolerances specified in PCI MNL-117 and limits of erection tolerances specified herein.

1. Panels shall be properly aligned utilizing a template on the tracks for each panel such that the inner edge of the platform, adjacent to the track, is located exactly 4 ft-7 in. from the track centerline and the top of deck is 3 ft-6 in. above the top of rail.

E. Panels shall create a continuous flush walking surface for the platform. There shall be no tripping hazard at the joints between panels. Panels that are excessively bowed or otherwise compromised in their dimensional tolerances shall not be used.

3.05 CONTROL JOINTS

A. Joints between adjacent precast concrete panels shall be filled with premolded joint filler, backer rod and sealant as shown on the drawings.

B. The Contractor shall adjust the panels prior to the connection of the panels to the steel platform stringers such that the control joint tolerances are maintained.

C. Joints between panels shall have a backer rod and sealant installed. Sealant shall be continuous and joint shall be waterproof. Sealant shall be installed strictly in accordance with sealant and backer rod manufacturer's recommendations and instructions for conditions for installation, preparation of the materials, installation, depth of sealant in relation to width of joint, and curing. See sealant specification section.

3.06 EXPANSION JOINTS

A. Install expansion joints between adjacent Precast Concrete Platform panels at all locations shown on the drawings. Install expansion joints between panels set at clearances with the manufacturer's installation requirements to provide for a watertight seal.

B. The Precast Concrete Platform panels shall be installed such that the expansion joint measurements (face to face of panel edges) match the clear dimensions shown on the drawings, adjusted for temperature, and to the tolerances required by the expansion joint manufacturer. Contractor shall adjust the panels prior to the connection of the panels to the steel platform stringers such that the expansion joint tolerances are maintained.

3.07 FIELD WELDING

A. Field welding of the platform panel bearing plate to the steel stringer is to be performed by a qualified welder using equipment and materials compatible to the base material.

3.08 ATTACHMENTS AND PENETRATIONS

A. Subject to the approval of the Commissioner, Precast Concrete Platform panels may be drilled or "shot" provided that no contact is made with the reinforcement bars. Should spalling occur, it shall be repaired by the Contractor to the satisfaction of the Commissioner or the panel shall be replaced.

3.09 TOLERANCES

A. The Precast Concrete Platform deck shall be fabricated and erected such that when assembled the joints between panels shall be 3/8 in. in width within the tolerance of plus or minus 1/16 in.

B. The Precast Concrete Platform decks shall be fabricated and erected such that when assembled the inner edge of the platform, adjacent to the track, shall be in perfect alignment. The outer edge of the precast platform deck shall be in alignment; however, a deviation of plus or minus 1/8 in. at this location will be acceptable.

3.10 PLACEMENT

A. Placement of the Precast Concrete Platform shall be coordinated with adjacent elements of construction to ensure proper installation, bearing, and conformance with the requirements for tolerances.

3.11 INSPECTION

A. The Precast Concrete Platform will be shop and field inspected by the Authority. Units with spalled or cracked concrete will be rejected. Bowed or dimensionally incorrect panels will be rejected. Visible chips larger than 1/8 in. deep, 1/2 in. wide, and 3/4 in. long will be rejected. All panels with such spalling, cracks, chips, other surface defects, bowing, dimensional irregularities, or other defects not meeting the approval of the Authority shall be replaced by the Contractor, at the direction of the Authority and at no expense to the Authority and no delay to the completion of the work.

3.12 CONCRETE COATING

A. The Concrete Sealer shall be applied in the field after the Precast Concrete Platform has been installed and according to the sealer manufacturer's directions and recommendations. Sealer shall not reduce the coefficient of friction of the walking surface of the panels.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of PRECAST CONCRETE PLATFORM shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of PRECAST CONCRETE PLATFORM shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Lintels.
3. Mortar and grout.
4. Masonry-joint reinforcement.
5. Miscellaneous masonry accessories.

1.03 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 REFERENCES

A. Masonry Standards Joint Committee (MSJC):

1. "Building Code Requirements and Specifications for Masonry Structures."

B. American Concrete Institute (ACI):

1. ACI 315, Details and Detailing of Concrete Reinforcement.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.

1.06 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include data on material properties and material test reports substantiating compliance with requirements.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

B. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.02 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.03 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
2. Density Classification: Medium weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

2.04 MASONRY LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.05 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.

D. Aggregate for Mortar: ASTM C 144.

E. Aggregate for Grout: ASTM C 404.

F. Water: Potable.

2.06 REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Mill- galvanized, carbon steel.
2. Wire Diameter for Side Rods: 0.1483 inch.
3. Wire Diameter for Cross Rods: 0.1483 inch.
4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

D. Subject to compliance with requirements, manufacturers offering joint reinforcement that may be incorporated in the Work include, but are not limited to, the following:

1. Heckman Building Products, Inc.
2. Hohmann & Barnard, Inc.
3. Masonry Reinforcing Corp. of America, DBA Wire-Bond.

2.07 TIES AND ANCHORS, GENERAL

A. Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Heckman Building Products, Inc.
2. Hohmann & Barnard, Inc.
3. Masonry Reinforcing Corp. of America, DBA Wire-Bond.

2.08 TIES AND ANCHORS

A. Materials: Provide ties and anchors made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 1064/A 1064M, with ASTM A 641/A 641M, Class B-2 coating.
2. Stainless-Steel Wire: ASTM A 580/A 580M, UNS S30400 or UNS S31600.
3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
4. Stainless-Steel Sheet: ASTM A 240/A 240M UNS S30400 or UNS S31600.
5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
6. Stainless-Steel Bars: ASTM A 276 UNS S30400 or UNS S31600.

B. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- thick steel sheet, galvanized after fabrication or 0.109-inch- thick, stainless-steel sheet.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch-diameter, hot-dip galvanized steel or stainless-steel wire.
3. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.075-inch- thick steel sheet, galvanized after fabrication or 0.078-inch- thick, stainless-steel sheet with dovetail tabs for inserting into dovetail slots in concrete.

C. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication or stainless steel.

2.09 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.

2.10 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

B. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2-cup dry measure) and laundry detergent (1/2-cup dry measure) dissolved in one gallon of water.

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride in mortar or grout.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For reinforced masonry, use Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476 and referenced unit masonry standard.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that foundations slab are within tolerances specified.
2. Verify that reinforcing dowels are properly placed.
3. Verify that substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.03 TOLERANCES

A. Comply with construction tolerances of referenced unit masonry standard and as follows:

1. Variation from Plumb: 1/4 inch in 10 feet; 1/2 inch maximum for building.
2. Variation from Level: 1/4 inch in 10 feet; 1/2 inch maximum.
3. Variation from Plan Lines: 2 inch in 20 feet; 3/4 inch maximum.
4. Variation in Cross Section: Do not exceed the following construction tolerances for thicknesses of walls and other masonry elements: Minus 1/4 inch or Plus 1/2 inch.
5. Variation in Mortar Joint Thickness: Bed Joints: Plus or Minus 1/8 inch; Head Joints Minus 1/4 inch, Plus 3/8 inch.

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

E. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 43 Joint Firestopping.

3.05 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in grouted masonry, including starting course on footings.

3. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Masonry Joints: Make mortar joints visually and dimensionally consistent. Unless otherwise indicated, maintain horizontal and vertical mortar joint widths of 3/8 inch.

E. Resetting: Do not pound, tap, or otherwise attempt to adjust masonry units after initial set has occurred. Remove units which require adjusting, clean thoroughly, and reset in fresh mortar.

3.06 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 1/2 inch. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

B. Provide continuity at wall intersections by using prefabricated T-shaped units.

C. Provide continuity at corners by using prefabricated L-shaped units.

D. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

E. Placing Reinforcement: Comply with TMS 602/ACI 530.1/ASCE 6.

F. Splicing: Provide lapped splices of minimum size indicated or permitted by governing code at locations shown.

3.07 ANCHORING MASONRY TO STRUCTURAL CONCRETE

A. Dovetail Slot Anchor/Ties:

1. Remove slot insert completely before installing anchor/ties.
2. Install dovetail anchor/ties in cast-in-place dovetail slots spaced a maximum of 16 inches o.c. vertically and 32 inches o.c. horizontally unless shown or noted otherwise on the Drawings.

B. Top of Wall Stabilizing Anchors:

1. Install and anchor specified top of wall stabilizing anchors as shown on the Drawings, if not shown, install and space not more than 32 inches o.c. horizontally and anchor to structure.
2. Install plastic tube in top of masonry wall to allow for insertion of pin anchor in tube.

3.08 LINTELS

A. Provide masonry lintels where shown and where openings of more than 24 inches for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.09 REINFORCED UNIT MASONRY INSTALLATION

A. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 51 inches.

B. Vertical cell fins shall be no greater than 1/4 inch.

3.10 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Commissioner's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.

5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.11 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of UNIT MASONRY shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of UNIT MASONRY shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 04 24 00

GLAZED CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Prefaced concrete masonry units.
2. Lintels.
3. Mortar and grout.
4. Masonry-joint reinforcement.
5. Miscellaneous masonry accessories.

1.03 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 REFERENCES

A. Masonry Standards Joint Committee (MSJC):

1. "Building Code Requirements and Specifications for Masonry Structures."

B. American Concrete Institute (ACI):

1. ACI 315, Details and Detailing of Concrete Reinforcement.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.

C. Samples: Manufacturer's standard color selection charts.

1.06 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include data on material properties and material test reports substantiating compliance with requirements.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

B. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations for Glazed Concrete Masonry Units: Obtain glazed masonry units of a uniform texture and color, within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.02 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

2.03 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for cove bases, lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged, glazed end units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
2. Density Classification: Medium weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

C. Prefaced CMUs: Lightweight hollow concrete units complying with ASTM C 90, with manufacturer's standard smooth resinous facing complying with ASTM C 744.

1. Size: Manufactured to dimensions specified in "CMUs" Paragraph but with prefaced surfaces having 1/16-inch- wide returns of facing to create 1/4-inch- wide mortar joints with modular coursing.
2. Colors and Patterns: As selected by Commissioner from manufacturer's full range.
3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. “Astra Glaze” (Trenwyth Industries, Inc.).
b. “Spectra Glaze” (Hi-Standard family brand).

2.04 MASONRY LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.05 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.

D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.

E. Aggregate for Mortar: ASTM C 144.

F. Aggregate for Grout: ASTM C 404.

G. Water: Potable.

2.06 REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Mill- galvanized, carbon steel.
2. Wire Diameter for Side Rods: 0.1483 inch.
3. Wire Diameter for Cross Rods: 0.1483 inch.
4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

D. Subject to compliance with requirements, manufacturers offering joint reinforcement that may be incorporated in the Work include, but are not limited to, the following:

1. Heckman Building Products, Inc.
2. Hohmann & Barnard, Inc.
3. Masonry Reinforcing Corp. of America, DBA Wire-Bond.

2.07 TIES AND ANCHORS, GENERAL

A. Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Heckman Building Products, Inc.
2. Hohmann & Barnard, Inc.
3. Masonry Reinforcing Corp. of America, DBA Wire-Bond.

2.08 TIES AND ANCHORS

A. Materials: Provide ties and anchors made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 1064/A 1064M, with ASTM A 641/A 641M, Class B-2 coating.
2. Stainless-Steel Wire: ASTM A 580/A 580M, UNS S30400 or UNS S31600.
3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
4. Stainless-Steel Sheet: ASTM A 240/A 240M UNS S30400 or UNS S31600.
5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
6. Stainless-Steel Bars: ASTM A 276 UNS S30400 or UNS S31600.

B. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- thick steel sheet, galvanized after fabrication or 0.109-inch- thick, stainless-steel sheet.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch-diameter, hot-dip galvanized steel or stainless-steel wire.
3. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.075-inch- thick steel sheet, galvanized after fabrication or 0.078-inch- thick, stainless-steel sheet with dovetail tabs for inserting into dovetail slots in concrete.

C. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication or stainless steel.

2.09 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.

2.10 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned. Use of any product containing unbuffered hydrochloric acid or other unbuffered acids is prohibited.

B. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2-cup dry measure) and laundry detergent (1/2-cup dry measure) dissolved in one gallon of water.

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride in mortar or grout.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For reinforced masonry, use Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476 and referenced unit masonry standard.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that foundations slab are within tolerances specified.
2. Verify that reinforcing dowels are properly placed.
3. Verify that substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Prefaced Concrete Units: Set prefaced concrete units same as non-prefaced unit.

1. While mortar is still wet, rake setting mortar out of face joints to a depth of not more 3/8 inch.
2. Point raked joints with the herein specified mortar with water repellent admixture.
3. Tool joints to a concave finish.

3.03 TOLERANCES

A. Comply with construction tolerances of referenced unit masonry standard and as follows:

1. Variation from Plumb: 1/4 inch in 10 feet; 1/2 inch maximum for building.
2. Variation from Level: 1/4 inch in 10 feet; 1/2 inch maximum.
3. Variation from Plan Lines: 2 inch in 20 feet; 3/4 inch maximum.
4. Variation in Cross Section: Do not exceed the following construction tolerances for thicknesses of walls and other masonry elements: Minus 1/4 inch or Plus 1/2 inch.
5. Variation in Mortar Joint Thickness: Bed Joints: Plus or Minus 1/8 inch; Head Joints Minus 1/4 inch, Plus 3/8 inch.

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry

surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

E. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 43 Joint Firestopping.

3.05 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in grouted masonry, including starting course on footings.
3. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Masonry Joints: Make mortar joints visually and dimensionally consistent. Unless otherwise indicated, maintain horizontal and vertical mortar joint widths of 3/8 inch.

E. Resetting: Do not pound, tap, or otherwise attempt to adjust masonry units after initial set has occurred. Remove units which require adjusting, clean thoroughly, and reset in fresh mortar.

3.06 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 1/2 inch. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

B. Provide continuity at wall intersections by using prefabricated T-shaped units.

C. Provide continuity at corners by using prefabricated L-shaped units.

D. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

E. Placing Reinforcement: Comply with TMS 602/ACI 530.1/ASCE 6.

F. Splicing: Provide lapped splices of minimum size indicated or permitted by governing code at locations shown.

3.07 ANCHORING MASONRY TO STRUCTURAL CONCRETE

A. Dovetail Slot Anchor/Ties:

1. Remove slot insert completely before installing anchor/ties.
2. Install dovetail anchor/ties in cast-in-place dovetail slots spaced a maximum of 16 inches o.c. vertically and 32 inches o.c. horizontally unless shown or noted otherwise on the Drawings.

B. Top of Wall Stabilizing Anchors:

1. Install and anchor specified top of wall stabilizing anchors as shown on the Drawings, if not shown, install and space not more than 32 inches o.c. horizontally and anchor to structure.
2. Install plastic tube in top of masonry wall to allow for insertion of pin anchor in tube.

3.08 LINTELS

A. Provide masonry lintels where shown and where openings of more than 24 inches for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.09 REINFORCED UNIT MASONRY INSTALLATION

A. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 51 inches.

B. Vertical cell fins shall be no greater than 1/4 inch.

3.10 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Commissioner's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.11 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of GLAZED CONCRETE MASONRY shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of GLAZED CONCRETE MASONRY shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 05 03 00

HOT DIP GALVANIZING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, apply to this Section.

1.02 SUMMARY

A. This specification covers iron and steel materials to be hot dip galvanized after manufacture or fabrication including, but not limited to:

1. Additional locations as noted on drawings.

B. Related Sections: The following sections contain requirements that relate to this Section.

1. Section 05 10 30 – Structural Steel.
2. Section 05 50 00 – Metal Fabrications.
3. Section 09 91 00 – Painting.
4. Must follow all galvanizing requirements within 05 50 00.

C. Duplex Paint System: Refer to Sections 05 10 30 Structural Steel and 09 91 00 Painting for additional information regarding painted, hot-dip galvanized steel. Galvanizer to coordinate with the steel fabricator, coating manufacturer, and coating applicator (painter) for duplex system requirements.

1.03 DEFINITIONS

A. Definition of project terms and abbreviations are found within Specification Section 01 35 00.

1.04 REFERENCES

A. Acronyms for reference standards are defined in Section 01 42 00.1.

B. AGA (American Galvanizers Association) Inspection of Products Hot Dip Galvanized After Fabrication.

C. AGA (American Galvanizers Association) The Design of Products to be Hot Dip Galvanized After Fabrication.

D. AGA (American Galvanizers Association) Recommended Details of Galvanized Structures

E. Research Council on Structural Connections of the Engineering Foundation: Specification for Structural Joints Using ASTM A 325 or A 490 bolts.

F. ASTM A123/A123M – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

G. ASTM A143/A143M – Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

H. ASTM A153/A153M – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

I. ASTM A384 – Safeguarding Against Warpage and Distortion During Hot-Dip.

J. ASTM A385 – Providing High-Quality Zinc Coatings (Hot-Dip).

K. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

L. ASTM A780 –Repair of Damaged Hot-Dip Galvanized Coatings.

M. DOD-P-21035 Paint, High Zinc Dust Content, Galvanizing Repair.

N. MIL-P-26915 Primer Coating, Zinc Dust Pigmented.

O. SSPC Paint 20 – Zinc-Rich Primers (Type I "Inorganic" and Type II "Organic").

P. SSPC SP 1 – Solvent Cleaning.

Q. SSPC SP 2 - Hand Tool Cleaning.

R. SSPC SP 3 – Power Tool Cleaning.

S. SSPC SP 6 – Commercial Blast Cleaning.

T. SSPC SP 10 – Near-White Blast Cleaning.

U. SSPC SP 16 – Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.

V. Drawing Sheets S43-00, S43-01, and S43-02 for additional information on finishes.

1.05 QUALITY ASSURANCE

A. Coating Applicator: Company specializing in hot dip galvanizing after fabrication and following the procedures of the Quality Assurance Manual of the American Galvanizers Association.

B. The galvanizer shall be aware that some newly fabricated steel will be duplex coated. Thus, precautions shall be taken to avoid post-treatments that may interfere with the adhesion of the paint system.

C. See Item 1.06.B below.

1.06 SUBMITTALS

A. In accordance with provisions of Division 1 Submittals, submit an original and two copies of the coating applicator's notarized Certificate of Compliance that the hot dip galvanized coating meets or exceeds the specified requirements of ASTM A123/ A123M or A153/A153M (as applicable).

B. Submit in accordance with provisions Division 1 Submittals, representative samples for each hot dip galvanized material for review by CDOT. CDOT's review shall be for color, texture, appearance, smoothness, etc. Approved samples shall become standards for the project and will be the basis for acceptance or rejection of all hot dip galvanized work.

C. Submit surface preparation procedure thirty days prior to the mockup. Include documentation that the surface preparation method is compatible with the coating specified within 09 91 00.

D. Submit as part of mockup samples in Item 1.06.B above samples of means and methods for repair of galvanized surfaces for review and approval by the Architect.

E. Submit reports verifying chemical suitability of steel materials to be used in fabrications where hot dip galvanizing is the final finish.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store and protect products under the provisions of the Additional Special Conditions.

B. Load and store galvanized articles in accordance with accepted industry standards.

PART 2 - PRODUCTS

2.01 GENERAL:

A. All galvanized steel is indicated on the structural drawings.

2.02 ACCEPTABLE COATING APPLICATORS

A. Members of the American Galvanizers Association or equal approved by the Architect and/or Engineer. A list of American Galvanizers Association members is available upon request.

2.03 FINISH PROTECTIVE COATING SYSTEM FOR GALVANIZED STEEL

A. Existing Galvanized Steel:

1. Field Primer: See Section 09 91 00 Painting.
2. For additional information, see Section 09 91 00 Painting.
3. Intermediate Coatings: See Section 09 91 00 Painting.
4. Finish Coatings: See Section 09 91 00 Painting.

B. New Galvanized Steel:

1. For additional information, see Section 09 91 00 Painting.
2. Intermediate Coatings: See Section 09 91 00 Painting.
3. Finish Coatings: See Section 09 91 00 Painting.

2.04 STEEL MATERIALS

A. Material for galvanizing to be geometrically suitable for galvanizing as described in ASTM A384 and A385. Steel materials suitable for galvanizing include structural shapes, pipe, sheet, fabrications, and assemblies.

B. Material to be chemically suitable for galvanizing. Steel used in visible fabrications where hot dip galvanizing is the final finish shall have low silicon content as well as levels of carbon, phosphorus, and manganese content beneficial to the galvanizing process. Recommended steel materials for hot dip galvanizing include, but are not limited to:

1. Structural Shapes and Plates: ASTM A36, A242 Type 2, A283, A441, A500, A501, A529, A572, A588, A 709, and A992.

Steel for Fasteners:

General Category	**Bolt Material**	**Nut Material**
Carbon Steel	A307 Gr A or B	A563 Gr A
High Strength	A325 Type 1	A563 Gr DH
Tower Bolts	A394	A563 Gr A
Quenched & Tempered (Carbon Steel Bolts)	A449	A563 Gr DH
Quenched & Tempered (Alloy Steel Bolts)	A354 Gr BC	A563 Gr DH

2. Steel for Sheet Metal Articles: ASTM A569 or A570.
3. Steel for Pipe or Tubing: ASTM A53, A120, or A595 Gr A or B.
4. All steel materials shall have a low silicon content.

2.05 FABRICATION REQUIREMENTS

A. Fabricate structural steel in accordance with Class I, II, and III guidelines as described in AGA's Recommended Details for Galvanized Structures. Class I fabrication detailing is the basis for finished appearance for any item, component, or assembly exposed to public view. In fabrications where large laps require vent holes as indicated for Class II detailing, vent holes exposed to public view shall be plugged. Class III detailing shall be limited to internal or fully concealed components of fabrications and to interior fabrications where intermittent welds are not visible to public view and have no adverse effect on the outward appearance or structural soundness of the fabrication.

B. Fabrication practices for products to be in accordance with the applicable portions of ASTM A143, A384, and A385, except as specified herein. Avoid fabrication techniques that could cause distortion or embrittlement of the steel.

C. The fabricator shall consult with the architect/engineer and hot dip galvanizer regarding potential problems or potential handling problems during the galvanizing process, which may require modification of design before fabrication proceeds.

D. Remove all welding slag, splatter, anti-splatter compounds, and burrs prior to delivery to the galvanizer.

E. Provide holes and/or lifting lugs to facilitate handling during the galvanizing.

F. Avoid unsuitable marking paints. Consult with the galvanizer about removal of grease, oil paint, and other deleterious material prior to fabrication.

G. Remove by blast cleaning or other methods, surface contaminants and coatings that would not be removable by the normal chemical cleaning process in the galvanizing operation.

H. Field welding of hot dip galvanized fabrications is not allowed, unless noted otherwise.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Pre-clean steelwork in accordance with accepted methods to produce an acceptable surface for quality hot dip galvanizing.

3.02 APPLICATION OF COATING

A. Galvanize steel members, fabrications, and assemblies after fabrication by the hot dip process in accordance with ASTM A123.

B. Galvanize bolts, nuts, and washers and iron and steel hardware components in accordance with ASTM A153.

C. Safeguard products against steel embrittlement in conformance with ASTM A143.

D. Galvanize reinforcing steel in accordance with ASTM A767.

E. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.

3.03 ZINC COATING REQUIREMENTS

A. Coating Weight: Provide coating weights per Table 1, ASTM A126 with a minimum coating thickness on any galvanized item of 460 g/m^2 (Grade 65) Conform with Para. 5.1 of ASTM A123, Table 1 of A767, or Table 1 of ASTM A153, as appropriate. Special thickness requirements should refer to ASTM A123 3.1.7 and be specified to the minimum average mils of thickness.

B. Surface Finish: Continuous, adherent, as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article.

C. Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

3.04 POST-TREATMENT FOR DUPLEX SYSTEMS

A. Water quenching or chromate conversion coating should be avoided as these processes interfere with paint adhesion and surface preparation for duplex systems.
B. Refer to Section 05 10 30, Para. 3.12, for information on Galvanized Surface Preparation for Duplex Coating.

3.05 TESTS

A. Inspection and testing of hot dip galvanized coatings shall be done under the guidelines provided in the AGA publication Inspection of Products Hot Dip Galvanized After Fabrication.

B. Include visual examination and tests in accordance with ASTM A123 or A153 as applicable to determine the thickness of the zinc coating on the metal surface.

C. Furnish Notarized Certificate of Compliance with ASTM Standards and Specifications herein listed. The Certificate must be signed by the galvanizer and contain a detailed description of the material processed. The Certificate shall include information as to the ASTM standard used for the coating.

3.06 FINAL FINISHING

A. Hot dip galvanized surfaces shall be smooth and free of burrs, projections, runs, or fins.

3.07 REPAIR OF DAMAGED COATING

A. Repair areas damaged by welding, flame cutting or during handling, transport or erection, by metalizing and burnishing in accordance with ASTM A 780 whenever damage exceeds 1/8" in width. 'Hot stick' repairs are allowed only where these repairs are not visible to the public. Zinc-rich paint repairs shall not be used on any fabrications where hot dip galvanized is the final finish without prior written approval of the Commissioner. Minimum thickness requirements for the repair are those described in ASTM A 123 Section 4.6 current edition.

1. Galvanizing Repair Paint: SSPC Paint 20 or MIL-P-21035, with dry film containing a minimum of 94% metallic zinc dust by weight.
2. Available Products: Subject to compliance with requirements, product that may be incorporated in the work include, but are not limited to, the following;

a. ZRC Cold Galvanizing Compound, Galvilite.
b. ZRC Galvilite® Galvanzing Repair Compound.
c. Approved equal.
d. Substitutions: Comply with General Conditions.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of HOT DIP GALVANIZING shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this Section. Payment for the Work of HOT DIP GALVANIZING shall be included in the contract lump sum price as shown in the Schedule for Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 09 00 00.

END OF SECTION

SECTION 05 10 30

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies requirements for structural steel used in the project including columns, beams, canopy and roof framing, framing for new stair opening, framing for elevator shaft, framing for escalator opening and support, etc. This work includes furnishing all labor, materials, accessories, tools, and equipment required to furnish and install all structural steel including, but not limited to, fabrication, galvanizing, field erection, field preparation for painting and any other work required for a complete project.

B. All new structural steel exposed after installation, unless indicated as galvanized only, shall be shop primed and coated with protective and finish coats in the field. Existing structural steel shall be field prepared and cleaned and also coated with protective and finish coats in the field.

C. New Structural Steel Finishes: The new fabricated structural steel assemblies are to have the following finishes:

(1)	(2)	(3)
Steel Location	Hot-Dip Galvanized	Paint Coating
Station House – Horizontal Roof Members	X	
Station House – Vertical AESS Columns		**X** (Category 4)
Pedestrian Bridge – AESS Truss Members		**X** (Category 4)
Platform – AESS Canopy		**X** (Category 4)

Platform - Horizontal Floor Members		X
Platform – Track Columns	X	X

Table Column Notes:

(1) Refer to Sheets S43-00, S43-01, and S43-02 for additional information.

(2) Refer to Section 05 03 00 Hot Dip Galvanizing. Duplex system requirements contained herein Section 05 10 03.

(3) Refer to Section 09 91 00 Painting

D. This Section includes structural steel as defined by the Code of Standard Practice of the American Institute for Steel Construction (AISC).

E. Include supplementary parts and members necessary to complete structural steel work, regardless of whether such parts and members are indicated by design. Include miscellaneous deck support angles as required for proper support of steel floor deck around columns, gussets, openings and obstructions.

F. Related Sections: The following sections contain requirements that relate to this Section.

1. Section 05 03 00 – Hot Dip Galvanizing.
2. Section 05 12 13 – Architecturally Exposed Structural Steel.
3. Section 05 31 13 – Steel Decking.
4. Section 05 53 00 – Stainless Steel Floor Plate and Stair Treads.
5. Section 07 92 00 – Joint Sealant.
6. Section 09 91 00 – Painting.
7. Must follow all galvanizing requirements within 05 03 00.

G. Definitions:

1. Definition of project terms and abbreviations are found within Specification Section 01 35 00.

1.03 STANDARDS

A. The structural steel work required herein, including details, fabrication, and erection, except as otherwise shown, shall comply with the provisions of the following codes, specifications and standards:

B. "Code of Standard Practice of Steel Buildings and Bridges," AISC.

C. "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings," AISC.

D. All welding, inspection of welds, and testing of welds shall follow "Structural Welding Code," AWS D1.5 (Bridge Welding Code), UNO.

E. Welding, inspection of welds, and testing of welds in areas other than track-supporting structure (se drawings) shall follow "Structural Welding Code," AWS D1.1 with prior approval of the Commissioner.

F. "Specifications for Assembly of Structural Joints Using High Strength Steel Bolts" as approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.

G. "Handbook on Bolt, Nut and Rivet Standards," Industrial Fasteners Institute (IFI).

H. American Railway Engineering and Maintenance of Way Association (AREMA) "Manual for Railway Engineering," Chapter 15, "Steel Structures," Parts 1, 3, and 4.

I. ASTM A6 – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.

J. ASTM A27 – Standard Specification for Steel Castings, Carbon, for General Application.

K. ASTM A36 – Standard Specification for Carbon Structural Steel.

L. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

M. ASTM A108 – Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.

N. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

O. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

P. ASTM A240 (Alloy Type 316L) – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications (*Type 316 is an Austenitic Stainless Steel Containing Molybdenum developed to provide improved corrosion resistance*)

Q. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

R. ASTM A354 – Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.

S. ASTM A370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

T. ASTM A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

U. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

V. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

W. ASTM A709 – Standard Specification for Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, and Bars and Quenched-and-Tempered Alloy Structural Steel Plates for Bridges.

X. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

Y. ASTM A992 – Standard Specification for Carbon Structural Steel.

Z. ASTM A1085 – Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)

AA. ASTM D2092 – Guide for Treatment of Zinc-Coated (Galvanized) Steel Surfaces for Painting.

BB. ASTM D6386 – Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.

CC. ASTM D7803 – Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating.

DD. ASTM E164 – Standard Practice for Ultrasonic Contact Examination of Weldments.

EE. ASTM E709 – Standard Guide for Magnetic Particle Examination.

FF. ASTM F959 – Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.

GG. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.

HH. ASTM F3125/F3125M – Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

II. AWS D1.5 "Bridge Welding Code."

JJ. MIL-P-20135 – Paint, High Zinc Dust Content, Galvanizing Repair.

KK. MIL-P-38336 – Primer Coating, Inorganic, Zinc Dust Pigmented Self-Curing, for Steel Surfaces.

LL. SSPC Paint 20 – Zinc-Rich Primers (Type I "Inorganic" and Type II "Organic").

MM. SSPC Paint 23 – Latex Primer for Steel Surfaces.

NN. SSPC SP 1 – Solvent Cleaning.

OO. SSPC SP 2 - Hand Tool Cleaning.

PP. SSPC SP 3 – Power Tool Cleaning.

QQ. SSPC SP 6 – Commercial Blast Cleaning.

RR. SSPC SP 10 – Near-White Blast Cleaning.

SS. SSPC SP 16 – Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.

TT. CTA Structural chapter of the Infrastructure Design Criteria Manual (IDCM), Revision 4, dates March 2013.

UU. American Railway Engineering and Maintenances-of-Way Association AREMA Manual (2012).

1.04 QUALITY ASSURANCE

A. The Contractor is solely responsible for quality control of all the structural steel work.

B. Testing Agency: The Contractor shall submit a minimum of (3) three names and qualifications of Testing Agency to the Commissioner for approval prior to start of Construction. All quality control, testing, and related submittals and reports within the Contract Documents (including source quality control, field quality control, and field testing) shall be the responsibility of the Testing Agency.

C. Contractor shall comply with all applicable governmental codes and regulations.

D. Galvanize Coating Applicator's Qualifications: Company specializing in hot dip galvanizing after fabrication and following the procedures of "Quality Assurance Manual" of the American Galvanizers Association.

E. Fabricator Qualifications:

1. Certification: Engage a firm experienced in fabricating structural steel similar to that indicated for the Project and with a record of successful in-service performance. Unless otherwise approved in writing by the Commissioner, fabricator must participate in the AISC quality certification program and be designated an AISC certified fabricator as follow:

    a. Building and Facility Structures: Building QMS Certification (BU).
    b. Bridge Structures: Comply with IDOT Standard Specification for Certification of Metal Fabricator.
    c. Track Structures: Bridge QMS Certification, Advanced (ABR).

2. Experience: No less than 10 years of experience in fabrication of structural steel for railroad bridges of type and scope similar to this project.

3. Experience: No less than 10 years of experience in fabrication of structural steel for transportation stations of type and scope similar to this project.

F. Erector Qualifications:

1. Experience: No less than 10 years of experience in erection of structural steel railroad bridges of type and scope similar to this project.
2. Supervision: Provide continuous erection supervision, by erector with no less than 10 years of experience in erection of structural steel rail road bridges of type and scope similar to this project.

G. Fabricator's and Erector's Welding Inspectors:

1. Certification: AWS QCI: Standard for Qualification of Welding Inspectors.

H. Comply with applicable provisions of the following specifications and documents, except where otherwise indicated:

1. AISC "Load and Resistance Factor Design (LFRD) Specification for Structural Steel Buildings."
2. AISC, "Code of Standard Practice for Steel Buildings and Bridges," including "Commentary" and supplements, except that section 3.1.2 options 1) and 2) shall not apply to connections that are substitutions, or altered by existing conditions.
3. Steel indicated as Architecturally Exposed Structural Steel (AESS) on contract documents shall be in compliance with the additional requirements of the AISC "Code of Standard Practice for Steel Buildings and Bridges" Chapter 10, and as specified herein.
4. AISC "Specification for Load and Resistance Factor Design of Single-Angle Members."
5. ASTM A6.
6. Research Council on Structural Connections (RCSC) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A325 or ASTM A 490 Bolts."
7. American Welding Society (AWS): AWS D1.1.
8. Industrial Fasteners Institute (IFI): IFI "Fastener Standards."
9. Steel Structure Painting Council (SSPC): Painting Manual, Volumes 1 and 2.

I. Welding: Qualify welding procedures, shop welders, field welders, welding operators, and tackers in accordance with AWS D1.1 AND AWS D1.5 and for the following periods of effectiveness of certification:

1. Certification of shop welding personnel shall not be more than six months old at commencement of welding. Certification shall remain in effect for duration of work provided welder is continuously engaged in performing type of welding for which he is certified, unless welder fails to perform acceptable welding, as determined by the Testing Agency. Certification and recertification of welding personnel are subject to verification by the Testing Agency. Retesting for recertification will be Contractor's responsibility.
2. Certification of field welding personnel shall not be more than six months old at commencement of welding. Certification shall remain in effect for duration of work provided welder is continuously engaged in performing the type of weld

for which he is certified, unless welder fails to perform acceptable welding, as determined by Testing Agency. Certification and recertification of welding personnel are subject to verification by the Testing Agency. Retesting for recertification will be Contractor's responsibility.

J. Stud Installation: Qualify headed stud bases, shop stud welding procedures, field stud welding procedures, and operators in accordance with AWS D1.1 AND AWS D1.5.

K. Bolt Installation: Qualify shop and field bolt tightening procedures in accordance with Specification for Structural Joints Using ASTM A325 bolts. Verify shop and field bolting crews' ability to install bolts in accordance with selected method of tightening.

L. Responsibility for Errors: The Contractor is responsible for any errors in detailing, fabrication, erection, and fit-up.

M. Fit-up: The Contractor is responsible for selecting connection types and erection methods that will result in fit-up within the allowed tolerances. Prior to producing shop drawings, review the Design Drawings and Specifications for constructability and propose revisions that may be required to ensure fit-up within the allowed tolerances. Submittal of shop drawings indicates that the Contractor is capable of providing fit-up within the allowed tolerances, using the submitted shop drawings.

N. Quality Control: Materials and fabrication procedures are subject to inspection and test in mill, fabricator's shop, and project site. Such inspections and tests do not relieve Contractor of responsibility for providing materials and fabrication in compliance with specified requirements. Promptly remove and replace materials or fabricated components that do not comply with project requirements.

O. Clarity: Promptly notify Commissioner if a member design or connection force is not clearly indicated.

P. AESS Pre-Fabrication Meeting: Refer to Section 05 12 13.

Q. AESS Pre-Shipping Meeting: Refer to Section 05 12 13.

R. Pre-installation Conference: Comply with Section 012000/Project Meetings.

S. Testing Agency Services: Required as specified in Section 014000 Quality Control, and herein.

T. Manufacturer's identification tags or marks are not acceptable on surfaces that will remain exposed to view after installation. Evidence of patching after removal of tags or marks is not acceptable.

1.05 PERFORMANCE REQUIREMENTS

A. Contractor shall retain an SSE to prepare calculations for submission with Engineer's signature and seal for the steel related items listed within the General Notes.

1.06 TESTING

A. The testing agency to inspect all bolted connections and welds as well as perform all other required tests.

B. The Contractor shall employ AISC Category III Certified Testing Agency, in addition to the requirements of the Contractor's Quality Control Plan. Reports and test results shall be supplied for the inspections and tests listed in this Specification.

C. Bolted connections shall be inspected by the Testing Agency in accordance with AISC Specifications for "Structural Joints Using ASTM A325 or A490 Bolts," except that only ASTM F3125, Grade A325 bolts shall be permitted on the project.

1. Building and Facility Structures: AISC Specifications for Structural Joints Using High-Strength Bolts, Section 9. For pretensioned and slip-critical joints, preinstallation verification must be performed in accordance with Section 7 of the AISC Specifications for Structural Joints Using High-Strength Bolts. Blind bolts are to be inspected by the Testing Agency per the manufacturer's ICC-ES report.
2. Bridge and Track Structures: IDOT Standard Specification Section 505. In addition to the after installation inspection, field rotational-capacity test in accordance with Article 505.04(f)(3) g.1 and preinstallation verification test in accordance with Article 505.04(f)(2) in IDOT Standard Specification must be performed. Article 505.04(f)(3)(d) does not apply and field rotational-capacity test must be witnessed by the Testing Agency.

D. Welding is to be inspected and tested by an independent Testing Agency, hired by the Contractor, approved by the Commissioner. The welding shall be inspected and tested by the Testing Agency during fabrication and erection of the structural steel.

1. Certify all welders and make inspections and tests as required. Record types and locations of all defects found in the work, and measures required and performed to correct such defects.
2. In addition to visual inspection of all welds, magnetic particle, ultrasonic and radio-graphic inspection shall be made of all welds. Magnetic particle inspection shall be made on the root pass and finished weld.
3. The method of magnetic particle inspection shall be in accordance with ASTM E709. Any type of crack or zone of incomplete fusion or penetration will not be acceptable.
4. Radio-graphic inspection technique and standards of acceptance shall be in accordance with AWS 1.1, and AWS D1.5 for the track supporting structure.
5. Ultrasonic inspection shall be performed in accordance with AWS 1.1, and AWS D1.5 for the track supporting structure.

a. Building and Facility Structures: Specification for Structural Steel Buildings, Chapter N, Section N5 with the following clarifications and modifications:

1) Table N5.4-1, 2, and 3 where "O" presents, a minimum of 15% of the welded joints must be observed on a random basis.
2) Nondestructive testing of welded joints is required per Section 3.14 of this Specification.

3) Section 5b, structures must be considered as in Risk Category III per ASCE 7, and user note, "NDT of CJP groove welds in materials less than 5/16 in. thick is not required" will not apply.
4) Section 5e, reduction of rate of ultrasonic testing will not be permitted.

b. Bridge Structures: AWS D1.5 Clause 6 and Clause 12 for any structural components designated on the Drawings or in the special provisions as FCM (Fracture Critical Member) with the following clarifications and modifications:

1) Section 6.1.3.1, the inspector must be an AWS Certified Welding Inspector (CWI) qualified and certified in conformance with the provisions of AWS QC1, *Standard for AWS Certification of Welding Inspectors*.
2) Section 6.1.3.4 the individuals who perform NDT shall be certified as NDT Level III and qualified per ASNT SNT-TC-1A as a Level II for NDT performed.
3) Where code does not contain structural element welded joint inspection frequency requirements, Section 3.14 will apply.

c. Track structures: Section 1.05 C 2 must apply and AREMA "Manual for Railway Engineering," Chapter 15, "Steel Structures," Part 3 Section 3.5.5 and Part 1 Section 1.14.4, with the following clarifications and modifications made to AREMA reference:

1) Section 3.5.5 b, groove welds must be tested with ultrasonic nondestructive testing method.
2) Section 3.5.5 c, 100% flange-to-web fillet welds must be inspected by the magnetic particle method.

6. Where codes do not contain structural element welded joint inspection frequency requirements, Section 3.06 will apply.

E. Each bolting crew and welder shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified that the inspector can refer back to the crew or person making the connection.

F. Access to locations where material for this contract is being fabricated or produced shall be provided for the purpose of inspection and testing, including scaffolding.

G. The Commissioner may inspect structural steel at the plant before shipment; however, the Commissioner reserves the right to reject any material, at any time before final acceptance, which does not conform to all of the requirements of the drawings and specifications.

H. The Testing Agency shall perform the specified tests. The Testing Agency shall be independent, hired by the Contractor, approved by the Commissioner and paid for by the Contractor. Corrective measures, including additional and more complete testing, which may result from these tests shall be the Contractor's responsibility; all costs of which shall be paid for by the Contractor.

I. Approved shop drawings are to be submitted to the galvanizer for his review and approval.

1.07 SUBMITTALS

A. Submit the following according to conditions of the construction contract and Division 1 Specification Sections.

B. Procedures:

1. Develop and submit for the Commissioner's review and comment, a schedule of shop drawing submittals a minimum of thirty days in advance of the first submittal. Submit shop drawings only in conformance with an agreed-upon schedule.
2. Shop drawings shall be reviewed and stamped by the Contractor prior to submittal to the Commissioner.
3. Submit distinct packages that include erection drawings and the corresponding shop drawings. Include in each resubmittal only erection drawings and shop drawings that require resubmittal. In each resubmittal, completely address comments noted on immediately preceding submittal.
4. The Commissioner's review of shop drawings will be for general considerations only. Compliance with requirements for materials, fabrication, and erection of structural steel is the Contractor's responsibility.
5. Develop shop drawings without using reproductions of drawings and without relying on drawings for completeness.
6. Submit in writing any request for modification to drawings and Specifications. Submitting shop drawings for review does not constitute "in writing" unless it is brought to the prior attention of the Commissioner that specific changes are being requested.

C. Shop Drawings: Submit shop drawings for the Commissioner's action prepared under direct supervision of a licensed structural engineer in the State of Illinois, including complete framing layout and details for fabrication, assembly, and erection of members. Clearly indicate the following on the shop drawings, in addition to any other information necessary for complete fabrication and erection:

1. Profiles, sizes, spacing, and locations of structural members, connections, attachments, anchorages, framed openings, size and type of fasteners.
2. References on member profiles to nearest grid lines, column lines, and connections.
3. Details of cuts, connections, splices, camber, holes, copes, fastener assemblies, welding, and other pertinent data.
4. Standard AWS symbols for welds, indicating size, length, and type; and distinguishing between shop and field welds.
5. Details for bolt assemblies, indicating bolt size, length, and type; indicating bolt hole size, length, and type; distinguishing between slip-critical and bearing bolts; and distinguishing between shop and field bolts.
6. Setting drawings, templates, and directions for installation of anchor bolts and other anchorages.

7. Provide a note on each shop drawing, written and signed by the fabricator's licensed Structural Engineer, indicating that the shop drawing connection details are in conformance with the connection design calculations.

D. Connection Calculations for Substitutions:

1. Any change or alteration to the document connections require the Contractor's SSE to provide calculations that are prepared, sealed, and signed by the Contractor's SSE. Review of structural calculations shall not relieve the Contractor from taking sole responsibility for all connection substitutions.
2. Develop substitution connection calculations and details based on Commissioner's comments on the design procedures, standard details, and sample calculations.
3. Provide cross-referencing between member shop drawings, connection shop drawings, and substitution connection calculations.

E. Mill Reports:

1. Submit to Testing Agency (Section 01 40 00) and to Commissioner for record two certified copies of mill reports of structural steel members and accessories supplied for this Project signed by manufacturers certifying that their products, including the following, comply with specified requirements:

    a. Structural steel, including chemical and physical properties.
    b. High-strength bolts, nuts, and washers, including mechanical properties and chemical analysis.
    c. Direct-tension indicators.
    d. Shear stud connectors.
    e. Shop primers.
    f. Nonshrink grout.
    g. Mill heat analysis of chemical composition.
    h. Tension, bend, and notch toughness test reports.
    i. Mill certification that all supplementary requirements have been complied with.
    j. Certification that bolts meet all ASTM requirements for the grade specified.
    k. Certification that welding rods will deposit weld composition and amounts of silicone as close as possible to base metal.

2. If structural steel is purchased directly from a United States mill, manufacturer's approved tests are acceptable for review.
3. If structural steel is purchased from dealer's stock, quality testing for compliance with Contract Document requirements are required to be performed in the United States by a Testing Agency approved by Commissioner and services paid by Contractor, coordinated with requirements of Section 014000 Quality Control.
4. Materials required for quality testing shall be furnished and paid by Contractor.
5. Before Delivery to Site, steel supplier shall certify Test reports from Testing Agency.

F. Qualification Certificates: Submit for Commissioner's record.

1. AISC Certification: Furnish evidence that structural steel fabrication plant has current AISC Quality Certification with facilities and personnel qualified to conduct required source quality control program.

G. Record Surveys: Submit for Commissioner's record. Certified surveys are to be prepared by Contractor's professional surveyors. Address elevations and locations of base plates and anchor bolts to receive structural steel, final elevations and locations of major members, with particular notation of discrepancies between actual installation and the Contract Documents. Address every detail and its location, dimensions, and association to existing structure. Denote every geometric discrepancy from the Contract Documents.

H. Installation Surveys: Submit for Commissioner's record. Certified surveys are to be prepared by Contractor's professional surveyors. Address as built conditions of all new structural steel elements and connections. Denote every geometric discrepancy from the Contract Documents. Survey shall be provided for the following locations prior to the fabrication of glass.

1. Canopy steel.
2. Stair framing.
3. Escalator framing.
4. Station roof framing.

I. Submit to Testing Agency proof of compliance for materials:

1. Report of ladle analysis for all steel.
2. Report of tensile properties for steel shapes, bars, and plates.
3. Mill Certifications: Provide certified copies of mill test reports covering chemical and physical properties of following:

    a. Steel shapes, plates, and bars.
    b. High-strength threaded fastener assemblies.
    c. Filler metal.
    d. Headed studs.
    e. Proprietary stainless steel rods, clevises, and connection assemblies.

J. Submit for record certificates of qualification for welding personnel in shop or field.

K. Hazardous Materials Notification: In the event no product or material is available that does not contain asbestos, PCB, or other hazardous materials as determined by the Commissioner, a "Material Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

L. Asbestos and PCB Certification: After completion of installation, but prior to Substantial Completion, the Contractor shall certify in writing that products and materials installed, and processes used, do not contain asbestos or polychlorinated biphenyls (PCB), using format in General Conditions.

M. Manufacturer's Literature: Submit to the Commissioner, copies of manufacturer's specifications and installation instructions for the products being supplied as well as for the welding, galvanizing, and any shop applied coats of paint, including agency

test reports and such other data as may be required to show compliance with these specifications and specified standards.

N. Submit weld procedures for every connection location and qualifications for approval prior to fabrication.

O. Provide certification from the galvanizer indicating that he has reviewed the approved shop drawings and certifies that he is capable of hot-dip galvanizing all members and fabrications according to all requirements.

P. Submit to the Commissioner for approval all proposed galvanizing repair work, including materials and methods.

Q. Coating Applicator: Company(ies) specializing in hot-dip galvanizing steel, painting plain steel, and/or painting hot-dip galvanized steel after fabrication.

R. Submit a formal plan for surface preparation of hot-dip galvanized steel surfaces to receive a duplex paint coating. The submittal shall be coordinated the coating manufacturer and coating applicator based on the primer used for the final paint system selected. Alternative surface preparation techniques from those specified herein will be considered through a joint submittal from the coating manufacturer and coating applicator.

S. Submit copies of the coating applicator's notarized Certificate of Compliance that the prepared hot-dip galvanized coating surface meets or exceeds the requirements for successful prime painting of the surface.

T. Contractor must submit a letter confirming that the steel shop drawings have been coordinated with all other new and existing pertinent adjacent objects, including but not limited to new and existing CIP concrete, PC concrete, and utilities.

U. Contractor must submit process plans for all steel erection phases. Process plans to include, but are not limited to the following:

1. Plans showing extent of work zone and equipment locations.
2. Analysis of material picks for lifting equipment capacities.
3. Special attention is to be paid to steel erected adjacent to active train traffic and traction power infrastructure. Coordination of these activities with CTA Safety and CTA Rail Operations is essential.
4. All other requirements for process plans as listed in Division 1.

V. Contractor must submit process plan for bolting and testing of slip critical connections and pretensioned bolts. The process plan must include a field demonstration by the erector and testing agency, witnessed by the Commissioner or the Commissioner's designee prior to steel erection.

W. Contractor must submit a Quality Plan to include, at a minimum, fabrication, galvanizing, shop assembly, field erection, testing, and inspecting.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with General Conditions and Section 01 60 00 Materials and Equipment, including the following:

1. Deliver structural steel to the Project site in such quantities and at such times to ensure continuity of installation.
2. Store materials to permit easy access for inspection and identification.
3. Keep steel members off the ground, using pallets, platforms, or other type of supports.
4. Protect steel members and packaged materials from corrosion and deterioration.
5. Store fasteners in a protected place.
6. Clean and relubricate bolts and nuts that become dry or rusty before use.
7. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures.
8. Repair or replace damaged materials or structures as directed.

B. Do not deliver material to the project site until the proposed method and sequence of erection has been reviewed by the Commissioner. Method and sequence shall be planned so as to avoid delay or damage to the work of other trades.

C. Storage of fabricated steel at the jobsite shall be the responsibility of the Contractor. Material stored at the job site shall not exceed design loads on existing or newly constructed structures so that members will not be distorted or otherwise damaged, and shall be protected against corrosion or deterioration.

1.09 SEQUENCING

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work.

1. Provide setting diagrams, templates, instructions, and directions, as required, for installation.
2. Do not install columns with anchor bolts until concrete is demonstrated to have attained the required twenty-eight-day compressive strength.

1.10 WARRANTY

A. Comply with General Conditions, agreeing to repair or replace specified materials or Work that has failed within the warranty period. Failures include, but are not limited to, the following:

1. Defective design, material, and workmanship.
2. Inadequately prepared surfaces and quality of primer and application.

PART 2 - PRODUCTS

2.01 UNAUTHORIZED MATERIALS

A. Materials and products required for work of this section shall not contain asbestos, polychlorinated biphenyls (PCB), or other hazardous materials identified by the Commissioner.

2.02 ACCEPTABLE MANUFACTURERS

A. Products of the manufacturers specified in this Section must establish the minimum functional and quality standards required for work of this Section.

B. Substitutions: Comply with General Conditions using form in Section 017839 Record Documents.

2.03 MATERIALS

A. Surface: For fabrication of work which will be exposed to view, use only materials that are smooth and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and application of surface finishes.

B. Members: Provide fine-grain killed steel for structural shapes within Groups 4 and 5 of AISC grouping for tensile property classification. See General Notes on Drawings for material standards:

1. Structural Steel Shapes, Plates, and Bars.
2. Cold-Formed Structural Steel Tubing.
3. Hot-Formed Structural Steel Tubing.
4. Steel Pipe:

    a. Finish: Black, except where indicated to be galvanized.

5. For bridge and track structures, material designated as FCM (Fracture Critical Material) must comply with Charpy V-Notch Testing requirements for Zone 2.
6. Provide and install all miscellaneous structural steel members required for this project including lintels, leveling, plates, base plates, setting plates, etc.

    a. For Carbon-Steel Castings: ASTM A27, Grade 65-35, medium-strength carbon steel.
    b. Shear Connectors: ASTM A108, Grade 1010 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.
    c. Anchor Rods, Bolts, Nuts, and Washers: As follows:

        1) Unheaded Rods: ASTM A36.
        2) Headed Bolts: ASTM A307, Grade A; carbon-steel, hex-head bolts; and carbon-steel nuts.

3) Headed Bolts: ASTM F3125, Grade A325, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
4) Headed Bolts: ASTM A354, Grade BDH structural bolts and heavy hex carbon-steel nuts.
5) Washers: As required for each bolt type.

d. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

1) Finish: Plain, Uncoated.
2) Direct-Tension Indicators: ASTM F959, Type 325.

e. For pretensioned and slip-critical joints, bolts, nuts, and washers must be supplied by manufacturer as a complete assembly.

f. Welding Electrodes: Comply with AWS 1.1, and AWS D1.5 for the track supporting structure requirements for type of materials being joined and as indicated on General Notes on drawings.

1) To achieve a more uniform galvanized coating thickness and appearance, welding rod shall deposit weld composition and amount of silicone matching that of the surrounding base metal and per steel mill reports.
2) Welding filler metals for HSS to HSS connections shall meet the notch toughness requirements of AWS D1.8.

g. Filler Metals:

1) Shielded Metal Arc Welding: AWS A5.1 or A5.5.
2) Submerged Arc welding: AWS A5.17.
3) Flux-Cord Arc Welding: AWS A5.20.

h. Slide Bearing Assemblies: Self-lubricating bearing elements comprised of 100% virgin polytetrafluoroethylene (PTFE) bearing pads bonded to steel plates. Assembly shall have allowable bearing stress of 15,000 psi, a coefficient of friction of 4% or less at 500 psi bearing, a minimum 80 durometer hardness in conformance with ASTM D2240.

1) Acceptable products include, but are not limited to:

a) Fabreeka Slide Bearings as manufactured by Fabreeka Products Company.

2) Approved equal.

i. Isolation Pads and Washers: The insulating fabric pads, sleeves, and washers shall be manufactured of all new (unused) materials and composed of multiple layers of prestressed cotton duct, impregnated and bound with a high-quality rubber compound, containing rot and mildew inhibitors and anti-oxidants, compounded into resilient pads, sleeves, or washers of uniform thickness. Verify size of pad with size of steel base plate.

1) Cotton duct shall be 8.1 oz per net square yard, duct wrap count 50 +/- 1 threads per inch and filling count 40 +/- 2 threads per inch, 2 yd per thread, 4 plies per inch of finishing pad thickness.
2) The insulation materials shall have a dielectric strength of more than 3,200 volts and an electrical resistivity exceeding 1,000,000 ohm-cm. They shall withstand compressive loads perpendicular to the plane of laminations of not less than 15,000 psi before breakdown. Load deflection properties in accordance with procedures of Military Specification (MIL) C-882 shall be the following maximum percentages of total pad thickness: 10% at 1,000 psi; 15% at 2,000 psi. When loaded to 1,500 psi, permanent set as load is removed in accordance with procedures of MIL-C-882 shall be a maximum of 2.5% of the original "zero point" thickness. Shore durometer shall not exceed 0.25 when loaded to 1,500 psi. The material shall not lose effectiveness throughout a temperature range of minus 65°F to +150°F. No visual evidence of damage or deterioration by environmental effects of sunshine, humidity, salt spray, fungus, and dust in accordance with MIL-E-5272. Refer to the drawings for the thickness of the pad (tolerance within +/- 5%).

j. Flat Stock Products: The sheet material used for flat stock products (washers and pads) shall meet the following requirements:

1) The material shall have a dielectric strength of 25.0 KV per 5/32 in. thickness.
2) The material shall withstand compressive loads perpendicular to the plane of lamination of not less than 10,000 psi before breakdown.
3) Load deflection tests for the material shall be in accordance with the following maximum of total pad thickness: 10% at 1,000 psi, 15% at 2,000 psi.
4) When the material is loaded to 1,500 psi, and load is removed permanent set shall be a maximum of 2.5% of the original "zero point" thickness.
5) Material durometer hardness shall be 85 to 95 Shore A.
6) The ratio of lateral expansion to vertical deflection shall not exceed 0.25 when loaded to 1,500 psi.
7) The material shall not lose effectiveness throughout a temperature range of minus 65°F to plus 150°F.
8) The material shall show no visual evidence of damage or deterioration by environmental effects of sunshine, humidity, salt spray, fungus, and dust.
9) Tolerances for the flat stock products of this specification shall be as follows:

a) Thickness shall be within plus or minus 5% of that required.
b) Length and width of pads shall be plus or minus 1/16 in.
c) O.D. and I.D. dimensions of washers shall be plus or minus 1/16 in.

k. Bushings: Bushings furnished shall meet all the requirements above for Flat Stock Products, the tolerances noted above for Flat Stock Products, and the following requirements:

1) Bushings shall be fabricated by wrapping a single ply of the impregnated fabric continuously around a round mandrel the same size as the required inside diameter, until the outside diameter is reached. Spiral wound bushings will not be accepted.
2) Bushings furnished must be one piece in length. Bushings furnished as layers of flat stock stacked and glued together to length will not be accepted.
3) The manufacturing process used to fabricate the bushings shall leave the inner and outer wall surfaces completely smooth around the diameters, free of raised overlaps, wrinkles, and bulges. The inner and outer diameters, and length shall be within plus or minus 1/32 in. of the required dimensions.

l. Grout: CRD-C-621 premixed, nonshrink cement-based grout. Grout shall be ready-to-use nonmetallic aggregate requiring only addition of water at jobsite, and shall produce a flowable grouting material having no drying shrinkage at any age and a maximum 4.0% expansion when tested in accordance with ASTM C827. Compressive strength of grout (2 in. x 2 in. cubes) shall not be less than 5,000 psi at seven days and 8,000 psi at twenty-eight days when tested in accordance with ASTM C109.

1) Euclid Chemical Co., "Euco NS."
2) L & M Construction Chemicals, Inc. "Crystex."
3) Master Builders "Masterflow 928."

m. Isolation Washers: Shall provide galvanic isolation. Approved material is nylon.

2.04 GALVANIZING, SHOP PRIMING, AND FINISHING

A. All exposed, new structural steel members and fabrications, unless indicated as being supplied with an exposed galvanized finish only, shall be shop primed and field finished with protective and finish coats in the field. See Painting Section 09 91 00.

B. Existing structural steel members and fabrications will be prepared and field finished with protective and finish coats according to Painting Section 09 91 00.

C. Galvanizing: Refer to Hot Dip Galvanizing Section 05 03 00. Contractor shall meet these requirements and those herein.

D. Galvanized Finish:

1. Minimum Preparation: Prepare surfaces, including the removal of loose mill scale, loose rust, and other foreign materials in accordance with requirements of American Hot-Dip Galvanizers Association and ASTM D2092.
2. Steel Shapes, Plates, Bars, and Strips: Hot-dip galvanized/ASTM A123, 1.25 oz/sq ft min.
3. Steel Sheets: Hot-dip galvanized/ASTM A653.
4. Assembled Steel Products: Hot-dip galvanized/ASTM A123, 1.25 oz/sq ft min.
5. Iron and Steel Hardware: Hot-dip galvanized/ASTM A153.

6. Before Leaving Shop: Damaged galvanized finish shall be prepared and touched up to match the quality of original galvanizing process.
7. Galvanized Surfaces to be Duplex Painted: Water quenching or chromate conversion coating should be avoided as these processes can interfere with later paint adhesion and surface preparation.

E. Galvanizing Repair Paint: SSPC Paint 20 or MIL-P-21035, with dry film containing a minimum of 94% metallic zinc dust by weight. Available Products: Subject to compliance with requirements, product that may be incorporated in the work include, but are not limited to, the following:

1. ZRC Cold Galvanizing Compound, Galvilite.
2. ZRC Galvilite® Galvanzing Repair Compound.
3. Approved equal.
4. Substitutions: Comply with General Conditions.

F. Finish Protective Coating System:

1. Existing Steel:

a. Field Primer: See Section 09 91 00 Painting.
b. For additional information, see Section 09 91 00 Painting.
c. Intermediate Coatings: See Section 09 91 00 Painting.
d. Finish Coatings: See Section 09 91 00 Painting.

2. New Structural Steel:

a. Shop Primer: See Section 09 91 00 Painting.
b. For additional information, see Section 09 91 00 Painting.
c. Intermediate Coatings: See Section 09 91 00 Painting.
d. Finish Coating: See Section 09 91 00 Painting.
e. All Other Steel: See Section 09 91 00 Painting.

2.05 PRIMER

A. Verify compatibility of primer paint and surface finishes. Prepare surfaces to ensure bond, at minimum, and to conform to indicated specifications of Steel Structures Painting Council, SSPC. See Section entitled "FINISHES," herein for material specifications.

2.06 FABRICATION

A. Fabricate and assemble structural steel in shop to greatest extent possible.

B. Fabricate structural steel according to AISC specifications referenced in this Section, shop drawings, and Contract Documents.

C. Verify all dimensions prior to fabrication.

D. Identify high-strength structural steel according to ASTM A6 and maintain markings until steel has been erected.

a. Mark and match-mark materials for field assembly.
b. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
c. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
d. Comply with fabrication tolerance limits of AISC "Code of Standard Practice for Steel Buildings and Bridges."
e. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

    1) Plane thermally cut edges to be welded.
    2) Plates shall be free of gross internal discontinuities such as ruptures and delaminations.

f. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing prior to welding. Completely assemble members to be milled before milling.
g. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and AWS D1.5 for track supporting structures and manufacturer's printed instructions.
h. Camber structural steel members where indicated on drawings. Specified camber applies at jobsite, just prior to erection, with member lying down flat such that self-weight has no effect. Contractor shall take necessary precautions to prevent or compensate for camber loss during shipment. Members with a field-measured camber outside of specified tolerance shall be returned to shop.
i. Base Plates: Hole sizes for anchor bolts may be oversized to facilitate erection as follows:

    1) Bolts 3/4 in. to 1 in. diameter – 5/16 in. oversize.
    2) Bolts 1 in. to 2 in. diameter – 1/2 in. oversize.
    3) Bolts over 2 in. diameter – 1 in. oversize.
    4) Use plate washers under nut at all oversized holes in base plates. Washers must be large enough to cover entire hole. Washer thickness shall be at least 1/8 of bolt diameter.
    5) Isolation washers shall be made of nylon.

j. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on shop drawings.

    1) Cut, drill, or punch holes perpendicular to metal surfaces.
    2) Do not flame-cut holes or enlarge holes by burning.
    3) Drill holes in bearing plates.
    4) Holes shall be clean-cut without torn or ragged edges.
    5) Outside burrs resulting from drilling or reaming operations shall be removed with a tool making a 1/16 in. bevel.
    6) Weld threaded nuts to framing and other specialty items as indicated to receive other work.

k. Openings in Structural Members:

1) Provide as required for other building components.
2) Reinforce openings with steel plates as indicated on drawings and weld in place to restore members to original strength.

2.07 CONNECTIONS

A. General: Refer to Drawings for connection types.

1. Shop Connections: High-strength bolted or welded, as indicated on drawings.
2. Field Connections: High-strength bolted or welded, as indicated on drawings.
3. High-Strength Bolted Joint Assembly and Tensioning of Connections: Tension all bolts (whether bearing or slip-critical) by turn-of-nut method, calibrated wrench method, or using direct tension indicators in accordance with RCSC (Research Council on Structural Connections) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 bolts." Correct bolted connections that fail inspection. For all track structures, use turn-of-nut method, or other method approved by the Commissioner and in accordance with RCSC.
4. Slip-Critical Connections: Connections detailed or installed as follows or where indicated on Drawings, are designated slip-critical connections:

a. Connections with bolts installed in oversized holes.
b. Connection with bolts installed in slotted holes where force on joint is in a direction other than normal to the axis of slot.
c. Connections in which combination of welds and bolts are used for stress transmission in common faying face.
d. All bolted steel connections shall be installed with a Class B faying surface unless noted otherwise on the documents.

B. Welded Construction:

1. In accordance with AWS D1.1 AND AWS D1.5 for track supporting structures.
2. Limit welding process to one or more of following:

a. Shielded metal arc.
b. Submerged arc.
c. Flux-cored arc.
d. Gas metal arc.

3. For fillet weld sizes not indicated on drawings, provide continuous welds with minimum fillet as specified by AWS D1.5 for track supporting structures.
4. Remove runoff tabs from members exposed to view.

C. Combination of bolts and welds used for stress transmission across common faying face of any connection is permitted only for slip critical connections and only if welds are made after bolts are tightened.FINISHES

2.08 FINISHES

A. General:

1. All structural steel members and accessories shall be shop-primed except where specifically required to be "galvanized" or remain "unprimed."
2. See Para. 1.02.C for finish table for new structural steel.
3. Related Painting Work: Section 09 91 00 Painting.

B. Unprimed Steel:

1. Do not prime members scheduled for fireproofing with Cementitious Fireproofing/Section 07 81 00.
2. Do not prime surfaces within 2 in. of field welds.

    a. After welding is completed, the unprimed surfaces and welded connections shall be primed as required above.

3. Do not prime surfaces to be in contact with concrete, mortar or surfaces to be encased in isolation grout.

    a. Extend priming of partially embedded members to a depth of 2 in.

4. Preparation: SSPC-SP2 or SSPC-SP3 minimum, prior to shipment.

C. Members with Slip-Critical Connections:

1. Follow surface preparation for members with slip-critical connections according to RCSC (Research Council on Structural Connections) “Specification for Structural Joints Using High Strength Bolts.”

D. Members to be concealed by other work:

1. Primer: SSPC- Paint 20.
2. Preparation: SSPC-SP2 or SSPC-SP3 minimum.

E. Members to receive sprayed-on cementitious fireproofing or cast-in-place concrete encasement:

1. Optional Primer: Modified alkyd rust-inhibitive primer, compatible with fireproofing material and conforming to UL fireproofing design as certified by fireproofing manufacturer, 55% minimum solids by volume, 3.0 mils minimum dry film. Acceptable products include, but are not limited to:

    a. Tnemec Company, Inc., 1009W primer, gray color, or equivalent.

2. Preparation: SSPC-SP2 or SSPC-SP3 minimum, prior to applying optional primer.

F. Members to Receive Field-Finished Paint Systems:

1. Primer: See Section Painting 09 91 00.

2. Finish: See Section Painting 09 91 00.

G. Galvanized Finish: Only where indicated on the documents.

1. Meet Section "Hot Dip Galvanizing" 05 03 00.
2. Minimum Preparation: Prepare surfaces, including the removal of loose mill scale, loose rust, and other foreign materials in accordance with requirements of American Hot-Dip Galvanizers Association and ASTM D2092.
3. Steel Shapes, Plates, Bars, and Strips: Hot-dip galvanized/ASTM A123, 1.25 oz/sq ft minimum.
4. Steel Sheets: Hot-dip galvanized/ASTM A653.
5. Assembled Steel Products: Hot-dip galvanized/ASTM A123, 1.25 oz/sq ft minimum.
6. Iron and Steel Hardware: Hot-dip galvanized/ASTM A153.
7. Before Leaving Shop: Damaged galvanized finish shall be prepared and touched up to match the quality of original galvanizing process.

H. Field Touch-Up Material:

1. For Primer: See Section "Painting" 09 91 00.
2. For Galvanized Finish: See Section "Hot Dip Galvanizing" 05 03 00.
3. For All Other Surfaces: See Section "Painting" 09 91 00.

2.09 SOURCE QUALITY CONTROL

A. The Testing Agency shall conduct structural steel quality assurance evaluations for compliance with specifications as follows:

1. Determine chemical composition of steel.
2. Determine mechanical properties, in accordance with ASTM A370, of following materials:

a. Steel shapes, plates and bars.
b. Headed stud shear connectors.
c. Anchor bolts.
d. High-strength threaded fasteners.
e. Filler metals for welding.

1) Check qualifications of the following for conformance to specifications:

a) Shop welding procedures and personnel.
b) Shop stud welding operators and stud bases.
c) Shop bolting procedures and crews.

f. Shop painting procedures and preparation.
g. Inspect high-strength shop-bolted connections in accordance with RCSC "Specifications for structural joints using A325 or A490 bolts" and as follows:

1) Visually inspect high-strength bolted connections.

2) Check bolts of connections between built-up truss members with a calibrated wrench for proper torque.
3) Check each bolt in bolted connections indicated as slip-critical with a calibrated wrench for proper torque.
4) Verify direct-tension indicator gaps for compliance with ASTM F959, Table 2.
5) Retest bolted connections that fail initial inspection after correction by fabricator.
6) Check calibration of wrenches at least twice daily.
7) Monitor installation of bolts to determine all plies of connected material have been drawn together and that the selected bolt tensioning procedure has been properly followed.

3. Inspect shop welds in accordance with AWS D1.1 and AWS D1.5 for track supporting structures and as follows:

a. Visually inspect 100% of welds.
b. Test 25% of fillet welds using magnetic particle method in conformance with ASTM E709.
c. Inspect 100% of complete penetration welds by ultrasonic testing in accordance with ASTM E164.
d. Inspect 100% of partial penetration welds by ultrasonic testing in accordance with ASTM E164, except that detecting joint discontinuity beyond partial penetration weld is not cause for rejection.

4. Inspect shop paint for conformance to specifications.
5. Inspect existing rivets on all connections within the scope of work.

B. Testing Agency shall submit inspection, observation, and/or test reports to Commissioner and shall provide an evaluation statement in each report stating whether or not structural steel conforms to requirements of specifications and drawings and shall specifically note deviation therefrom. Where testing is required for less than 100% of locations, select test locations at random and throughout the project. Testing reports to indicate the number of first-time "pass" results for each category of testing as a ratio of fist-time tests.

C. Report deficiencies to Commissioner immediately.

2.10 MISCELLANEOUS MATERIAL

A. Miscellaneous material, accessories, etc., not listed above shall be provided as specified hereinafter under the various items of work and/or as indicated on the drawings, or required for a complete structure according to specified standards.

B. Provide supplemental structural steel support framing for metal deck where normal deck bearing is precluded by other framing members and around openings.

2.11 GALVANIZING COATING REQUIREMENTS

A. Coating Weight: Conform with Para. 5.1 of ASTM A123, Table 1 of A767, or Table 1 of ASTM A153, as applicable.

B. Surface Finish: Continuous, adherent, as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article.

C. Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

2.12 TESTS FOR GALVANIZING

A. Galvanizer shall inspect the entire galvanized surface to ensure compliance with ASTM requirements.

B. Inspection and testing of hot-dip galvanized coatings shall be done under the guidelines provided in the AGA publication "Inspection of Products Hot Dip Galvanized After Fabrication".

C. Include visual examination and tests in accordance with ASTM A123, A767 or A153 as applicable to determine the thickness of the zinc coating on the metal surfaces.

D. Furnish a certificate indicating compliance with ASTM Standards and Specifications herein listed. The certificate must be signed by the galvanizer and contain a detailed description of the material processed as well as information as to the ASTM standard used for the coating.

PART 3 - EXECUTION

3.01 FABRICATION

A. Contractor must verify all dimensions and conditions in the field prior to fabricating and erecting structural steel. Notify the Commissioner of any major discrepancies.

B. Field modification of structural steel is prohibited without prior written approval of the Commissioner.

C. Structural steel for the bridge and track structures must be fabricated in accordance with Section 505, Steel Structures, of the IDOT Standard Specifications. In addition, track structures must be fabricated in accordance with AREMA "Manual for Railway Engineering," Chapter 15, "Steel Structures," Parts 3, Fabrication. Where differences occur in the provisions of the IDOT Standard Specification, AREMA "Manual for Railway Engineering," and this Specifications, the more stringent requirements must be followed as determined by the Commissioner.

3.02 PRODUCT HANDLING

A. Storage of Materials:

1. Store structural steel members at project site above ground on platforms, skid, or other supports.
2. Store other materials in a weathertight and dry place, until ready for use in work.

3. Store packaged material in their original unbroken package or container.

B. Store and maintain welding electrodes in accordance with AWS 1.1, and AWS D1.5 for the track supporting structure.

3.03 INSPECTION

A. Examine areas and conditions under which structural steel work is to be installed, and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Surveys: Employ a registered professional engineer experienced in survey work, or land surveyor, to establish permanent bench marks as shown and as required for accurate erection of structural steel. Check elevations and plan locations of concrete bearing surfaces, and locations of anchor bolts and similar as work proceeds, and report discrepancies. Do not proceed with erection until corrections have been made, or until compensation adjustment to structural steel work has been agreed upon with Contractor.

3.04 ERECTION

A. General: Provide in accordance with AISC "Specifications" and AISC "Code of Standard Practice." Accurately fit structural members to proper elevation and in alignment with finished structure. Make necessary adjustments to steel frame due to discrepancies in elevations and alignment before permanently fastening. Provide temporary bracing, bridging, connections and anchors as required to ensure proper alignment and stability during construction. Field cutting is prohibited, unless permitted by the Commissioner. Finish any cut surfaces equal to a sheared surface.

B. For bridge structures, structural steel must be assembled and erected in accordance with Section 505, Steel Structures, of the IDOT Standard Specifications and, also, in accordance with this Specification. For track structures, in addition to the requirements for bridge structures, structural steel must be assembled and erected in accordance with AREMA "Manual for Railway Engineering," Chapter 15, "Steel Structures," Parts 4, Erection. Where differences occur in the provisions of the IDOT Standard Specification, AREMA "Manual for Railway Engineering," and this Specification, the more stringent requirements must be followed, as determined by the Commissioner.

C. For bridge and track structures, the Contractor and the Contractor's erection engineer must be responsible to determine how cross-frames and diaphragms should be fitted. The Contractor and Contractor's erection engineer must perform girder drop analysis per AASHTO/NSBA Steel Bridge Erection Guide to determine the erected position of the girders and the condition under which that position is to be theoretically achieved. Girder drop analysis must be submitted to the Commissioner for review. No Load Fit (NLF or Fully Cambered Fit) should be avoided for skewed bridges or track structure spans with skew greater than 20°.

D. Temporary Shoring: Project is considered as a "non-self-supporting" structure until completion of entire Project. Submit inquiries on behavior of completed structure to

the Commissioner. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports only when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

E. Erection Tolerances:

1. Plumb, level, and align each individual piece in accordance with requirements of the AISC "Code of Standard Practice for Steel Buildings and Bridges."
2. Set structural frames accurately to the lines and elevations indicated, and as noted on Structural Drawings.
3. Align and adjust various members forming part of complete frame or structure before permanently fastening.

    a. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact.
    b. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
    c. Level and plumb individual members of structure.
    d. Establish required leveling and plumbing measurements on mean operating temperature of structure.
    e. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

F. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work. Furnish templates and other devices as necessary for presetting bolts and other anchors in accurate locations. Check positioning prior to concreting.

1. Refer to Division 3 sections for anchor bolt installation in concrete.

G. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces and roughen to improve bond. Clean bottom surface of base and bearing plates.

1. Use templates to secure anchor bolts and check correct positioning of anchor bolts prior to concreting.
2. Align attached column bases and bearing plates for beams and similar structural members with wedges, shims and/or setting nuts.
3. Grout under bearing plates immediately after leveling plates, before additional load is applied. Tighten anchor bolts after supported members have been positioned and plumbed. Remove leveling devices after grout achieves design strength. See Section entitled "GROUTING" for additional requirements.

H. Grouting:

1. Preparatory Work: Have all necessary tools and materials as near area to be grouted as possible to permit rapid and continuous work with grout. Anchor all

forms securely to prevent movement during placing or curing. Adequate clearance must be allowed between forms and base plates.

2. Mixing: Addition of water and mixing shall be in conformance with material manufacturer's instructions. Mix grout by using a mortar mixer. Use batches of size to allow continuous placement of freshly mixed grout. Do not retemper after initial set has occurred. Place quickly and continuously. Pack grout solidly between bearing surfaces and base plates to ensure that no voids remain. Exposed surfaces shall have smooth, dense finish. Wrap exposed grout surfaces with wet burlap or seal with plastic.
3. Grout temperatures: Grout temperatures should be maintained at 50°F to 90°F for a period of 48 hrs after placing. Care should be exercised so that extremes of hot or cold temperatures are avoided.
4. Placing: As grouting procedure begins, placement and compaction should be continuous until completed. Lengths of banding strap placed in forms before placing grout will assist in compaction of grout and elimination of air pockets. Strap should be worked in quick, short strokes and be removed before initial set occurs. Grout should be placed from one end or side only to avoid excessive air entrapment and assure good compaction. Whenever possible, grout bolt holes first. Do not overwork grout as this causes segregation, bleeding, and breakdown or initial set. If machines or equipment are being used nearby, consider shutting them down until grout takes final set.

I. Slide Bearings: Slide bearing plates shall be permanently affixed to member and support, respectively, by welding or bolting, as indicated. Member faces shall be aligned and leveled so as to maintain full and level contact between surfaces before completing installation. Use tempered shims where required for leveling.

J. Field Assembly:

1. Accurately assemble structural steel frames to lines and elevations indicated, within specified erection tolerances.
2. Various members forming parts of a complete frame or structure after being assembled shall be aligned and adjusted accurately before being fastened.
3. Fasten splices of compression members after abutting surfaces have been brought completely into contact.
4. Clean bearing surfaces that will be in permanent contact before members are assembled.
5. Perform necessary adjustments to compensate for discrepancies in elevation and alignment.
6. Connections: Do not weld or bolt members until affected portions of structure are properly stiffened and aligned. If connection areas are painted, remove paint at least 2 in. on either side of joint before making connection.
7. Splices are permitted only where indicated on drawings.
8. Do not use drift pins to enlarge unfair holes. Ream holes that must be enlarged to admit bolts. Burning and drifting may not be used to align unfair holes.
9. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces. On nonexposed welded construction, erection bolts shall be tightened securely and left in place, or if removed, holes shall be filled with plug welds.
10. Where parts cannot be assembled or fitted properly, as a result of errors in fabrication or of deformation due to handling or transportation, such condition shall be immediately reported to Commissioner, along with proposed method

of correction. The straightening of bends or warps shall be done by approved methods. Bent or damaged heat-treated parts will be rejected.

K. Headed Studs:

1. Automatically end weld headed studs in accordance with AWS 1.1, and AWS D1.5 for the track supporting structure.
2. Areas to which studs are to be attached must be free of foreign material, such as rust, oil, grease, paint, etc. When mill scale is sufficiently thick to cause difficulty in obtaining proper welds, remove by grinding or sand blasting.
3. Remove ceramic ferrules from studs and work after welding.

L. Do not attach nonstructural elements to structure until entire floor of structural framework has been erected and attachment of deck (and concreting, where required) is completed.

M. Gas Cutting: Do not use gas-cutting torches in field for correcting fabrication errors in structural framing. Cutting will be permitted only on secondary members that are not under stress. Finish gas-cut sections equal to a sheared appearance when permitted.

N. After erection is completed and before touch-up painting, inspect all joints in clean steel members. Fill any hole in members and connections of completed structure with weld metal.

O. Where building and facility steel structures are supported by bridge or track structures, detailing of the building and facility steel structures must consider the dead load deflection of the bridge or track structures at the stage when building and facility structures are erected. The erection tolerances specified in this Section applies to all steel structures, regardless of staging.

3.05 FIELD CONNECTIONS

A. Install and tension high-strength bolts according to RCSC "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."

1. Bolts: ASTM F3125, Grade A325 high-strength bolts, unless otherwise indicated.
2. Connection Type: Snug-tight, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

B. Weld Connections: Comply with AWS D1.1 (or AWS D1.5 for track supporting structures) for procedures, appearance, quality of welds, and methods used in correcting welding work.

C. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

D. Connections between members and corners must be mitered unless approved otherwise.

E. Welding or final bolting must not be done until as much of the structure as will be stiffened by the welding or bolting has been properly aligned.

F. Drift pins must not be used to enlarge unfair holes in main material

G. When high-strength bolts are used in pretensioned or slip-critical connections, bolt tensioning must be performed using "turn-of-nut method."

H. For bridge and track structures, bolt heads must face out on the exterior of the web.

3.06 PAINTING

A. Paint steel that is not encased in concrete, plaster, or sprayed-on fireproofing in accordance with Section "Painting" 09 91 00.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded or areas of shop paint.

C. Apply paint to exposed areas using same material as used for shop painting.

D. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.

E. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A780.

3.07 FIELD QUALITY CONTROL

A. Surveys: Survey base structure before proceeding with erection for dimensional extremes to determine range of required compensating adjustments. Make an accurate survey of actual column locations immediately upon completion of every tier of steel and promptly submit report to the Commissioner. Re-survey shall include tier below. Should column locations vary beyond allowable tolerances, take necessary corrective measures and modify details and/or procedure as required. Survey final erected structural steel frame prior to application of any other work, reporting any discrepancies from Contract requirements to the Commissioner.

B. General: The Testing Agency shall test and inspect steel materials and operations as work progresses. Failure to detect any defective work or materials shall not in any way prevent later rejection when such defect is discovered nor shall it obligate Commissioner for final acceptance.

1. Check qualification of following for conformance to specifications:

a. Field welding procedures and personnel.
b. Field welding operators and stud bases.
c. Field bolting procedures and crews.

2. Perform full-time inspection of field erection for 100% of structural joints. Inspect erected structural framework for conformance with requirements specified, including:

    a. Check location and set of anchor bolts and other inserts.
    b. Prior to attaching steel, check adjustment to fit inaccuracies.
    c. Check erected structural framework for alignments, plumbness, camber, etc.

3. Inspect high-strength bolted construction in accordance with RCSC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" and as follows:

    a. Visually inspect 100% of high-strength bolted connections.
    b. Testing of High-Strength Bolted Connections Installed as Pretensioned and Slip-Critical Condition: Inspect and test 100% bolts installed in snug-tight condition, with match-marks made, but prior to tightening to slip-critical condition. . After tightening by the turn-of-the nut method, bolted connection will be accepted on the basis of a visual inspection of the match-marks on the bolts.
    c. Check at least two bolts of every third connection between floor beams and girders with a calibrated torque wrench for proper torque.
    d. Check at least two bolts of every connection between girders and columns with a calibrated torque wrench for proper torque.
    e. Check field bolts of connections between built-up truss members with a calibrated torque wrench for proper toque.
    f. Check each bolt in bolted connections indicated as slip-critical with a calibrated torque wrench for proper toque.
    g. Verify direct-tension indicator gaps for compliance with ASTM F959, Table 2.
    h. Monitor installation of bolts to determine all plies of connected material have been drawn together and that selected tensioning procedures has been properly followed.
    i. Inspect all bolts of connections that have bolts failing inspection.
    j. Retest bolted connections that fail inspection after correction by the Contractor.
    k. Check calibration of wrenches at least twice daily.

4. Inspect field welds in accordance with AWS D1.1 and AWS D1.5 for track supporting structures as follows:

    a. Visually inspect 100% of welds.
    b. All inspection and testing is done after final pass.
    c. Magnetic Particle Testing: 20% of continuity plate, end plate, and bracing gusset plate fillet welds, selected at random.
    d. Magnetic Particle Testing: 100% of tension member fillet welds, e.g., hanger rod connections, bracing members to gusset plate and gusset plate welds for the main lateral resistance system, and other similar connections.
    e. Ultrasonic Testing and Inspection: 100% of complete and partial penetration welds in accordance with ASTM E164, e.g., built-up members and other similar members.

f. Magnetic Particle Testing: 100% of built-up member fillet welds in zones of moment connections.
g. Magnetic Particle Testing: 20% of other built-up member fillet welds, selected at random, final pass only.
h. Magnetic Particle Testing: 10% of other miscellaneous fillet welds, selected at random, final pass only.

5. Inspect headed stud welding in accordance with AWS D1.1 and AWS D1.5 for track supporting structures and as follows:

a. Visually inspect studs for complete fusion and full 360° weld flash (or fillet). Studs that reveal complete fusion and full weld flash shall be considered acceptable. If visual inspection reveals any stud that does not show complete fusion or weld flash or any stud repaired by welding, check stud by bending to an angle of 15° from its original axis in a direction opposite missing weld fillet. Studs that crack in weld, base metal, or shank shall be replaced. Studs that show no sign of failure shall be considered acceptable. Replace any stud that fails test.
b. In addition to visual inspection of stud welds, select, at random, six members per floor on which five studs shall be bent to an angle of 15° from its original axis. Not more than one of five studs shall show any sign of failure. If more than one stud fails, check all studs on member. Any stud that shows any sign of failure shall be replaced. For each member with any defective studs, test an additional member.
c. Any bent stud shall be left bent if no portion of stud is less than 1 in. from a proposed concrete surface, in which case, stud shall be straightened. Required bending and straightening shall be accomplished by mechanical means without heating.

6. Inspect erected structural steel for field touch-up painting in conformance with specifications.

C. Testing Agency shall submit inspection, observation, and/or test reports to the Commissioner and shall provide an evaluation statement in each report whether or not structural steel conforms to requirements of specifications and drawings and shall specifically note deviations therefrom. Where testing is required for less than 100% of locations, select test locations at random and throughout the project. Testing reports to indicate the number of first-time "pass" results for each category of testing as a ratio of fist-time tests.

1. Report deficiencies to Commissioner immediately and provide a repair procedure for review and approval prior to any deficiency correction.
2. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
3. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.08 FABRICATION

A. Material shall be properly marked and match-marked where field assembly is required. The sequence of shipments shall be such as to expedite erection and minimize the field handling of material.

B. Fabricate and assemble structural steel in shop to greatest extent possible. Assemblies shall conform to the dimensions shown on the approved shop drawings.

C. HSS Welded Connections

1. For HSS member with welded connections, member geometry may require splicing the HSS member for fit-up. Provide member splices as required by fabrication sequencing to provide all welds shown in the connection details. Refer to the drawings for HSS member splice connection details.

D. Beams shall be cambered where indicated on the Drawings.

E. Beam connections shall be as shown or noted on the Drawings. Unless noted otherwise, standard connections shall be used.

F. No combination of bolts and welds shall be used for stress transmission in the same face of any connection.

G. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on shop drawings.

1. For building structures, cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning; ream holes that must be enlarged to admit bolts. Drill holes in bearing plates.
2. For bridge structures, fastener holes must be in accordance with IDOT Standard Specification Article 505.04 (d).
3. For track structures, fastener holes must be in accordance with AREMA "Manual for Railway Engineering," Chapter 15, "Steel Structures," Parts 3, Fabrication, with the following modifications:

a. Section 3.2.6 g will not be permitted.
b. Section 3.2.7 e will not be permitted.

H. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

I. Rolled material, before and after being laid off or worked, must be straight within the tolerances allowed by ASTM A6. If straightening is necessary, it must be done by methods which will not adversely affect the behavior of the material. If straightening is not necessary, natural camber of rolled sections must be placed upward.

J. For steel to be galvanized, fabricate in accordance with Class I or II guidelines as described in AGA's Recommended Details for Galvanized Structures.

K. The maximum number of shop weld joint repairs is three unless otherwise approved by the Commissioner. Fabricator's welded joint repair procedure must be submitted to the Commissioner for approval, or the following preapproved repair procedure may be used:

1. Notify the Testing Agency prior to starting the repair procedure.
2. Remove the welded component by cutting to 1/8 in. above the welds.
3. Using air carbon arc, being extremely careful not to damage the base metal, remove the weld and remaining welded component to within 1/8 in. of the base metal.
4. Grind the remaining weld and welded component smooth and flush with the surrounding base metal. Grind parallel to the direction of applied stress.
5. Inspect all of the weld removal areas by magnetic particle test method either by the Testing Agency inspector or have the inspector witness the test.

    a. For track structures, time delay prior to magnetic particle test of weld repairs to groove welds for material over 2 in. in thickness, subject to tensile stress, must be 16 hrs minimum.

6. Complete a corrective action report and provide a copy to the Commissioner confirming the base metal meets the material requirement in this Specification with no defect and is adequate for the welded joint rework.

3.09 WELDING

A. Welding, filler metal, welding techniques and procedures shall be in accordance with AISC specification for the "Design, Fabrication and Erection of Structural Steel for Buildings," and AWS "Structural Welding Code" and "Filler Metal Specifications".

B. Welding processes other than shielded metal arc and submerged arc may be used provided procedure qualification tests in accordance with the American Welding Society are made for the intended application of any such process.

C. Built-up sections assembled by welding shall be free of warpage and all axes shall have true alignment.

D. Welds not specified shall be continuous fillet welds, using not less than the minimum fillet as specified by AWS.

E. All welding sequences shall be such as to reduce the residual stresses due to welding to a minimum value. If high residual stresses are present, stress relieving of joints may be required.

F. The toughness and notch sensitivity of the steel shall be considered in the formation of all welding procedures to prevent brittle and premature fracture during fabrication and erection.

G. Welded connections shall be detailed and designed to minimize the accumulation and concentration of thru-thickness strains due to weld shrinkage.

3.10 PREPARATION OF STEEL

A. Perform all inspections prior to galvanizing or field finishing. For contact surfaces, roughen galvanized surfaces by means of hand wire brushing per ASTM A123. Power wire brushing is not permitted.

B. All non-galvanized, existing structural steel surfaces shall be prepared and cleaned as specified in the painting section of these specifications.

C. Paint application shall be in accordance with paint manufacturer's printed instructions and recommendations. The fabricator shall submit paint system to be used for approval by the Commissioner prior to purchasing. All paint products shall be compatible products from the same manufacturer.

3.11 APPLICATION OF GALVANIZING

A. Galvanize steel members, fabrications, and assemblies to the greatest extent possible after fabrication by the hot dip process in accordance with ASTM A123. All structural steel members shall have all pieces attached by welding to the greatest extent possible as shown on drawings before galvanizing. All bolted pieces shall be bolted together after galvanizing. Ream all holes as necessary prior to galvanizing.

B. Prior to galvanizing, structural steel shall be cleaned of all mill scale, rust, spatter, slag or flux deposit, oil, dirt and other foreign material.

C. Dip all structural steel members and metal fabrications assuring a sufficient coating of all surfaces, including corners, joints, holes, and other surfaces.

D. Long steel members and large fabrications too large for a single dip in the galvanizing vat, shall be dipped in two applications to assure all surfaces are thoroughly and fully coated.

E. Galvanize bolts, nuts and washers and iron and steel hardware components in accordance with ASTM A153. Oversize components, threads or otherwise allow for additional thickness of galvanizing.

F. Safeguard products against steel embrittlement in conformance with ASTM A143.

G. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage or any distortion.

H. Zinc high spots, such as metal drip lines or zinc bumps, should be removed by cleaning with hand or power tools as described in SSPC SP 2 or 3. The zinc should be removed until it is level with the surrounding area, taking care that the base coating is not removed by the cleaning methods.

I. After cleaning, the surface shall be inspected for conformance to the required zinc thickness in accordance with ASTM A123 or A153 utilizing a magnetic-field-type thickness instrument in accordance with ASTM E376. Any item falling below the required zinc thickness, before or after removal of any high spots, shall be repaired in accordance with ASTM A780

3.12 GALVANIZED SURFACE PREPARATION FOR DUPLEX COATING

A. Newly galvanized surfaces shall be cleaned and prepared in accordance with either B and D (Step 1A and 2), or C and D (Step 1B and 2) below. Alternative surface preparation techniques will be considered through a joint submittal from the coating manufacturer and coating applicator.

B. Step 1A - Aqueous Alkaline Cleaning:

1. An alkaline solution (pH in the range of 11 to 12, but not greater than 13) shall be used to remove traces of oil, grease or dirt.
2. This solution can be applied through immersion in a tank filled with the solution, sprayed on, or brushed on with a soft nylon bristle brush. Steel or copper brushes shall not be used.
3. When dipping or spraying, it is recommended that the solution be used in the temperature range from 140°F to 185°F.
4. After cleaning, rinse thoroughly in hot water or water under pressure. Repeat to achieve a second freshwater rinse. Allow to dry completely before proceeding.

C. Step 1B – Solvent Cleaning (SSPC SP-1):

1. Typical cleaning solvents (such as mineral spirits, high-flash naphtha, etc.) can be used to remove oil and grease from the surface.
2. Proper rags or brushes should be used to wipe the galvanized parts. Small parts may be dipped or cleaned in ultrasonic solvent baths.
3. After cleaning, rinse thoroughly in hot water or water under pressure. Repeat to achieve a second freshwater rinse. Allow to dry completely before proceeding.

D. Step 2 – Sweep Blasting (SSPC SP-16):

1. Use an abrasive sweep or brush blasting, which uses a rapid nozzle movement to roughen the galvanized surface profile. The abrasive material shall be selected with care to provide a stripping action without removing excess zinc layers. Follow the procedures detailed in ASTM D6386 for abrasive sweep blasting.
2. Blast materials should have a particle size between 200 to 500 micrometers, and a Moh's hardness ≤ 5 (five or less).
3. Following abrasive blast cleaning, surfaces should be blown down with clean, compressed air.

E. After sweep blasting and air cleaning, the steel shall be shop-prime painted within 12 hrs or less. Rapid turnaround is required to avoid any further development of zinc compounds on the surface.

F. The coating applicator shall provide a Certificate of Compliance showing acceptance that the prepared hot-dip galvanized coating surface meets or exceeds the requirements for successful painting of the surface.

3.13 FIELD ALTERATIONS

A. Modifications required to structural steel fabrications to facilitate proper installation including cutting, drilling or welding shall be submitted to the Commissioner for written approval. Provide shop drawings of the proposed modifications certified by the Contractor's SSE.

B. Repair and touch up galvanizing upon completion of alterations, bolting, welding, etc. of fabrications of existing steel as specified in the painting section.

C. The maximum number of welded joint repairs is three unless otherwise approved by the Commissioner. This limit is also applicable to shop welds. Fabricator's welded joint repair procedure must be submitted to the Commissioner for approval, or the following pre-approved repair procedure may be used:

1. Notify the Testing Agency prior to starting the repair procedure.
2. Remove the welded component by cutting to 1/8 in. above the welds.
3. Using air carbon arc, being extremely careful not to damage the base metal, remove the weld and remaining welded component to within 1/8 in. of the base metal.
4. Grind the remaining weld and welded component smooth and flush with the surrounding base metal. Grind parallel to the direction of applied stress.
5. Inspect all of the weld removal areas by magnetic particle test method either by the Testing Agency inspector or have the inspector witness the test.

    a. For track structures, time delay prior to magnetic particle test of weld repairs to groove welds for material over 2 in. in thickness, subject to tensile stress, must be 16 hrs minimum.

6. Complete a corrective action report and provide a copy to the Commissioner confirming the base metal meets the material requirement in this Specification with no defect and is adequate for the welded joint rework.

D. Welded joint rework can start after the corrective action report is accepted by the Commissioner.

E. Protective coatings shall be restored per appropriate, approved material type and procedure conforming to ASTM A780.

3.14 FIELD CLEANING, GALVANIZING TOUCH UP AND PAINTING

A. Field cleaning and painting shall conform to the requirements of the painting section of these specifications, including preparation of existing surfaces, preparation of galvanized surfaces, touch-up of galvanizing and application of prime and finish coats at field welds, bolted connections, abraded areas and other areas of the exposed steel.

B. Repair of damaged and uncoated areas of galvanized steel shall be per approved repair material and approved detailed procedure conforming to ASTM A780. Damaged or uncoated areas shall be previously galvanized steel surfaces that do not

have the minimum required coating thicknesses as defined in the governing ASTM, ASTM A123, or ASTM A153.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of STRUCTURAL STEEL shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of STRUCTURAL STEEL shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000.

END OF SECTION

SECTION 05 12 13

ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes requirements regarding the appearance and surface preparation of Architecturally Exposed Structural Steel. (AESS). Refer to Section 05 10 30 'Structural Steel' for other requirements regarding steel work not included in this Section.

B. This Section applies to members noted on the drawings as AESS.

C. Related Sections: The following sections contain requirements that relate to this Section:

1. Section 05 03 00 – Hot Dip Galvanizing.
2. Section 05 10 30 – Structural Steel.
3. Section 05 31 13 – Steel Decking.
4. Section 05 50 00 – Metal Fabrications.
5. Section 07 92 00 – Joint Sealant.
6. Section 09 91 00 – Painting.
7. Architecturally Exposed Structural Steel shall follow specifications Structural Steel 05 10 30 and Hot Dip galvanizing 05 03 00 unless noted otherwise herein.

1.03 DEFINITIONS

A. Definition of project terms and abbreviations are found within Specification Section 01 35 00.

B. Architecturally Exposed Structural Steel: Structural Steel conforming to one of the categories of Architecturally Exposed Structural Steel or AESS Refer to ANSI/AISC 303-16 “Code of Standard Practice for Steel Buildings and Bridges”.

1.04 QUALITY ASSURANCE

A. The Contractor is solely responsible for quality control of the structural steel work.

B. Fabricator Qualifications: In addition to those qualifications listed in Section 05 10 30 'Structural Steel', engage an AISC Certified Fabricator, experienced in fabricating AESS similar to that indicated for this Project with a record of successful in-service performance, as well as sufficient production capacity to fabricate AESS without delaying the Work. Fabricator shall have 10 years minimum certifiable experience in designing, engineering, detailing, fabricating, erecting, and finishing of AESS of type and scope similar to this project.

C. Erector Qualifications: In addition to those qualifications listed in Section 05 10 30 Structural Steel, engage an AISC Certified Erector, experienced in erecting AESS work similar in material, design, and extent to that indicted for this Project and with a record of successful in- service performance. Erector shall have no less than 10 years of experience in erection of AESS of type and scope similar to this project.

D. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

E. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303-16," Code of Standard Practice for Steel Buildings and Bridges", Section 10.

F. Preinstallation Conference: Conduct a Preinstallation Conference, to review conditions associated with performing the work. Include review of schedule, fabrication and construction conditions, surface preparation and protective coating work, environmental requirements and coordination required for performing the work. Meeting participants shall include Commissioner, representative of fabricator and installer of AESS work, the finish-painting subcontractor, and installers of related work. Coordinate requirements for shipping, special handling, storage, attachment of safety cables and temporary erection bracing, final coating, touch up painting, mockup coordination, Commissioner's observations, and other requirements for AESS.

G. Mockup: Provide mockups of the nature and extent indicated on the Contract Documents.

1. Locate mockups as agreed to by Commissioner. Mockups shall be full size unless the Commissioner approves smaller mockups.
2. Notify the Commissioner one week in advance of the dates and times when mockups will be available for review.
3. Demonstrate applicable AESS characteristics for the specified category of AESS on the elements and joints in the mockup.
4. Build mockups using member sizes and materials indicated for final Work.
5. The mockup shall demonstrate weld quality and contouring of the welds at the aligned walls of the members.
6. The mockup shall demonstrate the specified surface preparation and finish coating.

7. HSS members shall extend at least 6 in. from the joint in the mockup.
8. Obtain Commissioner's written approval of mockups before starting fabrication.
9. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.

1.05 ACTION SUBMITTALS

A. Submit to the Commissioner copies of manufacturer's specifications and installation instructions for the products being supplied as well as for the welding, galvanizing, and any shop-applied coats of paint, including laboratory test reports and such other data as may be required to show compliance with these Specifications and specified standards.

B. AESS Shop Drawings: In addition to requirements of Section 05 10 30, show complete details of bolted and welded joints, and each item or component which is directly fastened or secured to AESS. Include elevations at 1/4 in. scale, typical elevations at 1 in. scale and details at full scale.

1. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Identify grinding, finish, and profile of welds as defined herein.
2. Indicate orientation of HSS seams and mill marks (where applicable).
3. Indicate type, size, finish, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections. Bolt heads should be oriented toward the visible face of the work.
4. Clearly indicate which surfaces or edges are exposed and what class of surface preparation is being used.
5. Indicate special tolerances and erection requirements as noted on the drawings or defined herein.
6. Indicate vent or drainage holes for HSS members.

C. AESS Samples: Submit samples showing each weld type of 8 in. length, and surface preparation for the work. Furnish samples of 1 ft long shapes and 1 ft square plates as applicable. Review of samples by the Commissioner will be only for visual appearance and quality.

1. Continuous weld appearance.
2. Sharp edges ground smooth.
3. Surface preparation.
4. Fabrication mark removal.
5. Weld show through.
6. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Identify grinding, finish, and profile of welds as defined herein.
7. Indicate orientation of HSS seams and mill marks (where applicable).
8. Indicate type, size, finish, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections. Bolt heads should be oriented toward the visible face of the work.

9. Clearly indicate which surfaces or edges are exposed and what class of surface preparation is being used.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification data for firms and persons specified in the "Quality Assurance" article to demonstrate their capabilities and experience. Include lists of completed projects names and address, names, and addresses of architects and owners, and other information specified. For each project, submit photographs showing detail of installed AESS.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver material to the project site until the proposed method and sequence of erection has been reviewed by the Commissioner. Method and sequence shall be planned so as to avoid delay or damage to the work of other trades.

B. Deliver AESS to project site in such quantities and at such times to ensure continuity of installation. Tie downs on loads shall be nylon straps or shall use softeners when using chains or wire rope slings to avoid damage to edges and surfaces of members. The standard for acceptance of delivered and erected members shall be equivalent to the standard employed at fabrication.

C. Material stored at the jobsite shall not exceed design loads on existing or newly constructed structures so that members will not be distorted or otherwise damaged, and shall be protected against corrosion or deterioration. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.

D. Handle finish pieces using nylon type slings, or chains with softeners, or wire ropes with softeners such that they are not damaged.

1.08 PROJECT CONDITIONS

A. Field Measurements: Where AESS is indicated to fit against walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.09 COORDINATION

A. Coordinate installation of anchors for AESS members. Furnish setting drawings, templates, and directions for installing anchors, including sleeves, concrete inserts, anchor bolts, and items with integral anchors.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: All AESS Steel and category are indicated on the structural drawings.

B. Epoxy Filler for AESS:

1. Description: Solvent-resistant, two-component metal and epoxy compound suitable for repair of steel and compatible with required protective coating system.
2. Acceptable products include, but are not limited to:

    a. Devcon Corp., Plastic Steel.
    b. 3M Company, Scotch-Weld Adhesive 1751.

C. Blasting Abrasive for AESS: Type, grade, hardness, and size gradation necessary to achieve requirements of Contract Documents, subject to approval of prime coating manufacturer. Blasting abrasive shall be new, not recycled; uncontaminated, free of harmful materials, dry, and uniformly graded.

D. High-Strength Bolts, Nuts, and Washers: Refer to Section 05 10 30 'Structural Steel'.

2.02 PAINT SYSTEM

A. Compatibility: Components/procedures of the AESS paint system shall conform to the coating system specified in Section 09 91 00 Painting.

B. Finish Protective Coating System for All AESS Steel:

1. Shop Primer:
2. For additional information, see Section 09 91 00 Painting.
3. Intermediate Coatings: See Section 09 91 00 Painting.
4. Finish Coatings: See Section 09 91 00 Painting.

C. Primer: Primer shall comply with federal standards for VOC, lead, and chromate levels

D. Finish Coating: Field apply intermediate and top coats per Section 09 91 00 Painting.

E. Verify compatibility of primer paint and surface finishes. Prepare surfaces to ensure bond, at minimum, and to conform to indicated specifications of Steel Structures Painting Council, SSPC.

2.03 FABRICATION

A. Fabricate AESS work with special care for best appearance and as required by Contract Documents. Apply techniques as applicable to produce and maintain quality of work within required tolerances.

B. Preassemble AESS components in the shop so as to minimize field splicing and assembly of units at project site. Disassemble components only to the extent necessary for shipping and handling. Mark components for reassembly and coordinate installation, except do not apply marks on exposed surfaces. All HSS members shall be provided as closed, seal welded members with closed or capped ends. In each member shall also have weeps as shown on the drawings. Steel Surfaces: Surfaces of steel which will be exposed shall be smooth and free of blemishes, pitting, seam marks, roller marks, rolled trade names, roughness, and other like conditions or imperfections. Remove such blemishes by welding, grinding, or other method prior to starting surface preparation. Sequence work with surface preparation operation.

1. Filler, caulk, or body putty type materials, other than filler metal deposited by welding process, are not acceptable for remedial work.
2. Epoxy filler may be applied to pockets, voids, pitting, or other blemishes on exposed surfaces of interior steel to be painted, including welds.

2.04 FABRICATION AESS 1

A. Use special care in handling and shipping of AESS both before and after shop painting minimize damage to any shop finish. Use nylon type slings or softeners when using chains or wire rope slings.

B. The permissible tolerances for member depth, width, out of square, and camber and sweep shall be as specified in ASTM A6/A6M-2014 Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling (ASTM A6/A6M), ASTM A500/A500M-2013 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes (ASTM A500/A500M), and Standard Specification for Cold-Formed Welded Carbon Steel Structural Sections (HSS) (ASTM A1085/A1085M).

C. Fabricate and assemble AESS in the shop to the greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by the Commissioner. Detail AESS assemblies to minimize field handling and expedite erection.

D. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.

E. Remove backing and run out tabs.

F. Grind sharp edges smooth, including sheared, punched, or flame cut edges.

G. Provide a continuous appearance to welded joints including tack welds. Provide joint filler at intermittent welds.

H. Bolted Connections: Make in accordance with Structural Steel 05 10 30. Provide bolt type and finish as noted herein.

I. Weld Connections: Comply with AWS D1.1 and Structural Steel 05 10 30. Appearance and quality of welds shall be consistent. Assemble and weld built-up sections by

methods that will maintain alignment of members without warp exceeding the tolerance of this section.

J. Install bolts on the same side of the connection. Orient uniformly in the direction indicated, consistent from one connection to another.

K. Remove weld spatter, slivers, and similar surface discontinuities.

L. Grind off projections larger than 1/16 in. at butt and plug welds.

M. Continuous Weld Appearance: Where continuous welding is noted on the drawings, provide welds of a uniform size and profile.

N. Seal Welds: Seal weld open ends of round and rectangular hollow structural section with 3/8 in. closure plates. Provide venting as required for galvanized members.

2.05 FABRICATION AESS 2

A. Fabricate to requirements of AESS 1 and as follows:

1. The as-fabricated straightness tolerance shall be one-half of that specified in ASTM A6/A6M, ASTM A500/A500M, or ASTM A1085/A1085M.
2. For curved structural members, whether composed of a single standard structural shape or built-up, the as-fabricated variation from the theoretical curvature shall be equal to or less than the standard camber and sweep tolerances permitted for straight members in the applicable ASTM standard.
3. The tolerance on overall profile dimensions of welded built-up members shall one-half of that specified in AWS D1.1/D1.1M: 2015 Structural Welding Code – Steel (AWS D1.1).
4. Provide hidden part marks or piece marks that may be fully removed after erection.

2.06 FABRICATION AESS 3

A. Fabricate to requirements of AESS 2 and as follows:

1. Fabricate AESS with exposed surfaces smooth, square, and of surface quality consistent with the approved mockup.
2. Grind projections at butt and plug welds to be smooth with the adjacent surface.
3. Orient HSS seams as shown.

B. Copes, miters, and cuts in surfaces exposed to view shall have a maximum gap of 1/8 in. in an open joint. If the gap is shown to be in contact, the contact shall be uniform within 1/16 in.

C. Mill marks shall not be exposed to view. If it is not possible to hide mill marks, then the mill marks are to be removed by appropriate length cutting of mill material. If this is not possible, the fabricator shall remove the mill mark, grind, and fill the surface to be consistent with the approved mockup.

D. The matching of abutting cross sections is required.

2.07 FABRICATION AESS 4

A. Fabricate to requirements of AESS 3 and as follows:

1. Contouring and Blending of Welds: Where welds are indicated to be ground contoured, or blended, oversize welds as required and grind to provide a smooth transition and match profile on approved mockup.
2. Minimize Weld Show Through: At locations where welding on the opposite side of an exposed connection creates distortion, weld show through shall be minimized to conform to the approved mockup.

B. Open holes shall be filled with weld metal or body filler and smoothed by grinding or filling to the standards applicable to the shop fabrication of the materials.

2.08 SHOP PRIMING

A. Provide surface preparations to SSPC-SP6. Coordinate the required surface profile with the approved paint submittal prior to beginning surface preparation. Prior to blasting remove any grease and oil using solvent cleaning to meet SSPC-SP 1. Weld spatter, slivers, and similar surface discontinuities shall be removed. Sharp corners resulting from shearing, flame cutting, or grinding shall be eased.

B. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 in.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop primer to surfaces that are inaccessible after assembly or erection.

2.09 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply per Hot Dip Galvanizing 05 03 00.

2.10 FABRICATION QUALITY CONTROL AND QUALITY ASSURANCE AESS 1 AND 2

A. Structural Requirements:

1. Conform to Quality Control requirements per ANSI/AISC 360-16 "Specification for Structural Steel Buildings" Chapter N and ANSI/AISC 303-16," Code of Standard Practice for Steel Buildings and Bridges," Section 10. Refer to Section 051030 "Structural Steel" for additional requirements.
2. Commissioner will engage a Quality Assurance agency per the requirements of ANSI/AISC 360- 16 "Specification for Structural Steel Buildings" Chapter N and ANSI/AISC 303-16," Code of Standard Practice for Steel Buildings and Bridges," Section 10.

B. AESS Acceptance: The Commissioner shall observe the AESS steel in the shop at a viewing distance consistent with the final installation and determine acceptability based on the approved mockup.

2.11 FABRICATION QUALITY CONTROL AND QUALITY ASSURANCE AESS 3 AND 4

A. Conform to FABRICATION QUALITY CONTROL AND QUALITY ASSURANCE AESS 1 AND 2 and as follows.

B. AESS Acceptance: The Commissioner shall observe the AESS steel in the shop at a viewing distance consistent with the final installation and determine acceptability based on the approved mockup.

PART 3 - EXECUTION

3.01 EXAMINATION

A. The erector shall check AESS members upon delivery for twist, kinks, gouges, or other imperfections which may result in rejection of the appearance of the member. Coordinate remedial action with fabricator prior to erecting steel.

3.02 PREPARATION

A. Temporary Shoring: Project is considered as a "non-self-supporting" structure until completion of entire project. Submit inquiries on behavior of completed structure to the Commissioner. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports only when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

B. Provide connections for temporary shoring, bracing, and supports only where noted on the approved Fabrication Documents. Temporary connections not shown shall be made at locations not exposed to view in the final structure or as approved by the Commissioner. Handle, lift, and align pieces using nylon straps or chains with softeners required to maintain the appearance of the AESS through the process of erection.

3.03 ERECTION GENERAL

A. The Contractor shall take note that portions of this work are attached to an active trackway. As such, the structures that are integral with the trackway may shift during or before construction and all dimensions provided on the design drawings relative to trackway structures shall be considered as for reference only. The fabricator shall ensure that the dimensions and locations of existing structures and components match those found in the field and shall implement sufficient mitigating measures to accommodate expected trackway movements, including surveys taken immediately prior to fabrication, where appropriate.

B. Methods:

1. Perform operations in a manner that close fit and appearance of steel and structure will not be impaired.
2. Provide steel within required tolerances. Compensate for temperature variations, cumulative welding draw, construction loadings, sequential applications of permanent dead loads or any predictable condition that could cause distortions to exceed required tolerances.
3. Do not cut, trim, or weld components during erection in a manner that will damage finish, decrease strength or result in visual imperfection or failure in performance of the work.
4. Repair imperfections in steel surfaces as specified in Section 2.06.B. and finish repaired to meet requirements of Contract Documents.

3.04 ERECTION AESS 1

A. Employ special care to handle and erect AESS. Erect finish pieces using nylon straps or chains with softeners such that they are not damaged.

B. Place weld tabs for temporary bracing and safety cabling at points concealed from view in the completed structure or where approved by the Commissioner during the preinstallation meeting. Methods of removing temporary erection devices and finishing the AESS members shall be approved by the Commissioner prior to erection.

C. AESS Erection Tolerances: Erection tolerances shall meet the requirements of standard frame tolerances for structural steel per Chapter 7 of ANSI/AISC 303-16.

D. Set AESS accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

E. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.

F. Remove backing and run out tabs.

G. When temporary braces or fixtures are required to facilitate erection, care shall be taken to avoid any blemishes, holes, or unsightly surfaces resulting from the use or removal of such temporary elements.

H. Bolted Connections: Align bolt heads on the same side of the connection as indicated on the approved fabrication or erection documents.

I. Weld Connections: Comply with AWS D1.1 and Section 05 10 30. Appearance and quality of welds shall be consistent. Employ methods that will maintain alignment of members without warp exceeding the tolerance of this Section.

J. Remove weld spatter exposed to view.

K. Grind off projections larger than 1/16 in. at field butt and plug welds.

L. Continuous Welds: Where continuous welding is noted on the drawings, provide continuous welds of a uniform size and profile.

M. Do not enlarge holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.

N. Splice members only where indicated.

O. Obtain permission for any torch cutting or field fabrication from the Commissioner. Finish sections thermally cut during erection to a surface appearance consistent with the mockup.

3.05 ERECTION AESS 2

A. Erect to the requirements of AESS 1 and as follows:

1. AESS Erection Tolerances: Erect to standard frame tolerances for structural steel per Chapter 7 of ANSI/AISC303-16.

3.06 ERECTION AESS 3

A. Erect to the requirements of AESS 2 and as follows.

B. Field Welding: Weld profile, quality, and finish shall be consistent with mockups approved prior to fabrication.

C. Provide a continuous appearance to welded joints including tack welds. Provide joint filler at intermittent welds.

3.07 ERECTION AESS 4

A. Erect to the requirements of AESS 3 and as follows.

B. Welds Ground Smooth: Erector shall grind welds smooth.

C. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection creates distortion, grind distortion and marking of the steel to a smooth profile with adjacent material.

D. Filling of Weld Access Holes: Where holes must be cut in the web at the intersection with flanges on W shapes and structural tees to permit field welding of the flanges, they shall be filled with joint filler.

E. Where welds are indicated to be ground, contoured, or blended, oversize welds as required and grind to provide a smooth transition and match profile on approved mockup.

3.08 FIELD CONNECTIONS

A. Verify that weld sizes, fabrication sequence, and equipment used for AESS will limit distortions to allowable tolerances.

B. Prevent surface bleeding of back-side welding on exposed steel surfaces.

C. Grind smooth exposed fillet welds 1/2 in. and larger.

D. Grind flush butt welds.

E. Dress exposed welds.

3.09 FIELD QUALITY CONTROL AND QUALITY ASSURANCE

A. Conform to Quality Control requirements per ANSI/AISC 360-16 "Specification for Structural Steel Buildings" Chapter N and ANSI/AISC 303-16," Code of Standard Practice for Steel Buildings and Bridges", Section 10. Refer to Section 05 10 30 Structural Steel for additional requirements.

B. Commissioner will engage a Quality Assurance agency per the requirements of ANSI/AISC 360-16 "Specification for Structural Steel Buildings" Chapter N and ANSI/AISC 303-16," Code of Standard Practice for Steel Buildings and Bridges," Section 10.

C. AESS Acceptance: The Commissioner shall observe the AESS steel in place and determine acceptability based on the qualification data and submittals.

D. Surveys: Survey base structure before proceeding with erection for dimensional extremes to determine range of required compensating adjustments. Make an accurate survey of actual column locations immediately upon completion of every tier of steel and promptly submit report to the Commissioner. Resurvey shall include tier below. Should column locations vary beyond allowable tolerances, take necessary corrective measures and modify details and/or procedure as required. Survey final erected structural steel frame prior to application of any other work, reporting any discrepancies from Contract requirements to the Commissioner.

3.10 ADJUSTING AND CLEANING

A. Touch-up Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint shall be completed to blend with the adjacent

surfaces of AESS. Such touch-up work shall be done in accordance with manufacturer's instructions and as specified in Division 9 Section Painting.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded area. Any repairs to galvanized surfaces shall comply with ASTM A780/A780M – 2015 Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings.

C. Cleaning: Clean exposed surfaces of AESS promptly after installation of components, exercising care to avoid damage.

D. Protection:

1. Maintain AESS in a clean condition. Remove spillage of materials as they occur.
2. Protect AESS from damage during subsequent construction.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of ARCHITECTURALLY EXPOSED STRUCTURAL STEEL shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this Section. Payment for the Work of ARCHITECTURALLY EXPOSED STRUCTURAL STEEL shall be included in the Contract lump sum price as shown in the Schedule for Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 03 00 00.

END OF SECTION

SECTION 05 31 13

STEEL DECKING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Station high roof deck.
2. Other areas indicated in the documents.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Section 05 03 00 – Hot Dip Galvanizing.
2. Section 07 92 00 – "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

C. Definitions:

1. Definition of project terms and abbreviations are found within Specification Section 01 35 00.

1.03 REFERENCES

A. Acronyms for reference standards are defined in Section 01 42 00.

B. American Iron and Steel Institute (AISC): "Specification for the Design of Cold-Formed Steel Structural Members."

C. ASTM A108 – Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.

D. ASTM A611 – Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Structural Quality.

E. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

F. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

G. ASTM A924 – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

H. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials

I. AWS D1.1 – Structural Welding Code - Steel.

J. AWS D1.3 – Structural Welding Code - Sheet Steel.

K. CTA IDCM – Infrastructure Design Criteria Manual, Chapter 7 Structural, February 2017, Chicago Transit Authority.

L. DOD-P-21035 Paint, High Zinc Dust Content, Galvanizing Repair

M. MIL-P-21035 – Paint, High Zinc Dust Content, Galvanizing Repair.

N. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): "Architectural Sheet Metal Manual."

O. Steel Deck Institute Inc. (SDI): "SDI Design Manual for Composite Decks, Form Decks and Roof Decks." Design Manual No. 30 and 31.

P. SSPC Paint 20 – Zinc-Rich Primers (Type I "Inorganic" and Type II "Organic").

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements, including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.05 QUALITY ASSURANCE

A. The contractor is solely responsible for the design of shoring systems. All shoring shall be designed and have calculations performed by the Contractor's SSE. Shoring drawings and calculations shall be submitted for record only. Shoring plans shall include superimposed loading information as well as location and magnitude of shoring posts and towers.

B. Standards: Comply with applicable requirements and details of AISC "Specification for the Design of Cold-Formed Steel Structural Members", SMACNA "Architectural Sheet Metal Manual" and SDI "SDI Design Manual for Composite Decks, Form Decks and Roof Decks".

C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

D. Wind Uplift: Provide roof panel system including supports meeting requirements of Underwriters Laboratories, Inc. for Class 90 wind uplift resistance.

E. Field Measurements: Where possible, prior to fabrication of panels, take field measurements of structure or substrates to receive panel system. Allow for trimming panel units where final dimensions cannot be established prior to fabrication.

F. Structural Design: Panels must be designed to support snow and wind loads as defined by the local building code and CTA IDCM for the supports spaced as shown on the drawings. Deck profile, type, depth, and thickness to be selected to provide superimposed design loads required and as determined using SDI Design Manual No. 30 & 31 construction loading criteria. Provide test data or calculations signed by a Structural Engineer licensed in the state of Illinois.

G. Installer Qualifications: The work of this section shall be performed by a company that specializes in the type of steel deck work required for this Project, with a minimum of 10 years of documented successful experience and shall be performed by skilled workmen thoroughly experienced in the necessary crafts.

1. Work shall be performed in compliance with Owner's insurance underwriters' requirements.

H. Manufacturer shall specialize in manufacturing the type of steel decking required for this Project, with a minimum of 10 years of documented successful experience as a single-source responsibility and warranty.

I. Qualification of Welding Work:

1. Welding Standards: Comply with applicable provisions of AWS D1.1 and AWS D1.3.

a. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

2. Decking welded in place is subject to inspection and testing.

a. Expense of removing and replacing any portion of decking for testing purposes will be borne by the Owner if welds are found to be satisfactory.
b. Remove work found to be defective and provide acceptable work at no additional cost to the Owner

1.06 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Submit for Approval shop drawings, signed and sealed by a Structural Engineer licensed in the State of Illinois, and clearly indicate, but not limited to, the following information:

1. Layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.
2. Type of finish.
3. All details indicating full compliance with this Section, Architect/Engineer's design requirements, and Contract Documents.

C. Product Data: Submit for Record Only manufacturer's product data, including specifications and installation instructions clearly marked to indicate all technical information, including load tables, which specifies full compliance with requirements of this Section and Contract Documents for each type of deck, accessory and product specified.

D. Present welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Supply research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence steel deck's compliance with the building code in effect for the project.

F. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

G. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

H. Structural Calculations: Furnish engineering calculations to show that maximum stresses and deflections do not exceed specified design load requirements under full design loading. Calculations shall address all design gravity and in-plane diaphragm loads indicated on the drawings. Contractors SSE shall provide calculations signed and sealed that show the Contractor’s selected deck product can resist the loads published by the deck supplier for this project. Calculations shall be submitted with decking shop drawing submittal, else the submittal shall be considered incomplete.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

C. Protect with a waterproof covering and ventilate to avoid condensation.

1.08 WARRANTY

A. Comply with General Conditions, agreeing to repair or replace specified materials or Work that has failed within the warranty period. Failures include, but are not limited to, the following:

1. Defective material and workmanship.
2. Inadequately prepared surfaces and quality of primer and application.
3. Excessive deflection.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.02 UNAUTHORIZED MATERIALS

A. Materials and products required for work of this section shall not contain asbestos, polychlorinated biphenyls (PCB), or other hazardous materials identified by the Commissioner.

2.03 ROOF DECK

A. Roof Deck: Fabricate panels to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31.

B. Stainless-Steel Sheet: ASTM A240/A240M, Type 316.

C. Prime-Painted Steel Sheet: ASTM A611, Grade C, shop primed as follows:

1. Shop Primer: Grey or white baked-on, lead- and chromate-free rust-inhibitive primer, conforming to the performance requirements of Fed. Spec. TT-P-664.

D. Galvanized-Steel Sheet: ASTM A653, Grade A, G 60 zinc coated according to ASTM A653

E. Deck Profile: As indicated.

F. Profile Depth: As indicated on drawings.

G. Design Uncoated-Steel Thickness: Minimum 18 gage.

H. Span Condition: As indicated.

I. Available Products: Subject to compliance with requirements, product that may be incorporated in the work include, but are not limited to, the following:

1. Consolidated Systems, Inc/Columbia, South Carolina.
2. Robertson A United Dominion Co/Pittsburgh, Pennsylvania.
3. Roof Deck, Inc/Hightstown, New Jersey.
4. United Steel Deck, Inc/Summit, New Jersey.
5. Vulcraft Div. of Nucor Corp/Charlotte, North Carolina.
6. Walker Div. of Butler Manufacturing Co/Parkersburg, West Virginia.
7. Wheeling Corrugating Co., Div. of Wheeling-Pittsburgh Steel Corp/Wheeling, West Virginia.
8. CSM Products & Solutions.
9. Western Metal Deck.
10. Substitutions: Comply with General Conditions.

J. Design Load and Deflection: Design, fabricate and install component parts so that the completed Work shall withstand inward and outward loading applied normal to the plane of metal roofing panels with deflection not exceeding 1/240 of the clear span between supports.

1. Wind Load 30 PSF.
2. Snow Load 25 PSF.
3. Point Load 200 lbs.

K. Design Factor of Safety: Design, fabricate, and install component parts of Work, including roofing panels and connections, with a factor of safety not less than 1.5, such that failure of any component shall not occur at less than 1.5 times the maximum design load, except where more-stringent requirements are specified. Failure is defined as breakage, component disengagement, or permanent distortion in excess of 0.2% of the span of each member.

L. Building Movement: Design, fabricate, and install the Work to withstand building movements including thermal movements, loading deflections and similar movements. The Commissioner will furnish specific data on anticipated building movements as may be requested by Contractor.

M. Thermal Movement: Design, fabricate and install the Work to withstand expansion and contraction forces resulting from a 120°F ambient temperature range of –20°F to +100°F, which may result in exterior metal surface temperature exceeding 180°F.

2.04 ACCESSORIES

A. Do not use metals which are corrosive or otherwise incompatible with metals joined.

B. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

C. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

D. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

E. Side Lap Fasteners: Manufacturer's standard, corrosion-resistant, hexagonal washer head; self-drilling, carbon steel screws, No. 10 minimum diameter, approved by Factory Mutual as a method for securing steel roof deck for Class indicated.

F. Flexible Rib Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.

G. Provide tight-fitting closures at open ends of flutes and sides of decking.

H. Hanger Tabs: Manufacturer's standard piercing steel sheet hanger attachment devices for floor deck panels.

I. Weld Washers: Manufacturer's standard uncoated-steel sheet weld washers, shaped to fit deck rib, 0.0598 in. thick with 3/8 in. minimum diameter prepunched hole.

J. Recessed Sump Pans: Manufacturer's standard size, single piece steel sheet 0.071 in. thick minimum, of same material as deck panels, with 1-1/2-in. minimum deep level recessed pans and 3 in. wide flanges. Cut holes for drains in the field.

K. Flat Receiver Pan: Manufacturer's standard size, single-piece steel sheet, 0.071 in. thick minimum units, of same material as deck panels.

1. Cut holes for drains in the field.

L. Modified Bituminous Sheet: Minimum 65 mil (1.6 mm) nominal thickness, self-adhering sheets designed to be overlaid consisting of rubberized-asphalt membrane with woven or nonwoven fabric reinforcement embedded within the membrane, and with release liner on adhesive side.

1. Sheet Strips: Self-adhering, reinforced, rubberized-asphalt strips of same material and thickness as sheet waterproofing.
2. Physical Properties:

    a. Tensile Strength, Membrane: 50 lbf/in. (8.75 kN/m) minimum; ASTM D882.
    b. Pliability: Unaffected when bent 180° over a 1/4 in. (6.4 mm) mandrel at minus 15°F (minus 26°C); ASTM D146.
    c. Puncture Resistance, Mesh: 40 lbf (180 N) minimum; ASTM E154.

M. Steel Sheet Accessories: ASTM A653, G 90 coating class, galvanized according to ASTM A653.

1. Galvanizing Repair Paint: SSPC Paint 20 or MIL-P-21035, with dry film containing a minimum of 94% metallic zinc dust by weight.
2. Available Products: Subject to compliance with requirements, product that may be incorporated in the work include, but are not limited to, the following:

    a. ZRC Cold Galvanizing Compound, Galvilite.
    b. ZRC Galvilite® Galvanzing Repair Compound.
    c. Approved equal.
    d. Substitutions: Comply with General Conditions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FABRICATION

A. General: Form deck units in lengths to span three or more supports where possible, with flush, telescoped or nested 2 in. laps at ends and interlocking or nested side laps, unless otherwise indicated.

B. Metal Cover Plates: Fabricate metal cover plates for end-abutting floor deck units of not less than same thickness as decking. Form to match contour of deck units and approximately 6 in. wide.

C. Metal Closure Strips: Fabricate metal closure strips, for cell raceways and openings between decking and other construction, of not less than 0.045 in. min. (18 gage) sheet steel. Form to provide tight-fitting closures at open ends of cells or flutes and sides of decking.

3.03 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Place deck panels under supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract horizontal side-lap alignment.

1. Align deck panels over full length of runs and align at ends of abutting panels.

C. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

D. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to the decking.

1. Provide neat, square, and trim cuts.

E. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

1. Reinforce in accordance with structural details.

2. Reinforce roof deck around openings 6 in. to 12 in. in size by means of a flat galvanized steel sheet placed over the openings on the top of decking and fusion welded to the surface of the deck.

    a. Provide not less than 16 gauge steel sheet of the same quality as the deck units, at least 12 in. wider and longer than the opening, unless otherwise indicated.
    b. Space welds at each corner and not more than 12 in. on center along each side.

F. Mechanical fasteners will be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

G. Locate decking bundles to prevent overloading of supporting members.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

1. Immediately after welding deck and other metal components in position, coat the welds, burned areas, and damaged surface coating with specified touch-up primer.

3.04 ROOF-DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 in. long, and as follows:

1. Weld Diameter: 3/4 in., nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space welds not more than 12 in. apart, with a minimum of two welds per unit at each support. Provide closer spacing where required for in-plane diaphragm force and uplift resistance. In addition, secure deck to each supporting member in ribs where side laps occur.
3. Weld Washers: Install weld washers at each weld location.

B. Side Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding 36 in., or less where required by design, using one of the following methods:

1. Mechanically fasten with FM approved self-drilling No. 10 diameter or larger carbon steel screws.
2. Mechanically clinch or button punch.
3. Fasten with 1-1/2 in. long minimum welds.

C. End Bearing: Install deck ends over supporting framing with a minimum end bearing of 4 in., with end joints as follows:

1. End Joints: Lapped 2 in. minimum.

D. Miscellaneous Roof-Deck Accessories: Install end closures, and continuous drip edges according to deck manufacturer's written instructions. Weld to deck and mechanically fasten to substrate to provide a complete deck installation.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, waterproofing application, protection, and drainage components, and to furnish reports to the Commissioner.

1. Flood Testing: Flood test Mezzanine Roof Deck areas for leaks, according to recommendations in ASTM D5957, after completing and protecting waterproofing but before overlaying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water. Testing agency shall observe flood testing.

a. Flood to an average depth of 2-1/2 in. (65 mm) with a minimum depth of 1 in. (25 mm) and not exceeding a depth of 4 in. (100 mm). Maintain 2 inches (50 mm) of clearance from top of sheet flashings.
b. Flood each area for 48 hours.
c. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Commissioner.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.06 REPAIRS AND PROTECTION

A. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

B. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces with galvanized repair paint according to ASTM A780 and the manufacturer's instructions.

C. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on both surfaces of installed deck panels.

1. Touch up painted surfaces with same type of shop paint used on adjacent surfaces.
2. Where shop-painted surfaces are exposed in-service, apply touchup paint to blend into adjacent surfaces.

D. Provide final protection and maintain conditions to ensure steel decking is without damage or deterioration at time of Substantial Completion

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of STEEL DECKING shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this Section. Payment for the Work of STEEL DECKING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

END OF SECTION

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Cold-formed metal framing, including but not limited to the following:

1. Load-bearing wall framing.
2. Ceiling joist framing.
3. Soffit framing.

B. Related Sections:

1. Unit masonry: Section 04 20 00.
2. Structural steel: Section 05 10 30.
3. Metal fabrications: Section 05 50 00.
4. Stainless steel plate wall panel system: Section 07 42 12.
5. Non-Structural Metal Framing: Section 09 22 16.
6. Gypsum board: Section 09 29 00.

1.3 PERFORMANCE REQUIREMENTS (DESIGN CRITERIA)

A. Delegated Design: Engage a qualified Licensed Structural Engineer to design cold-formed steel framing including fasteners to the building construction and the associated items of the framing assembly. Design cold-formed steel framing in accordance with the design criteria stated herein.

B. Provide design and structural engineering calculations prepared by, signed and sealed by a Licensed Structural Engineer, licensed in the State of Illinois.

C. Determine the size, gauge, and spacing when not shown on the Drawings of members, connections and anchorage to building structure and construction using the following criteria:

1. Provide cold-formed metal framing and anchors used to secure the framing to the building construction, design and engineered to perform under the Design Loads indicated in the Structural Drawings.
2. Wind Loads: To resist wind pressures from any direction as required by building codes.
3. Other Loads: Design loads are those shown on the Structural Drawings.
4. Maximum Allowable Deflection:

    a. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.
    b. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.

5. Anchorage to Structural Concrete Frame: Provide power driven galvanized fasteners of type suitable for application indicated, fabricated from corrosion resistant materials, with capability to sustain, without failure, a load (shear and bearing) equal to 10 times design load without exceeding allowable stress of fastener or framing members, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
6. Anchorage to steel or imbeds: Welded connections per AWS requirements.
7. Provide bolted or welded connections of cold-formed framing members.
8. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.

D. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Complete framing plans showing layout spacing, gauges of metal and dimensions of wall framing.
2. Show details of connections, welds, anchorage, bridging, bracing and splice details.
3. Indicate adjacent materials and construction to be attached to the wall framing.
4. Provide complete erection drawings.
5. Provide shop drawings sealed and signed by the same State of Illinois Licensed Structural Engineer that prepared calculations.

1.6 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions for framing systems components and fire-rated and non-fire-rated deflection track.

B. Calculations: Structural calculations, prepared to comply with the referenced documents, design criteria, Drawings and this Section. Provide calculations prepared, signed and sealed by a licensed Structural Engineer, licensed in the State of Illinois. Reference structural calculations to the shop drawings, and include the following:

1. Attachment and anchorage to the building structure.
2. Load-bearing stud wall member sizes (if shown on Drawings or required by conditions).

C. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.

D. Welder Certificates: Copies of welding certificates for each welder involved in the work.

1.7 QUALITY ASSURANCE

A. Comply with laws, codes, rules and regulations of governmental authorities having jurisdiction over the work.

B. Provide welding complying with AWS D1.0, Code for Welding in Building Construction.

1. Qualify welding processes and welding operators in accordance with the AWS, Standard Qualification Procedure.
2. Welded fabrications and assemblies in place are subject to inspection and testing. Expense of removing and replacing any portion of a fabrication or assembly for testing purposes will be borne by the Commissioner if welds are found to be in conformance. Remove work found to be defective or in non-conformance and replace with new acceptable work at no additional cost to the Commissioner.

C. Provide materials and methods of installation in accordance with the current printed published instructions details and specifications of the Cold-Form Metal Framing

Manufacturer for type of construction shown on the Drawings, except as hereafter modified and as approved by the Cold-Formed Metal Framing Manufacturer.

D. Fabricator/Installer Qualifications: Engage an experienced Fabricator/Installer with not less than 5 consecutive years experience, who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

E. Engineer Qualifications: Structural Engineer legally authorized to practice in the jurisdiction where project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of cold-formed metal framing similar to this project in material, design, and extent and that have a record of successful in-service performance.

1.8 DELIVERY, HANDLING AND STORAGE

A. Deliver and store materials, components and fabricated units in such a manner as to avoid damage. Provide bundles of materials bearing the name of the manufacturer, size, gauge, and location of framing members.

B. Unload and store framing members, fabricated assemblies or units at the site in such a manner as to prevent distortion or damage to the members and the prime coat or galvanizing. Locate fabricated assemblies and units in areas of the site so as to limit the handling before installation in the construction. Store framing members, fabricated assemblies and related materials so that they are not in contact with the ground, and so that they are properly supported, covered and kept dry.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. SCAFCO Steel Stud Company, Spokane, WA 99220.

B. Telling Industries, Streetsboro, OH 44094.

C. MBA Building Supplies, Libertyville, IL 60048.

D. Clarkwestern Dietrich Building Systems LLC., West Chester, OH 45069.

E. Marino/Ware, South Plainfield, NJ 07080.

2.2 MATERIALS

A. Steel for Cold-Formed Metal Framing - Studs and Tracks: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: 33, 37, 40, 50, Class 1; as required by structural performance.

B. Single Deflection Track: Manufacturer's single, deep leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads.

C. Double Deflection Tracks: Manufacturer's double, deep leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads, thickness to match studs and track.
2. Inner Track: Of web depth indicated, or as required for the design deflection.

D. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure.

E. Proprietary Fire-Rated and Non-Fire Defection Track:

1. Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire resistance rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs. Provide manufacturer’s standard slip clip assembly and other accessories as required by the conditions of the installation.
2. Product: Subject to compliance with requirements, provide one of the following:
   a. Fire Trak Corp., Fire Trak (attached to studs with Fire Trak Slip Clip).
   b. Metal-Lite, Inc., The System.
   c. SLP-TRK, Dietrich Industries, Inc.

F. Fastenings: Bolts, nuts, washers, anchor and lag bolts and other fastenings necessary for proper fabrication and erection of items specified or required, hot-dip galvanized complying with ASTM A 123 and ASTM A 385 as applicable.

G. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

H. Framing Accessories:Fabricate steel framing accessories of same material and finish used for framing members, with a minimum yield strength of 33,000 psi.
2. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   a. Supplementary framing.
   b. Bracing, bridging, and solid blocking.
   c. Web stiffeners.
   d. Anchor clips.
   e. End clips.
   f. Foundation clips.

g. Gusset plates.
h. Stud kickers, knee braces, and girts.
i. Joist hangers and end closures.
j. Hole-reinforcing plates.
k. Backer plates.

I. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

J. Anchor Bolts: ASTM F 1554, threaded carbon-steel bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

K. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, as appropriate for the substrate.

L. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

M. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

N. Welding Electrodes: Comply with AWS standards.

O. Touch-up Paint: High zinc dust content, rust inhibiting paint complying with MIL-P-21035 (ships), and ASTM A 780/A 780M, compatible with galvanized surfaces.

P. Bituminous Paint: Asphalt emulsion, ASTM D 1187.

Q. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.

2.3 PROTECTIVE COATING

A. Coat steel fabrications and framing components that will be in contact with concrete and masonry or where the possibility of galvanic action may occur with a heavy coat of bituminous paint. Do not extend coating onto finish surfaces.

2.4 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's

specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

E. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

G. Install insulation, specified in Section 07 21 00 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at 24 inches o. c. unless otherwise indicated on Drawings.

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks.

1. Stud Spacing: 16 inches unless otherwise indicated on Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically unless otherwise indicated on Drawings. Fasten at each stud intersection.

J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

L. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: 16 inches unless otherwise indicated on Drawings.

D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.

E. Where necessary install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 ERECTION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The Work of COLD-FORMED METAL FRAMING shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of COLD-FORMED METAL FRAMING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER Architectural Work: 090000

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes, but is not limited to:

1. Gratings and support.
2. Stainless steel plate for vegetated roof.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel shapes for supporting masonry walls.
5. Steel framing and supports for applications not specified in other Sections.
6. Loose bearing and leveling plates not specified in other Sections.
7. Elevator machine beams, hoist beams and divider beams.
8. Steel shapes for supporting elevator door sills.
9. Ladders.
10. Metal Stairs.
11. Downspouts.
12. Drip pans.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Sections: The following sections contain requirements that relate to this section:

1. Cast in place concrete: Section 03 30 00.
2. Unit Masonry: Section 04 20 00.
3. Structural Steel: Section 05 10 30.
4. Decorative Metal: Section 05 70 00.
5. Sheet Metal Flashing and Trim: Section 07 62 00.

6. Painting: Section 09 91 00.
7. Rotogates: Section 10 45 40.
8. Electrical: Division 26.
9. Communications: Division 27.
10. Electronic Safety and Security: Division 28.

1.03 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this section.

1.04 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified Professional Engineer, as defined in Section 01 40 00 "Quality Requirements," to design metal fabrications.

B. Fabricate and install the following metal fabrications as detailed on the drawings:

1. Design Loads are indicated in the Structural Drawings.
2. Steel Stairs: including treads, tread supports, platform/ landing, platform/ landing supports and stringers.
3. Treads: Capable of withstanding a uniform load of 100 lb per sq. ft. or a concentrated load of 300 lb. on an area of 4 sq. inches located at the center of the tread, whichever produces the greater stress.
4. Platforms: Capable of withstanding a uniform load of 100 lb per sq, ft. Limit deflection of treads, platforms and framing members to L/360 or ¼" whichever is less.

C. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum range in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and air temperature.

1. Temperature Range: 120 degrees F. ambient; 180 degrees F. material surfaces.

D. In general, for steel, connections are to be made with shop welds and field bolting.

1.05 ACTION SUBMITTALS

A. Product data for products used in miscellaneous metal fabrications, including:

1. Finishes, paint products, and grout.

B. Shop drawings showing sizes and detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, profiles, and details of metal fabrications and their connections. Indicate heights, sizes and spacings of components. Show anchorage, joinery and accessory items. Where installed metal fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified Professional Engineer who was responsible for their preparation. Where applicable, indicate field verified dimensions on shop drawings.

1. Include setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed.
2. Indicate field verified dimensions on shop drawings.
3. Indicate on shop drawings locations, details, and dimensions.

C. Samples representative of materials and finished products as may be requested by Commissioner; in specified finish.

1.06 INFORMATIONAL SUBMITTALS

A. Furnish engineering calculations for metal fabrications as prepared by a structural engineer, and as required by the Commissioner, showing that maximum stresses and deflections do not exceed specified performance requirements under full design loading. Calculations shall be prepared and sealed by a structural engineer, licensed in the State of Illinois.

B. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

C. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

D. For galvanized coating applications, submit notarized Certificate of Compliance with ASTM Standards and Specifications listed, signed by galvanizing applicator.

E. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified structural engineer responsible for their preparation.

F. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.

C. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel," D1.3 "Structural Welding Code - Sheet Steel", and D1.2 "Structural Welding Code - Aluminum." Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Engineer Qualifications: Structural Engineer licensed to practice in Illinois and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this Project.

E. Regulatory Requirements: Comply with applicable requirements of governing codes, ordinances and regulations.

F. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel", or when applicable, comparable AWS standards for 316 stainless steel.

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

G. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings".

H. Galvanize Coating Applicator’s Qualifications: Company specializing in hot dip galvanizing after fabrication and following the procedures of “Quality Assurance Manual” of the American Galvanizers Association.

I. Accessibility Standard: For metal fabrications indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", Illinois Accessibility Code, and ICC A117.1.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store fabricated components and materials in clean, dry locations, away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation within covering.

B. Handle metalwork on site to a minimum; exercise care to avoid damaging metal finishes.

1.09 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive the Commissioner of other rights the Commissioner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a 5 year written warranty, beginning from date of substantial completion, and executed by the Contractor, manufacturer and the Abrasive Stair Treads installer agreeing to repair or replace components of stair treads that develop defects in materials or workmanship within the specified warranty period. Defects include, structural failures, deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

1.10 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications shall fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work. Verify conditions for installation of the work.

B. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for adjustments, trimming and fitting.

1.11 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this section but required for work of another section. Deliver such items to Project site in time for installation.

1.12 EXTRA STOCK

A. Deliver extra stock of Abrasive Stair Treads to CTA West Shops, 3901 W. Maypole Street, Chicago, IL 60624. Furnish new materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identification. Furnish not less than 5 percent

of the supplied materials, for each type, color, pattern installed including fasteners.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, stains, discolorations, and, for steel sheet, "oil canning" and variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless otherwise indicated or required for design loading.
2. Hot-Formed Steel Tubing: ASTM A 501.

    a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.

D. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:

1. Cold-Rolled Steel Sheet: ASTM A 366/A 366M.
2. Hot-Rolled Steel Sheet: ASTM A 569

E. Galvanized Steel Sheet: Quality as follows:

1. Commercial Quality: ASTM A 653/A 653M, G90 coating designation unless otherwise indicated.

F. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

1. Provide galvanized finish for exterior installations and where indicated.

G. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

H. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27/A 27M. Provide bolts, washers, shims as required, hot-dip galvanized per ASTM A 153.

I. Elastomeric Pads: Comply with Section 783 of the Standard Specifications.

J. Gray-Iron Castings: ASTM A 48, Class 30.

K. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

L. Rolled Steel Floor Plate: ASTM A 786/A 786/M

M. Steel Bars for Gratings: ASTM A 569/A 569M or ASTM A36/A 36M

N. Wire Rod for Grating Cross Bars: ASTM A 510 (A 510M).

O. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.

1. Size of Channels: As indicated on drawings.
2. Material: Galvanized steel complying with ASTM A 653/A 653M, with G90 coating; 0.108 inch nominal thickness.

2.02 STAINLESS STEEL

A. Stainless Steel: Provide austenitic stainless steel in form and grade indicated complying with the following requirements:

1. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M UNS S31603.
2. Stainless-Steel Bars and Shapes: ASTM A 276, UNS S31603.
3. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
4. Tubing: ASTM A 554, Grades MT 316.
5. Pipe: ASTM A 312/A 312M, Grade UNS S31600.
6. Bars and Shapes: ASTM A 276, UNS S31600.
7. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.

2.03 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632, Alloy 6061-T6.

D. Aluminum Castings ASTM B 26, Alloy 443.0-F.

2.04 FASTENERS

A. General: Provide Type 300 series stainless steel fasteners unless otherwise indicated. If not stainless steel, provide fasteners of same basic metal and alloy as fastened metal. Do not use metals which are corrosive or otherwise incompatible with metals joined. Provide Type 300 series stainless steel fasteners for exterior use or where built into exterior walls. Select fasteners

for the type, grade, and class required and for type of loading and installation condition shown or as specified by the manufacturer.

1. Provide stainless steel fasteners and accessories on exterior installations and steel matching the fabrication material on interior installations.
2. Provide ASTM A 276 series 300 stainless steel unless noted otherwise.
3. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
4. Where subject to vandalism or as otherwise specified, provide vandal proof type fasteners.

B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

C. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

D. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A, with hex nuts, ASTM A 563 and, where indicated, flat washers.

E. Stainless steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

F. Lag Bolts: ANSI B18.2.1.

G. Machine Screws: ANSI B 18.6.3.

H. Plain Washers: Round, carbon steel, ANSI B 18.22.1.

I. Lock Washers: Helical, spring type, carbon steel, ANSI B 18.21.1.

J. Expansion Anchors: Anchor bolt and sleeve assemblies of type as required for installation condition shown; and of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594.
2. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-325, Group VIII (anchors, expansion), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-575, Grade 5.

K. Cast-In-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153.

L. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.

2.05 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically specified by manufacturer for interior and exterior applications.

2.06 WELDING

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded. Provide type and alloy of filler metal and electrodes as specified by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength and compatibility in the fabricated items.

B. Structural welds to be 3/16” fillet continuous welds unless noted or required otherwise. Ground smooth and flush welds exposed to view unless noted otherwise.

2.07 PAINT

A. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, complying with DOD-P-21035 or SSPC-Paint-20.

B. Shop Primer for Ferrous Metal: Primer to be recommended for application over galvanizing and be manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field or shop-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

C. Bituminous Paint: Cold-applied asphalt mastic complying with ASTM D 1187 and containing no asbestos fibers.

D. Zinc Chromate Primer: FS TT-P-645.

2.08 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles, curves and surfaces and straight sharp edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arrises.

C. Allow for thermal movement in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners.

D. Cut, drill, shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed surfaces.

G. Weld corners and seams continuously to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent. Grind exposed welds flush and smooth to match and blend with adjoining surfaces.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous. Cope or miter corner joints.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1 1/2 inches, with a minimum 6 inch embedment and 2 inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

J. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners wherever possible.

K. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

L. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

M. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.09 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 06 sections.

B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

C. Hot dip galvanize rough hardware.

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

A. Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

B. Provide shop drawings showing applicable field verified sizes, details. Coordinate with supplier of equipment or product framing is supporting, if applicable.

C. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide x 1/4 inch x 8 inches long. Secure miscellaneous framing securely to structure by welding or anchoring as approved. Install to withstand applicable loadings and stresses.

D. Galvanize miscellaneous framing and supports after fabrication, touch up galvanizing in field, and also prime and paint any exposed surfaces.

2.11 METALS

A. Abrasive-Surface Floor Plate: Stainless Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.

B. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

C. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

D. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches or as indicated.
2. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B structural steel, Grade 33 (Grade 230); 0.0677-inch minimum thickness; hot-dip galvanized after fabrication.

E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.12 MISCELLANEOUS

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

2.13 FABRICATION - GRATINGS AND SUPPORTS

A. Provide steel bar gratings and frames of sizes and at locations shown on the Drawings. Galvanize exterior gratings and accessories. Provide each grating with tamper proof saddle type hold down clips.

B. Fabricate unit with main bars and cross bars of rectangular cross-section, with flush top, slotted construction, mechanically interlocked and welded. Provide patterns, spacing and bar sizes indicated on the Drawings or required by loads, complying with NAAMM, Metal Bar Grating Manual.

C. Comply with FS-RR-G-661C, Type I. Provide steel supporting members as indicated or required, using welded construction to the extent feasible. Form gratings into sections as indicated or as necessary for proper access and handling.

D. Form banded edges on panels and around openings through panels, where shown on the Drawings.

E. Provide nonslip surfaces on top of grating by coating with abrasive material metallically bonded by a proprietary process.
   1. Provide one of the following:
      a. "Mebac" (IKG Borden, Clark, NJ 07066).
      b. "SLIP-NOT" (W. S. Molnar Company, Detroit, MI 48027).
      c. "Algrip" (Ross Technology Corporation, Leola, PA 17540).
      d. "Anti-Slip" (Safeguard Technology Inc., Streetsboro, Ohio 44241).

F. Provide access panel hinged as indicated.

2.14 METAL LADDERS

A. General:

   1. Comply with ANSI A14.3, except for elevator pit ladders.
   2. For elevator pit ladders, comply with ASME A17.1/CSA B44.

B. Steel Ladders:

   1. Space siderails 18 inches apart unless otherwise indicated.
   2. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
   3. Rungs: 1-inch- diameter steel bars.
   4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   5. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
   6. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch in least dimension.
   7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.

C. Elevator Hoistway Ladder: Supported from hoistway grating and hinged as indicated.

2.15 STEEL FRAMED STAIRS

A. General: Construct stairs to conform to sizes, thicknesses, shapes, details and arrangements indicated. Verify dimensions and conditions in field. Verify code requirements, performance requirements, and method of support. Join pieces together by welding, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, railings, newels, balusters, wire mesh panels, struts, clips, brackets, bearing plates, and other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.

   1. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair

Manual" for Architectural Class of stair except where more stringent requirements are indicated.

2. Fabricate treads and platforms of exterior stairs to accommodate slopes to drain in finished traffic surfaces.
3. Provide stiffener plates, bracing and additional framing to resist torsion, and properly secure stairs to the structural elements.

B. Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers, newels, and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.

C. Treads, and Landings: Fabricate treads and landings as shown on the drawings and specified herein and assemble as shown on the drawings. Unless shown otherwise on the drawings, form treads and platforms of 3/8 inch thick cast iron floor plate. Attach treads and platforms to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach treads to brackets by bolting, as indicated.

2.16 PIPE AND DOWNSPOUT GUARDS

A. Fabricate pipe and downspout guards from 3/8-inch- thick by 12-inch- wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.

2.17 METAL DOWNSPOUT BOOTS

A. Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.

2.18 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.19 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.20 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.21 STEEL AND IRON FINISHES

A. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

B. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

2.22 GALVANIZING

A. Hot-dip galvanize items as indicated to comply with ASTM A 123, for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strips 0.0299 inch thick and heavier. Comply with ASTM A 153 for galvanizing steel and iron hardware.

2.23 STAINLESS STEEL FINISHES

A. Comply with ASTM A480/A480M. Remove or blend tool and die marks and stretch lines into finish.

B. Polished finish: Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop

welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports securely to, and rigidly brace from, building structure.

3.03 INSTALLATION - GRATINGS AND SUPPORTS

A. Comply with the recommendations of the NAAMM, Metal Bar Grating Manual for installation methods, including clearances and standard anchoring details.

B. Secure removable sections or units to the supporting members with the type and size of anchors indicated, if not indicated, as recommended by the grating manufacturer for the types of installations shown on the Drawings.

C. Secure removable sections or units with tamperproof devices. Anchor non-removable sections or units by welding or tamperproof devices.

D. Install gratings level and to proper elevations, plane and alignment with adjacent work. Provide and install anchors and accessories required for attachment to other construction to allow for removal and replacement of grating sections.

3.04 INSTALLING METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing steel stairs to in place construction. Include threaded fasteners for concrete inserts, through-bolts, lag bolts, and other connectors as required; weld stair framing to steel structure.

B. Set steel stair base plates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge or bearing plate.

C. If stair is to be set into concrete, pack voids solid with nonmetallic, nonshrink grout after installation.

D. Install stair units accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack.

3.05 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified Section 09 91 00 "Painting".

B. Clean stainless steel with soap and water; rinse with clear water.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of METAL FABRICATIONS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of METAL FABRICATIONS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 05 53 00

STAINLESS STEEL FLOOR PLATE AND STAIR TREADS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes, but is not limited to, the following metal fabrications:

1. Stainless steel stair tread plates, landings, platforms with non-slip abrasive finish.
2. Stainless steel stair nosings with non-slip abrasive finish.
3. Stainless steel floor plates with non-slip abrasive finish. Located as the pedestrian bridge floor and access platforms.
4. Stainless steel walk off mats with non-slip abrasive finish.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Section 03 20 00– Concrete Reinforcement and Embedded Assemblies.
2. Section 05 10 30 - Structural Steel.
3. Section 31 15 00 – Shoring
4. Section 07 92 00 – Joint Sealants for joint sealants, joint fillers, and joint preparation.

C. Definitions:

1. Definition of project terms and abbreviations are found within Specification Section 01 35 00.
2. Definitions in ASTM E985 for railing-related terms apply to this Section.

1.03 REFERENCES

A. Acronyms for reference standards are defined in Section 01 42 00.

B. ASTM A240 (Alloy type 316 L) – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications (Type 316 is an Austenitic Stainless Steel Containing Molybdenum developed to provide improved corrosion resistance).

C. ASTM C633 – Adhesion or Cohesive Strength of Flame-Sprayed Coatings.

D. ASTM E140 – Hardness Conversion Tables for Metals.

E. ASTM E384 – Microhardness of Materials.

F. ASTM E303 – Standard Test Method for Measuring Surface Functional Properties Using the British Pendulum Tester.

G. ANSI B 101.1 – Test Method for Measuring Wet Static Coefficient of Friction of Common Hard-Surface Floor Materials.

H. ANSI B 101.3 – Test Method for Measuring Wet Dynamic Coefficient of Friction of Common Hard-Surface Floor Materials.

I. ANSI A 326.3 – American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

J. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual."

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of metal fabrications specified in this Section by same firm that fabricated them.

C. Structural Engineer's Qualifications: Provide a copy of the engineers current State of Illinois license.

D. Regulatory Requirements: Comply with applicable requirements of all governing codes, ordinances and regulations. Fabricate and install handrails in accordance with the ADA Guidelines.

E. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 01 Section "Project Meetings" with all trades involved.

G. Field Welding: Stainless steel plate shall not be field welded. All stainless steel plate shall be protected over 100% of its surface during any welding procedures occurring as part of the project.

H. Stair treads shall be constructed to meet all applicable local building and ADA codes.

I. All stainless steel floor plate shall be supplied and fabricated through a single manufacturer and supplier.

1.05 EMBED DESCRIPTION

A. See drawings for system descriptions.

B. Stainless Steel Plate Embeds: The stair tread and nosing and riser (if applicable) shall extend over the entire width of the stair and be embedded into the stair structure; except provide a 1 in. gap between the stair stringers and the stainless steel treads and nosing and risers.

1. Stainless steel stair treads surface part of stair landings to have grooves in a parallel pattern through length of the tread in compliance with detectable warning accessibility codes.
2. Stainless steel stair tread to be double nose type or as shown on the drawings.
3. Stainless steel stair tread surface to be a non-slip granular surface.
4. A 1/8 in. gap shall be provided between treads part of stair landing.

1.06 SLIP RESISTANCE

A. Test each surface finish to be used for walking. Slip resistance tests must be performed by the testing agency approved by the Commissioner and the tests to be done according to ANSI B 101.3, Test Method for Measuring Wet DCOF of Common Hard Surface Floor Materials using the BOT-3000E digital tribometer measuring device and/or according to ASTM E303 using the British pendulum tester. The test device and method to be as selected by and approved by the Commissioner.

1.07 SUBMITTALS

A. General: Submit each item in this Article according to the General and Special Conditions and Division 01 Specification Section, "Submittals."

B. Submit catalog cuts, product data, specifications, technical data, installation instructions for stair riser, tread and nosing products and accessories. Provide product data for stainless steel abrasive stair risers, treads, and nosings, including surface design, spacing, depth, type of slip resistant granules, color, texture and method of fusion to stainless steel tread.

1. Provide specifications for type of stainless steel specified.
2. Provide color and finish charts for metal risers, treads, and nosing and abrasive granulars for Commissioner's initial selections.

C. Submit shop drawings showing sizes and detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, profiles, and details of stair structure, stair components, metal fabrications; their assembly and their connections. Indicate heights, sizes ,and spacings of components. Show anchorage, joinery, and accessory items. Where applicable, indicate field-verified dimensions on shop drawings.

1. Include setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed.
2. Indicate field-verified dimensions on shop drawings.
3. Indicate conformance to minimum code requirements.

D. Provide a sample of typical stair tread assembly, 12 in. long with score pattern and abrasive finish selected. Samples representative of other materials and finished products as may be requested by Authority, in specified finish.

E. Provide welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

F. Provide qualification data for firms and persons specified as fabricator and installer in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

G. Provide specifications for galvanizing, primer, and top coat finishes. Provide samples of specified finishes. Provide color charts. Indicate compatibility of painting system and recommendations for application of galvanizing, primer and top coats.

H. For galvanized coating applications, submit notarized Certificate of Compliance with ASTM Standards and Specifications listed, signed by galvanizing applicator.

I. Provide product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for stairs and railings.

1. Provide test results for coefficient of friction for tread surface.

J. Submit a copy of the warranty for Authority's review and approval.

K. Submit method of separation for dissimilar metals and materials proposed to be used to prevent corrosion.

1.08 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications shall fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work. Verify all conditions for installation of the work.

B. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for adjustments, trimming, and fitting.

1.09 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this section but required for work of another section. Deliver such items to project site in time for installation.

C. Mount handrails only on completed walls or other construction. Do not support handrails temporarily by any means not satisfying structural performance requirements.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in a clean, dry area in accordance with manufacturer's instructions. Allow adequate ventilation of products to prevent condensation forming on metal surfaces. Do not store for extended time in original banding or distortion may occur on abrasive finished products.

C. Handling: Protect materials, surfaces, and finishes during handling and installation to prevent damage.

1.11 WARRANTY

A. Special Warranty for Stair System and Abrasive Stair Treads: Submit a 5 year warranty from the date of substantial completion and executed by the Contractor, manufacturer and the installer agreeing to repair or replace at the direction of the Authority and at no cost to the Authority components of the stair system, including the abrasive stair tread materials that develop defects in materials or workmanship within the specified warranty period.

B. Failure and defects of the stair system and abrasive stair treads include, but are not limited to:

1. Structural failures.
2. Steel framing members, rails, and/or treads bending, twisting, or deflecting.
3. Connections failing.
4. Metal fatigue or cracking.
5. Deterioration of metals.
6. Deterioration of metal finishes.
7. Development of rust and corrosion.
8. Evidence of stains caused by rust or corrosion.
9. Non-slip abrasive material dislodging.
10. Loss of abrasive surface.

11. Other defects or failures beyond normal weathering and use.

PART 2 - PRODUCTS

2.01 STEEL (PLATE, STAIR NOSING, AND WALK OFF GRATING)

A. Abrasive Stainless Steel Plate:

1. All stainless steel shall meet ASTM 316L.
2. Thickness: Refer to drawings.
3. Surface Hardness, Rockwell C Scale, ASTM E140 and E384: Minimum of 55.
4. Anti-Slip Bond Strength, Surface to Substrate, ASTM C633: Minimum of 4,000 ps.i
5. Coefficient of friction: Min. 0.42.
6. UL Listed: UL 410 slip resistant.
7. Surface: All metal plasma stream deposition process bonds surface to substrate. Anti-slip primarily martensitic steel surface consisting of a random hatch matrix. Add to all surface coverage 100%.
8. Slip Resistance: Tread and other walking surfaces to have a slip resistance with a minimum value of 0.42 DCOF measured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.
9. Available Products: Subject to compliance with requirements, product that may be incorporated in the work include, but are not limited to, the following:

    a. SlipNOT stainless steel grip plate, Grade 2-Medium, W.S. Molner Company.
    b. Approved Equal.

10. All abrasive stainless steel plate shall come from the same steel supplier, and the abrasion process performed by the same steel fabricator.

2.02 FASTENERS AND ACCESSORIES

A. General: Provide Type 300 series stainless steel fasteners unless otherwise indicated and approved. Do not use metals which are corrosive or otherwise incompatible with metals joined. Select fasteners for the type, grade, and class required and for type of loading and installation condition shown or as specified by the manufacturer.

1. Provide countersunk or concealed fasteners for interconnection of treads and other metalwork components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method.
2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
3. All holes or countersinks shall be machine made. Screwheads shall not protrude above plate surface.

B. Machine Screws: ANSI B 18.6.3 (ANSI B 18.6.7 M).

C. Nylon Washers: 6/6 see drawings.

D. Lock Washers: Helical, spring type, carbon steel, ANSI B 18.21.1.

E. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.

1. Use ASTM 316 L headed studs TIG welded to plate.
2. Headed studs shall be attached every 12 inches.

F. Elastomeric Pads: Comply with Section 783 of the Standard Specifications.

2.03 WELDING

A. Welding shall not be performed in the field on any stainless steel.

B. All stainless steel shall be fully protected during field welding operations.

C. Shop Welding: All common fusion and resistance methods except oxyacetylene welding have proven successful. Use AWS E/ER 316L filler metal for best results.

2.04 FABRICATION, GENERAL

A. Form exposed work true to line and level with accurate angles, curves and surfaces and straight sharp edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arises.

B. Allow for thermal movement in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners.

C. Cut, drill, shear, and punch metals cleanly and accurately. Remove burrs.

D. Ease exposed edges to a radius of approximately 1/32 in., unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Remove sharp or rough areas on exposed surfaces.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous. Cope or miter corner joints.

G. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1 1/2 in., with a minimum

5 in. embedment and 2 in. hook, not less than 8 in. from ends and corners of units and 12 in. o.c., unless otherwise indicated.

H. Provide necessary rebates, lugs, and brackets for assembly of units. Use concealed fasteners wherever possible.

I. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

J. Corrosion Protection:

1. Separate surfaces of dissimilar metals with an approved method.
2. Coat concealed surfaces of stainless steel that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.
3. To prevent corrosion, paint or coat the contact surfaces of metals in contact with masonry or concrete work, with a heavy coating of epoxy paint; or provide separation material as submitted and approved by the Authority.
4. To prevent corrosion, paint or coat the contact surfaces of dissimilar materials and dissimilar metals with a heavy coating of epoxy paint; or provide separation material as submitted and approved by the Authority.

K. Slip Resistance: Tread and other walking surfaces to have a slip resistance with a minimum value of 0.42 DCOF measured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Examine areas to receive slip-resistant matal fabrications. Notify Commissioner if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

3.02 PREPARATION

A. Installer shall examine conditions under which work is to be performed and shall notify the Authority in writing of unsatisfactory conditions. Installer shall not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

C. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

D. Field verify all dimensions and conditions for the installation of all metal fabrications. Coordinate with approved shop drawings.

3.03 INSTALLATION, GENERAL

A. Install slip-resistant metal fabrications at locations indicated on the drawings and in accordance with manufacturer's instructions.

B. Install slip-resistant metal fabrications level, square, rigid, with flush installation.

C. Fasten slip-resistant metal fabrications to support steel as indicated on the drawings.

D. Repair damaged factory-applied finishes as directed by the Commissioner.

E. Replace defective or damaged slip-resistant metal fabrications as directed by the Commissioner.

F. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction, include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required. Secure to meet all design loading and stresses.

G. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.

H. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

I. Fit exposed connections accurately together to form hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of metal items, restore finishes to eliminate any evidence of such corrective work.

J. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing or provide new units as required.

K. Corrosion Protection:

1. Separate surfaces of stainless steel treads from other materials or dissimilar metals with an approved coating, membrane, or other approved separation.
2. Coat concealed surfaces of stainless steel that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

3. Paint the contact surfaces of dissimilar materials and metal in contact with masonry or concrete work, with a heavy coating of epoxy paint; or provide separation material as submitted and approved by the Commissioner.

3.04 INSTALLATION OF TREADS

A. Install slip-resistant metal fabricated treads at locations indicated on the drawings and in accordance with manufacturer's instructions.

B. Install slip-resistant treads level, straight, square, rigid with flush installation.

C. Fasten slip-resistant treads to support steel as indicated on the drawings, with approved method of separation for dissimilar metals. Ensure that dissimilar metals are not in direct contact in their final configuration.

D. Repair damaged factory-applied finishes as directed by the Commissioner.

E. Replace defective or damaged slip-resistant metal fabricated treads as directed by the Commissioner.

3.05 ADJUSTING AND CLEANING

A. Clean stainless steel with soap and water; rinse with clear water.

3.06 PROTECTION

A. Protect finishes of metalwork from damage during construction period by use of temporary protective coverings approved by fabricators. Remove protective covering at time of substantial completion.

B. For prefinished surfaces, restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude nonuniform oxidation and discoloration.

C. Restore finishes damaged during installation and construction period so that no evidence remains of corrective work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

D. Protect from all field welding operations. Field welding sparks can damage stainless steel finishes and cause premature corrosion.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of STAINLESS STEEL FLOOR PLATE AND STAIR TREADS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this Section. Payment for the Work of STAINLESS STEEL FLOOR PLATE AND STAIR TREADS shall be included in the contract lump sum price as shown in the Schedule for Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 03 00 00.

END OF SECTION

SECTION 05 70 00

DECORATIVE METAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Windbreaks.
2. Perforated metal panel systems.
3. Stainless-steel wainscot wall panels.
4. Stainless-steel pipe and tube railings.
5. Stainless-steel plate frame.
6. Guardrails, barriers, and gates.
7. Combination hall push-button stations.
8. Closures and trim.
9. Escalator enclosures.
10. Stainless-steel light fixture enclosures.
11. Stainless-steel cane rails.
12. Decorative metal fence.

B. Related Requirements:

1. Metal Fabrications: Section 05 50 00.
2. Structural Glass Curtain Walls: Section 08 44 26.
3. Electrical: Division 26.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified Structural Engineer, as defined in Section 01 40 00 "Quality Requirements," to design decorative metal, including attachment to building construction.

B. Structural Performance: Decorative metal items, including anchors and connections, shall withstand the effects of gravity loads and the following loads and stresses without exceeding the allowable design working stress of materials involved and without exhibiting permanent deformation in any components:

1. Exterior Items: Design Loads indicated in the Structural Drawings.
2. Handrails : Design Loads indicated in the Structural Drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. Deflection of Glass Channel Members at Windbreak: At design wind pressure, as follows:

1. Lateral displacement due to curvature of Post: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

E. Dimensions: Perforated metal panels to be in sizes, in thicknesses, and with perforations in size, spacing, and patterns as shown on drawings.

F. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

G. Physical Performance Factors: Material to equal or exceed tolerances, ratings and/or values as stipulated in ASTM A 264 for exterior use.

H. Panel system shall be designed and installed to allow thermal movement of the material.

I. Supports and fasteners should accommodate expansion of the materials.

J. Panels used in windbreaks application shall designed to withstand the loads indicated by the applicable codes.

1.04 COORDINATION

A. Coordinate installation of anchorages for decorative metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product, including finishing materials.

1. Gate hardware, locks, hinges, etc.

B. Shop Drawings: Show fabrication and installation details for decorative metal.

1. Include plans, elevations, component details, and attachment details.
2. Indicate materials and profiles of each decorative metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

C. Samples for Initial Selection: For products involving selection of color, texture, or design.

D. Samples for Verification: For each type of exposed finish.

1. Sections of linear shapes.
2. Perforated metal panels: Include 12-inch x 18-inch samples of plates.
3. Full-size Samples of castings and forgings.
4. Samples of welded joints showing quality of workmanship and color matching of materials.

1.06 INFORMATIONAL SUBMITTALS

A. Furnish engineering calculations for as prepared by a structural engineer, and as required by the Commissioner, showing that maximum stresses and deflections do not exceed specified performance requirements under full design loading. Calculations shall be prepared and sealed by a structural engineer, licensed in the State of Illinois.

B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

C. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

D. Evaluation Reports: For post-installed anchors, from ICC-ES.

E. Qualification Data: For fabricator and organic-coating applicator.

F. Welding certificates.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing decorative metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Installer Qualifications: Fabricator of products.

C. Engineer Qualifications: Structural Engineer licensed to practice in Illinois and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this Project.

D. High-Performance Coating Applicator Qualifications: A firm experienced in successfully applying organic coatings, of type indicated, to aluminum extrusions and employing competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

E. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

F. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups as indicated on Construction Mockups drawing.

G. Production Facility Mockup review:

1. Make the production facility available to the Commissioner for review of the mockup prior to fabrication. Provide advance notice of a minimum of six weeks prior to the schedule of fabricating.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store decorative metal in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

B. Deliver and store cast-metal products in wooden crates surrounded by enough packing material to ensure that products are not cracked or otherwise damaged.

1.09 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with decorative metal by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

2.02 METALS, GENERAL

A. Metal Surfaces, General: Use materials with smooth, flat surfaces unless otherwise indicated. Use materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Provide decorative metal free from surface blemishes where exposed to view in finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.

2.03 STEEL AND IRON

A. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.

B. Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Sheet, Cold Rolled: ASTM A 1008/A 1008M, either commercial steel or structural steel, exposed.

2.04 STAINLESS STEEL

A. Stainless Steel: Provide austenitic stainless steel in form and grade indicated complying with the following requirements:

1. Tubing: ASTM A 554, Grade MT 316L.
2. Pipe: ASTM A 312/A 312M, UNS S31600.
3. Sheet, Strip, Plate, and Flat Bar: ASTM A 240, UNS S31600.
4. Bars and Shapes: ASTM A 276, UNS S31600.
5. Castings: ASTM A 743/A 743M.

2.05 FASTENERS

A. Fastener Materials: Unless otherwise indicated, provide the following:

1. Stainless-Steel Items: ASTM A 276, UNS S31600.
2. Uncoated-Steel Items: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed, ASTM A 276, UNS S31600, where exposed.
3. Dissimilar Metals: ASTM A 276, UNS S31600.

B. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.

C. Provide concealed fasteners for interconnecting components and for attaching decorative metal items to other work unless otherwise indicated.

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.06 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Section 09 91 00 "Painting."

C. Intermediate Coats and Topcoats for Steel: Provide products that comply with Section 09 91 00 "Painting."

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

E. Mounting Adhesive: heavy duty construction adhesive.

F. Laminating Adhesive: Adhesive recommended by metal fabricator that will fully bond metal to metal, will prevent telegraphing and oil-canning, and is compatible with substrate and noncombustible after curing.

1. Contact Adhesive: VOC content of not more than 80 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Metal-to-Metal Adhesive: VOC content of not more than 30 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Multipurpose Construction Adhesive: VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
4. Special-Purpose Contact Adhesive: (Contact adhesive used to bond melamine-covered board, metal, unsupported vinyl, ultrahigh molecular weight polyethylene, and rubber or wood veneer, 1/16 inch thick or less, to any surface): 250 g/L.
5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

G. Stainless Steel Glazing Channels: Manufacturer's extruded or formed-stainless steel glazing channels of thickness required to support imposed loads. Standard high-strength 316 stainless steel with nonstaining, nonferrous shims for aligning system components.

1. Construction: Nonthermal.
2. Glazing System: Retained mechanically on top and bottom.
3. Glazing Plane: Center.

H. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically specified by manufacturer for interior and exterior applications.

2.07 WELDING

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded. Provide type and alloy of filler metal and electrodes as specified by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength and compatibility in the fabricated items.

B. All structural welds to be 3/16” fillet all around continuous welds unless noted or required otherwise. Ground smooth and flush all welds exposed to view unless noted otherwise.

2.08 FABRICATION, GENERAL

A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

B. Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.

C. Form simple and compound curves in bars, pipe, tubing, and extruded shapes by bending members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces.

D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

E. Mill joints to a tight, hairline fit. Cope or miter corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.

F. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

G. Provide necessary rebates, lugs, and brackets to assemble units and to attach to other work. Cut, reinforce, drill, and tap as needed to receive finish hardware, screws, and similar items unless otherwise indicated.

H. Comply with AWS for recommended practices in shop welding. Weld behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.

1. Where welding cannot be concealed behind finished surfaces, finish joints to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 3 Welds: partially dressed weld with spatter removed.
2. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

2.09 FABRICATING WINDBREAKS

A. Non-welded Connections: Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

B. Brackets, Flanges, Fittings, Clips and Anchors: Provide brackets, clips flanges, miscellaneous fittings, and anchors to interconnect sections to other work, unless otherwise indicated.

1. Furnish angles, supporting frame, fasteners, and other anchorage devices for connecting to other work. Fabricate anchorage devices, the intent of which is indicated in the drawings, sized to be capable of withstanding applicable loads. Coordinate anchorage devices with supporting structure.

2.10 FABRICATING PERFORATED METAL PANEL SYSTEMS

A. Non-welded Connections: Fabricate perforated metal panels to interconnect members with concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

B. Brackets, Flanges, Fittings, Clips and Anchors: Provide brackets, clips flanges, miscellaneous fittings, and anchors to interconnect sections or panels of perforated metal to other work, unless otherwise indicated.

1. Furnish angles, supporting frame, fasteners, and other anchorage devices for connecting perforated metal panels to other work. Fabricate anchorage devices, the intent of which is indicated in the drawings, sized to be capable of withstanding applicable loads. Coordinate anchorage devices with supporting structure.

C. Panels:

1. Perforations: See Drawings for size and shape.
2. Panel Edges: See Drawings for margins sizes.

2.11 STAINLESS-STEEL WAINSCOT WALL PANELS

A. Fabricate stainless-steel wainscot wall panels of 18 gage stainless-steel sheet to produce flush, smooth, rigid, hairline joints.

B. Basis of Design Product: "Back of House Protection" (Inpro Corporation).

C. Panels:

1. See Drawings for size and shape.
2. Panel Edges: See Drawings.

2.12 GUARDRAILS, BARRIERS, AND GATES

A. General: Fabricate guardrails, barriers, and gates to comply with requirements indicated for their design, dimensions, heights, details, finish, and member sizes, including thickness, profiles, post spacing, and anchorage, but not less than that required to support structural loads. Form to required shapes and sizes, with true curves, lines and angles. Design to follow approved shop drawings. Also, verify that installations will meet applicable building codes and ADA and CTA requirements. For fabrication, follow approved shop drawings for design, sizes, heights and details. Assemble components at right angles, straight, flush and with equal spacing. Shop drawings to indicate actual field verified dimensions, details, and conditions.

B. Fabricate from structural tubing, bar and plate as indicated. Miter corners to provide tight joints.

C. Interconnect guardrail, barrier, and gate members with full butt welds unless otherwise indicated. At tee and cross intersections, notch ends of intersecting members to fit contour to which end is joined and weld all around. Joints to be tight and smooth. Members to be parallel and perpendicular to each other. Miter and weld joints and connections to form solid joints. Grind and smooth welds.

D. Changes in direction of railing members to be formed by mitering and welding; or, if indicated, railings to be bent at corners, rail returns, and wall returns.

E. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

F. Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors as required for interconnections of pipe and other members and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work. Secure railings and barriers securely to structure (floor, walls, ceiling, columns, beams).

G. Fasteners: Unless noted otherwise, provide fasteners fabricated from type 300 series stainless steel. Do not use materials that are corrosive or incompatible with metals joined. Provide concealed fasteners except where welded or where exposed fasteners are unavoidable or are the standard method of fastening. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

H. Gates: Provide pivots and mounting plates to securely anchor gates to structure. Cut, drill and tap gates to receive hardware plate box and similar items. Ease edges of locking plates.

I. Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and over-stressing of substrate.

J. Material for sleeves, flanges, wall returns, wall brackets, end closures, toe boards, miscellaneous fittings and anchors: Provide of same stainless steel material as guardrails, barriers, and gates.

K. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with in compatible materials.

L. Comply with AWS for specified practices in shop and field welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded joints of welding flux, and dress on exposed and contact surfaces. Grind exposed welds flush and smooth to match and blend with adjoining surfaces. Weld continuously along entire line of contact unless spot welding is indicated.

M. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration.

N. Provide castings that are sound and free of warp or defects which impair strength and appearance.

O. Preassemble items in shop to greatest extent possible to minimize splicing and assembly of units at project site. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

P. Where noted, provide 1 1/2" diameter stainless steel handrails and handrail supports on stairs as indicated on the drawings. Form, shape and anchor as indicated. Grind welded joints flush to form smooth transitions and maintain sharp lines. Protect finish. Provide and install steel bracket, finished to match associated assembly, to support handrails.

Q. Guardrail: 316 stainless steel tubes as indicated on structural drawings with stainless steel welded rod mesh. Space rods at 4” x 2” o. c. and weld ends to tubes.

2.13 GATES

A. Gates: Provide pivots and mounting plates to securely anchor gates to structure. Cut, drill and tap gates to receive hardware plate box and similar items. Ease edges of locking plates. Provide minimum 3 heavy duty stainless steel hinges, closer, bumper, mortise lock, and electric strike. Cut, drill and tap gates to receive hardware plate box and similar items.

2.14 FABRICATION, RAILINGS

A. General: Fabricate railings to comply with requirements indicated for their design, dimensions, heights, details, finish, and member sizes, including thickness, profiles, post spacings, and applied loads. Form to required shapes and sizes, with true curves, lines and angles. Assemble components at right angles, straight, flush and with equal spacing. Fabrication to follow approved shop drawings. Also, verify that installations will meet all applicable building codes and ADA requirements, including maximum clearance between members.

B. Fabricate railings from the following:

1. One and one-half inch diameter stainless steel pipe, using fully welded construction.
2. Provide closure plates or caps at ends, of the same material as the rails, welded for a continuous, smooth appearance.

C. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

D. Close exposed ends of railing members with prefabricated end fittings.

E. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

F. Assemble by welding unless approved otherwise. Weld corners, joints and seams continuously to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed welds, finish welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent. Grind exposed welds flush and smooth to match and blend with adjoining surfaces, forming smooth transitions and maintaining sharp lines.

G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

H. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.15 COMBINATION HALL PUSH-BUTTON STATIONS

A. Fabricate units of stainless steel to comply with details indicated. Coordinate with elevator signal equipment to provide integrated, closely fitted assemblies.

1. Fabricate faceplates from 1/8-inch- thick sheet with edges beveled at a 45-degree angle for one-half thickness of metal.
2. Provide units with emergency pictorial signs and text, complying with requirements of authorities having jurisdiction, indicating that in fire emergency, elevators should not be used and that stairways should be used instead. Engrave pictorial sign and text into front surface of faceplates to a depth of 1/16 inch with engraving painted red. Make signs 5 inches wide by 8 inches high.
3. Provide cutouts in faceplates of units for push buttons of elevator hall push-button station and elevator key switches. Coordinate locations and sizes of cutouts so additional faceplate is not required and so faces of push buttons are flush with fronts of faceplates and key switches project beyond faceplate only by depth of bezel.

2.16 ESCALATOR ENCLOSURES

A. Form escalator enclosures from metal of type and thickness indicated below. Coordinate size of enclosures, location of cutouts, and method of attachment to adjoining construction.

1. Stainless-Steel Sheet: 0.062 inch.

2.17 PIPE SYSTEM COVERS

A. Form pipe system covers from metal of type and thickness indicated below. Coordinate size of covers, location of cutouts for piping, and method of attachment to adjoining construction.

1. Stainless-Steel Sheet: 0.050 inch.

2.18 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.19 STAINLESS-STEEL FINISHES

A. Comply with ASTM A480/A480M. Remove or blend tool and die marks and stretch lines into finish.

B. Unpolished finish: Bright, Cold-Rolled, No. 2B finish.

C. Polished finish: Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

D. Directional Satin Finish: No. 4.

E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.20 STEEL AND IRON FINISHES

A. Primer Application: Apply shop primer to prepared surfaces of items unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated ferrous-metal surfaces with unless primers specified in Section 09 91 00 "Painting" are indicated.
2. Do not apply primer to galvanized surfaces.

B. Shop-Painted Finish: Comply with Section 09 91 00 "Painting".

1. Color: Match Commissioner's sample.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Provide anchorage devices and fasteners where needed to secure decorative metal to in-place construction.

B. Perform cutting, drilling, and fitting required to install decorative metal. Set products accurately in location, alignment, and elevation, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.

C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of decorative metal, restore finishes to eliminate evidence of such corrective work.

D. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

E. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.

F. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal arc welding and requirements for welding and for finishing welded connections in "Fabrication, General" Article. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

G. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat, with a heavy coat of bituminous paint, concealed surfaces of stainless steel that are in contact with grout, concrete or dissimilar metals.

3.03 INSTALLATION, WALL PANELS

A. Install wall panels with adhesive system in accordance with wall panel manufacturer’s written instructions.

3.04 INSTALLING GUARDRAILS, BARRIERS, AND GATES

A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:

1. Anchor posts in concrete by core drilling holes not less than 6 inches deep and 1 inch greater than outside diameter of post. Clean holes of loose material, insert posts and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's directions.
2. Anchor posts to steel as required by conditions, welded to posts and to steel supporting members.
3. Anchor rail ends into concrete and masonry with steel flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.

B. Align rails so that variations from level for horizontal members and from parallel with rake of steps for sloping members do not exceed 1/4 inch in 12 feet. Align at abutting joints.

C. Welded Connections: Use fully welded joints; cope or butt components to provide full contact. At exposed welded connections, finish exposed welds and surfaces smooth and blended so that no roughness is evident (by sight or touch) after finishing, and welded surface matches contours of adjoining surfaces.

D. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of posts.

E. Install barriers and gates as shown on drawings. Install hardware for gate, provide required accessories, and make necessary adjustments.

F. Installation to be rigid, straight, level, and secure. Installation to meet applicable codes. Touch up paint finish after installation.

G. Install gate hardware according to hardware manufacturer's directions for proper operation. Install using recommended tamper proof type fasteners.

H. Barriers: Anchor barriers to structure with 5/8" expansion anchor bolts as indicated on the drawings. Provide brackets and support framing attached with stainless steel counter sunk machine screws.

3.05 ATTACHING RAILINGS

A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.

B. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields or lag bolts.
2. For steel use self-tapping screws fastened to steel framing.

D. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of posts.

E. Installation to be rigid, straight, level, and secure. Installation to meet all applicable codes. Anchorage, fastening and setting of posts to be firm, secure, and be able to withstand design loadings as specified above. Follow approved shop drawings.

F. Wall brackets to allow for proper location of rail, proper distance from the wall, and required slope and elevation of the rail.

G. Secure wall brackets to the wall using expansion anchors or other approved anchors to secure rail and meet design loads. Anchors to be stainless steel. Screws to be tamperproof.

3.06 INSTALLING COMBINATION HALL PUSH-BUTTON STATIONS

A. Coordinate installation of combination hall push-button stations with installation of related elevator signal equipment components. Secure units in place with faceplate overlapping surrounding wall finish and drawn into contact with surrounding wall finish at entire perimeter of faceplate.

3.07 ERECTION TOLERANCES

A. Erection Tolerances: Install decorative metal to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment: 1/16 inch offset.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.08 CLEANING AND PROTECTION

A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 "Painting"

C. Protect finishes of decorative metal from damage during construction period with temporary protective coverings approved by decorative metal fabricator. Remove protective covering at time of Substantial Completion.

D. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of DECORATIVE METAL shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of DECORATIVE METAL shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 05 73 11
GLASS RAILING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Glass-supported railing system, including fabrication and installation accessories.

B. Related Sections:

1. Cast-in-place concrete: Section 03 30 00.
2. Structural steel: Section 05 12 00.
3. Metal fabrications: Section 05 50 00.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design:

1. Design railing systems and anchorage, including engineering analysis prepared by a qualified Structural Engineer, using structural performance requirements and design criteria indicated herein.
2. Engineer and design of components and materials, as well as the installation of the railing systems.
3. Provide railing systems designed and constructed to comply with applicable codes and minimum values specified herein.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Handrails and Top Rails of Guards: Design Loads indicated in the Structural Drawings.
2. Infill of Guards: Design Loads indicated in the Structural Drawings.
3. Support each section of top rail by a minimum of three glass panels or by other means so top rail will remain in place if any one panel fails.
4. Testing performed according to ASTM E 894 and ASTM E 935.

C. For fully tempered glass in glass supported railing systems, use a safety factor of 4.0 applied to the applicable modulus of rupture listed under "Mechanical Properties" in AAMA Aluminum Curtain Wall Series No. 12 "Structural Properties of Glass."

D. Anchors and Connections:

1. Anchors, connections and assemblies connecting the railing system and associated fabrications to the supporting construction when shown on the Drawings are suggested locations. Determination of location is part of the structural design of the system, connections and anchors, including quantities and spacing and accessories and reinforcements necessary for fabrication, and installation of the railing system.
2. Notify the Commissioner in writing prior to the submittal of shop drawings of any changes in the proposed locations of connections and anchors.
3. The Commissioner's review of shop drawings is not to be construed as removing responsibility from the railing system manufacturer/installer for structural failures related to design, fabrication, and installation.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Complete plan layout, elevation and details; indicating materials, dimensions, anchorage to the structure, fasteners, welds, size and spacing.

1. Show glazing details indicate materials and thickness.
2. Show finishes on metal surfaces.
3. Show adjacent and structural support construction and method of attachment.
4. Provide shop drawings sealed and signed by the same Structural Engineer that prepared design calculations.

B. Samples: One 12 inch long sample of top and bottom rails with 12 inch x 12 inch sample of specified glass between rails.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer’s Literature: Materials description and installation instructions.

B. Design Calculations: Submit design calculations prepared and sealed by Structural Engineer. Design railing system, fasteners and anchors in accordance with the loading criteria specified herein and local code requirements.

C. Certifications:

1. Railing System: Signed copies of Glass Railing System Manufacturer's written certification stating that the system conforms with the referenced performance and quality assurance requirements.
2. Welder Certificates: Submit 3 copies of welding certificates for each welder involved in the work.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.6 QUALITY ASSURANCE

A. Manufacturer/Fabricator Responsibilities:

1. Provide glass railing system and accessories by a firm having undivided responsibility for the design, fabrication and installation (except for primary structural steel support structure) as shown on the Drawings and specified herein.
2. Design Calculations: The Manufacturer/Fabricator is to submit design calculations to substantiate performance requirements specified, prepared by, signed and sealed by a Structural Engineer licensed in the State of Illinois. The responsibility for design and conformance with the performance requirements is that of the fabricator.

B. Comply with laws, ordinances, rules, regulation, codes and orders of public authorities having jurisdiction over this part of the work.

C. Comply with the following:

1. Safety Glazing:
   a. ASTM C 1048.
   b. ASTM C 1172.
   c. ANSI Z97.1.
   d. 16 CFR 1201 CI and CII.
2. GANA'S - Glazing Manual and Laminated Glazing Reference Guide.

D. Provide welding complying with American Welding Society (AWS) and the Aluminum Association (AA) recommended practices and procedures.

E. Provide metal fabrications complying with the National Association of Architectural Metal Manufacturers (NAAMM), Metal Finished Manual and Aluminum and AA Specifications for Aluminum Structures, current editions.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver glass railing system components to the project site clearly marked for proper identification.

B. Store system components in accordance with the manufacturer's instructions, above ground, in dunnage and protected from construction activities and other causes of breakage or damage.

C. Schedule delivery to the job site when area of installation is prepared for installation of railing system.

D. Handle railing system components at the job site in such a manner as to prevent damage. Immediately remove from the project site damaged or otherwise unsuitable material and components when so ascertained.

1.8 MOCKUP INSTALLATION

A. Mockups: Before installing glass railing system, build mockup to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in the location indicated or, if not indicated, as mutually agreed upon with Commissioner.
2. Build mockups for glass of railing system consisting of one glass panel (minimum 4 feet long), top rail, base and cover and anchorage system components.
3. Notify Commssioner 7 days in advance of dates and times when mockups will be constructed.
4. Obtain Commissioner's approval of mockups before fabricating glass railing system.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Blumcraft Division of C.R. Laurence Company, Los Angeles, CA 90058.

B. Julius Blum & Co., Inc., Wood Ridge, NJ 07075.

C. Q-Railing USA Co., Tustin, CA 92780.

D. Taco Metals, Miami, Florida 33162.

E. The Wagner Companies, Butler, WI 53007.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221, 6063-T5 Alloy and Temper.

B. Structural Steel: ASTM A 36, prime painted comply with FS-TT-P-664C.

C. Stainless Steel Handrail and Base Cover: Sheet, plate and strip, 240, UNS S31600, minimum thickness 0.056 inch, mill flattened, stretcher leveled.

D. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent glass, flat), Quality q3 (glazing select). Provide products complying with requirements indicated below for class, thickness, and manufacturing process that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to 16CFR, Part 1201 for Category II materials.

1. Minimum 1/2 inch thick clear tempered safety glass with flat polished edges, four sides.
2. Manufacturing Process: Temper by horizontal (roller hearth) process.
3. Product: Ultra Clear (Low Iron) Float Glass, complying with ASTM C 1036, Type I, Class 1, Quality q3, with a minimum 91 percent visible light transmission, provide one of the following:
   a. "Krystal Klear" (AFG Industries Inc.).
   b. "Optiwhite" (Pilkington Building Products North America).
   c. "Starphire" (Vitro Architectural Glass).

E. Laminated Glass: ASTM C 1172, Condition A (uncoated), Type I (transparent flat glass), Quality-Q3 with two plies of (tempered) glass and polyvinyl butyral interlayer not less than (0.0350) (0.060) inch thick.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Butacite" (Kuraray America, Inc.).
   b. "Saflex" (Eastman Chemical Company).
2. Kind: LT (laminated tempered).
3. Glass Color: Clear
4. Interlayer Color: Clear
5. Interlayer Color and Pattern: As selected by Commissioner from manufacturer's full range.
6. Glass Plies for Glass Panels: Thickness required by structural loads, but not less than 1/4 inch, each.

F. Setting Blocks: EPDM blacks, 90 durometer standard with glass railing system manufacturer.

G. Glass Protective Insert: Polyvinyl chloride (PVC) insert standard with glass railing manufacturer.

H. Glazing Cement and Accessories for Structural Glazing: Glazing cement, setting blocks, shims, and related accessories as recommended or supplied by railing manufacturer for installing structural glazing in metal subrails.

1. Glazing Cement: Nonshrinking organic cement designed for curing by passing an electric current through metal subrail holding glass panel, as standard with manufacturer.

I. Welding Electrodes and Filler Metal. Provide the alloy and type required for strength, workability, compatibility and color match after grinding smooth and finishing the fabricated product.

J. Fasteners: Same basic metal or alloy as the metal fastened, and finished to match in color and texture. Comply with FS FF-S-92 for machine screws.

K. Anchors and Inserts: Either furnish inserts to be set in concrete and masonry work, or provide other anchoring devices as required for the installation of glass railing system work. Provide toothed steel expansion bolt devices for drilled-in-place anchors.

L. Bituminous Paint: Asphalt emulsion ASTM D 1187.

2.3 FABRICATION

A. Fabricate and assemble items in the shop and mark each item to ensure proper installation at the project site. Disassemble for shipment only to the extent required by shipping limitations.

B. Carefully match parts of the fabrication to maintain continuity of line and design. Join parts with hairline contact, flush and smooth with adjacent surfaces, using concealed fasteners. Grind exposed weld areas smooth to match and blend with finished surfaces.

C. Fabricate railing systems of the thicknesses, sizes and shapes shown, or if not shown, as required to produce work of adequate strength and durability without deflections. Use proven details of fabrication, as required to achieve proper assembly and alignment of the various components of the work. Exposed to view surfaces of the fabrications shall not exhibit pitting, seam marks, roller marks, stains, grinder marks, discolorations or other imperfections of finishes.

D. Weld corners and seams and in accordance with the recommendations of AWS and AA. Provide welds behind finished surfaces without distortion or discoloration of the exposed side. Grind exposed welds smooth and flush, to match and blend with adjoining surfaces.

E. Structural Glass Balusters: Factory-bond glass to aluminum base and top-rail channels in railing manufacturer's plant using glazing cement to comply with manufacturer's written specifications, unless field glazing with insert is standard with manufacturer.

F. Flat-grind and polish exposed vertical edges of lites to produce square edges with slight chamfers at edges and faces.

G. Provide brackets, fittings, inserts, bolts and fasteners with railing system, as may be required for proper support and anchorage to the construction and for other work.

H. Cut, reinforce, drill and tap fabricated items as may be required to receive other items of work.

2.4 STAINLESS STEEL FINISHES

A. Comply with ASTM A480/A480M. Remove or blend tool and die marks and stretch lines into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

1. Directional Satin: No. 4 finish.

C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

D. Wrap each fabrication with protective plastic sheeting prior to shipping.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchoring inserts, placement templates and installation instructions to those contractors installing such items.

B. Examine surfaces and conditions of the installation to receive glass railing system. Installation of the railing system and associated construction shall constitute acceptance of the existing materials and conditions.

3.2 INSTALLATION

A. Set glass railing system components accurately as measured from established building lines and levels, plumb and in true alignment with previously completed work. Install in accordance with the manufacturer's printed installation instructions and the final reviewed shop drawings.

B. Install railing base and anchor securely in place in the manner shown on the reviewed shop drawings.

C. Glass Panels:

1. Install tempered glass panels in protective insert or insert glass into base channel and bond with glazing cement unless glass was bonded to base and top rail channels in factory, on setting blocks with roll distortion parallel to the bottom or sill glazing pocket in accordance with the glass manufacturer's recommendations for the type of glass installation.
2. Set panels with 1/4 inch gap between panels and abutting construction unless shown otherwise on the Drawings. Do not seamed, nipped or abraded tempered glass at the job site.

D. Install handrails on glass panels with manufacturer's standard protective insert. Set handrails with hairline joints, straight and in line with each other. Install base cover plates in segments same length as handrails with joints aligned one above the other.

E. Do not cut or abrade finishes which cannot be completely restored in the field. Return units with such finishes to the manufacturer/fabricator for required alterations, followed by complete refinishing.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Commissioner will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made by Commissioner.

B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings according to ASTM E 894 and ASTM E 935 for compliance with performance requirements.

C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Commissioner and comply with specified requirements.

D. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.4 PROTECTION AND CLEANING

A. Protect railing components from damage immediately upon installation.

B. Wash metal finishes just prior to final acceptance. Comply with instructions and recommendations of the railing system manufacturer for cleaning.

C. Use streamers or ribbons suitably attached to the railing and held free of the glass. Do not apply warning markings directly to the glass.

D. Remove and replace glass which is broken, cracked, chipped or damaged in any way and from any source, including weather, vandalism and accidents during the construction period.

E. Maintain glass in a reasonably clean condition during construction so that it will not become stained.

F. Wash and polish glass on both faces and metal finishes just prior to final acceptance. Comply with instructions and recommendations of the glass manufacturer and glass railing system manufacturer for cleaning in each case.

G. Touch-up paint finish system of imperfections as recommended by manufacturer of paint finish system. Remove and replace any railing system component that cannot be successfully repaired.

H. Remove protective coverings when there is no longer any danger of damage to the metal surfaces of the system from other work yet to be performed in the same location. Restore protective coverings which have been removed or damaged during shipment or installation of the work, if such other work is yet to be performed.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The Work of GLASS RAILING SYSTEMS shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of GLASS RAILING SYSTEMS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER Architectural Work: 090000

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Wood blocking and nailers.
2. Plywood backing panels.

1.03 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.

C. Application: Treat all rough carpentry unless otherwise indicated.

1. Plywood backing panels.

2.02 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.

B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber and any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Western woods; WCLIB or WWPA.

7. Northern species; NLGA.
8. Eastern softwoods; NeLMA.

2.03 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.04 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope

as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

3.02 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood Paneling: Install 1-by-3-inch nominal-size furring at 24 inches o.c.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of ROUGH CARPENTRY shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of ROUGH CARPENTRY shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 06 15 43
MASS TIMBER PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes Mass Timber roof panels as shown on the Drawings.

B. For the purposes of this specification Mass Timber Panels includes the following types of construction:

1. Nail Laminated Timber (NLT)

C. Related Requirements:

1. Section 05 10 30 – Structural Steel.

2. Section 06 10 00 - Rough Carpentry.

1.3 REFERENCES

A. APA, The Engineered Wood Association.

B. ALSC, American Lumber Standard Committee Board of Review.

C. ALSC DOC PS20-15, American Softwood Lumber Standard.

D. ASTM A153/A153M-16a Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM F1667-15 Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

F. ICC-ES ESR-1539 Power-Driven Staples and Nails.

G. AITC 405 and ASTM D2559 Standards for Wood Adhesives.

H. NDS 2015 National Design Specification for Wood Construction

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate details to supporting structures.

1. Placement of lifting devices onto panels in shop may be required.

2. Verify dimensions and site conditions prior to fabrication.

1.5 ACTION SUBMITTALS

A. Shop Drawings: Include panel location plans, dimensions, shapes and sections, openings, support conditions, connections.

1. Indicate lifting connections.

2. Indicate locations, tolerances, and details of anchorage to supporting structure. Coordinate all details to supporting structures with General Contractor and applicable subcontractors.

3. Include and locate openings.

4. Indicate location of Mass Timber panel by same identification mark placed on panel.

5. Indicate relationship of Mass Timber panels to adjacent materials.

6. Clearly indicate stress grade, service grade, appearance grade.

7. Provide three dimensional models of interfaces, Mass Timber panels, secondary timber members, plus connections.

8. Provide a letter outlining steps to be taken during construction to ensure adequate weather protection of wood structures.

B. Samples: Physical samples must be provided for proposed materials and finishes. Samples are required to receive approval of the Commissioner before commencing fabrication. The following samples are required:

1. 3 samples of laminated members in the depths indicated on the structural drawings, 24" square with expected grain and color variations for visual approval for each different condition. Include the following information:
   a. Species type.
   b. Finish applied.
   c. Intended location.

2. Indicate location of Mass Timber panel by same identification mark placed on panel.

1.6 INFORMATIONAL SUBMITTALS

A. Product Data: For each type of product indicated. Submit proposed sealer for review and approval.

B. Structural design calculations: Provide structural design calculations demonstrating the Mass Timber panels are adequate to resist the design loading as specified on the Structural Drawings. The Mass Timber panels shall be designed to act be stamped and signed by a registered Structural Engineer licensed in the State of Illinois. It is noted that the material properties indicated on the Structural Drawings are representative of what is anticipated to meet the required performance.

C. Structural design criteria: The structural design criteria for the Mass Timber panels are as shown on the Structural Drawings. The codes of reference are as specified herein.

D. Mockup: Separate shop drawings shall be submitted for the Mockups. In addition to shop drawings the mass timber supplier shall provide construction sequence information for the mockup and testing protocol for testing required by this specification. The construction of the mockup shall not proceed until associated submittals have been approved.

E. In lieu of grade stamping lumber exposed to view, submit manufacturer's certificate certifying that products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Design Standards: The structural design of the Mass Timber panels shall reference the following standards:
   1. The National Design Specification for Wood Construction NDS 2005 applicable to types of Mass Timber panels indicated.

B. For NLT:
   1. Perform work in accordance with NDS and the following agencies:
      a. Lumber Grading Agency: Certified by ALSC.
      b. Plywood Grading Agency: Certified by APA.
   2. Build prefabricated panels in a shop environment for quality control. Shop fit panels during fabrication. Review with Commissioner prior to proceeding further.

C. The minimum connector stiffness for connectors:
   1. k_ser >= 600 kip/in (per foot width).
   2. k_ult >= 375 kip/in (per foot width).

D. Maintain a QA/QC log including, but not limited to:
   1. Environmental conditions at stages, such as during fabrication, storage, transportation, erection and ideally until building is completely finished.
   2. Actual length, thickness and width of the panels. Length, width, thickness and diagonal measurement are to be noted on top surface of panels.

3. Site deliveries, including verified load manifests with notes of damaged or missing materials and elements.
4. Material and element install with sign off for QC on hardware/fastener installation.
5. Equipment used, such as but not limited to torque drills (with torque clutch) for screw installation through steel plates etc.
6. Any changes or modifications.
7. The inclusion of representative pictures within the log is required.
8. Weather Protection: Provide letter outlining steps to be taken during construction to ensure adequate weather protection of wood structures.

E. Factory Inspections:

1. Provide for the Commissioner's representatives to visit the factory where the mass timber panels are being manufactured. Do not ship the panels without the written approval of the Commissioner after conclusion of the factory visit.

F. Construct a full scale mockup assembly of the proposed composite Mass Timber system. The mockup shall be constructed at a location near the job site as selected by the Contractor and approved by the Commissioner.

G. Mockup requirements:
1. Build a mockup of the mass timber panels in a roofing application as indicated on drawings. Include:
   a. Edge condition.
   b. End joint.
   c. Adjacent panel joint.
   d. Steel column.
   e. Steel beam with steel plates and connections.
   f. Recessed ceiling light fixture.
   g. Column supported light fixture.
2. Mockup must illustrate typical wood appearance, coating, and finish.
3. Keep mockup available to view as the standard of Work for remaining construction period.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Support units during shipment on non-staining material in same position as during storage.

B. Store units with adequate bracing and protect units to prevent contact with soil and separated with striping (so air may circulate around faces of members), to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
1. Place stored units so identification marks are clearly visible.

C. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses that would cause cracking or damage. Protect corners with wood blocking.

D. Lift and support units only at designated points shown on Shop Drawings.

E. Slit underside of membrane covering during storage at Site. Do not deface members.

F. Cover top and sides with opaque moisture resistant membrane.

G. Maintain protection of NLT panels during construction.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. NLT:
1. Lumber Grading Rules: DOC PS20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
2. Do not grade stamp lumber exposed to view. Deliver to site with certificates as to species, grades, stress grades, seasoning, moisture content, and other evidence as required to show compliance with the Specifications.
3. Dress lumber, S4S, unless otherwise indicated.
4. Maximum Moisture Content: 19% unless noted otherwise.
5. Wood Members: No.1/No.2 Douglas Fir.

2.2 ACCESSORIES

A. Concealed Fasteners and Metal Framing Anchors: hot dip galvanized unless noted otherwise.

B. Composite Screw Connectors: "Strong-Drive SDS Heavy-Duty Connector" (Simpson Strong-Tie Company Inc.) self-tapping screws or approved equal.

C. Nails, Brads, and Staples: ASTM F 1667.

D. Wrapping Material: Weatherproof, lightproof, stain free material. Cut holes on site and underside of wrapping to avoid accumulation of condensation.

2.3 MISCELLANEOUS MATERIALS

A. Plywood Roof Sheathing: Provide Fire Retardant Plywood roof sheathing. Refer to structural drawings.

B. Water Based Fire Retardant Treatment: Shop apply prior to application of finish stain to interior face to meet ASTM E84 Class A Fire Performance, "Wood Seal A" (Flame Seal Products) or approved equal.

C. Wood Sealer: As specified in Section 09 91 00. Sealer shall be compatible with indicated finish. End sealer shall be effective in retarding the transmission of moisture at cross-grain cuts.

D. Specialty and/or proprietary products shown on the Drawings have been selected and specified based on the manufacturer's representation. The Consultant shall not become guarantor of the product. Install specialty products in strict conformance with the manufacturer's recommendations. Contractor is responsible for proper workmanship during installation.

2.4 PREFABRICATION

A. For NLT:
   1. Hand select members to ensure straightness and architectural-quality appearance.
      a. No wane, knot holes, grade stamps, or stains are permitted to be visible in the completed structure.
      b. Assume a minimum of 30% - 40% lumber rejection rate to achieve acceptable appearance with #2 grade material. Higher grade material (e.g. J-grade or MSR lumber) will reduce the rejection rate and may be substituted for #2 grade material at Contractor's option.
   2. Place soffits of timbers so the least number of checks and knots will be visible in the completed structure.
   3. Use common steel wire nails unless noted otherwise. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless noted otherwise.
   4. Substitution of common nails with power-driven nails of the same length and diameter is acceptable. Substitution of power-driven nails of smaller diameter is permitted only with the Structural Engineer's prior approval.
   5. Clearly mark top surface of panels for identification during erection.
   6. Plywood sealing layer to be installed on panels prior to erection, splice installed in field.
   7. Placement of lifting devices onto panels in shop may be required. Supplier to coordinate with general contractor, structural steel fabricator, and installer.
   8. Verify dimensions and site conditions prior to fabrication.

B. Fabrication Tolerances
   1. Soffit elevation of individual laminations: plus or minus 1/32 inch.
   2. Panel width: plus or minus 1/4 inch.
   3. Panel length: plus or minus 1/8 inch.
   4. For rectangular panels, the corner-to-corner diagonal measurements should not deviate from each other by more than 1/8 inch.

2.5 FINISH

A. 80 grit sanding.

B. Fire retardant treatment to reduce interior finish rating to Class 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to fabrication, check dimensions relating to this section of work. Report any discrepancies to the Commissioner.

B. Prior to site erection, examine site conditions and ensure an acceptable condition.

3.2 INSTALLATION

A. Erect Mass Timber panels in accordance with final reviewed shop drawings.

B. Make adequate provision for possible erection stresses. Set panel level and plumb to correct positions. Securely brace panels and anchor in place to maintain plumb until permanently secured by finished structure.

C. Mass Timber panels shall be full shored during construction.

D. Fit Mass Timber panels closely and accurately, without trimming, cutting or other modifications, unless approved in writing by the Commissioner.

E. Site cutting or boring of Mass Timber panels, other than shown on shop drawings not permitted without written consent of the Commissioner.

F. Provide gaps as required for construction tolerances and swelling. Details and locations shall be discussed with and approved by the Commissioner in writing prior to construction. Gaps on the interior of the building are to be filled after the roof construction and exterior wall construction is complete.

3.3 CLEANING

A. Clean exposed surfaces of Mass Timber panels after erection and completion of field touch up.
   1. Perform cleaning procedures, if necessary, according to Mass Timber manufacturer's written recommendations, Protect other work from staining or damage due to cleaning operations.
   2. Do not use cleaning materials or processes that could change the appearance of exposed Mass Timber panels or damage adjacent materials.

3.4 ERECTION TOLERANCES

A. For rectangular areas, the corner-to-corner diagonal measurements should not deviate from each other by more than 1/2 inch or 0.25% of the length of the shortest side of the rectangle, whichever is greater.

B. Overall Surface Levelness (Floors and Flat Roofs): 1/4 inch in 10 feet maximum.

C. Elevation: plus or minus 3/8 inch from specified.

D. Joints: 3/16 inch maximum gap between panels or laminations unless noted otherwise.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The Work of MASS TIMBER PANELS shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of MASS TIMBER PANELS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER Architectural Work: 090000

END OF SECTION

SECTION 06 51 50

FIBERGLASS HANDRAILS, STAIR AND PLATFORM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including Book 1 Terms and Conditions, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specifications Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Section 05 10 30 Structural Steel
2. Section 05 50 00 Metal Fabrications

1.02 DESCRIPTION

A. This Section specifies requirements for the manufacture, fabrication, delivery and erection of fiberglass reinforced polymer (FRP) systems including structural shapes, supports, posts, decking, grating, handrails, guardrails, stair and platform. The work under this Section shall include furnishing all material, fastening and anchorage devices, appurtenances, accessories and incidentals necessary for a complete installation including bolts, screws, washers, inserts, brackets, angles, kickplates and other devices required for a complete system. Work to also include all testing, labor, tools, and equipment for furnishing and erecting fiberglass reinforced plastic systems. Work includes special treatments and/or color impregnations; and all other appurtenant work as required.

1.03 REFERNCES

A. ASTM D 635 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.

B. ASTM E 84 Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. The Contractor shall submit the following for the review of the Authority:

B. Samples: Three (3) sets of samples of the components of the proposed system to the Authority. The samples shall represent all critical components of the stair, platform, handrail and other systems.

1. Provide color charts for the materials to be used; samples shall be of the exact selected color from manufacturer’s standards.

C. Manufacturer's Data/Catalog Cuts: Materials specifications and installation and maintenance manuals for review in accordance with the contract requirements.

D. Structural Information: Published literature including structural design data, structural properties data and grating load and deflection tables.

E. Shop Drawings: Shop Drawings for decking, grating, handrails, guardrails, stair and platform systems. Shop drawings to indicate all plans, elevations, sections and details; supports and dimensions; member sizes; connection details; type and size of fastening and anchorage devices; for all construction using FRP materials.

F. Test Reports: Test results for the materials to be used indicating the material provided meets the requirements of this section.

G. Structural Calculations: Structural calculations for the FRP structures to be constructed and the structural members of the system indicating that the structures and structural shapes meet or exceed the structural requirements stipulated in this section. Calculations shall be based on actual field verified dimensions, conditions and design loads.

H. The Contractor shall certify that handrail installation complies with or exceeds OSHA requirements.

I. Quality Assurance: Manufacturer's and installer's qualification information.

J. Warranty: Copy of the warranty for the materials and the installation for the Authority's review and approval.

1.05 QUALITY ASSURANCE

A. Manufacturer: All items to be provided under this section shall be furnished only by manufacturers having a minimum of ten (10) years experience in the design and manufacture of similar products and systems.

B. Installer: For the items to be installed under this section, a record of at least five (5) previous, separate, similar successful installations in the last five (5) years shall be provided for the installer.

1.06 WARRANTY

A. The Contractor and the Supplier shall warrant the materials and installation of fiberglass decking, grating, handrails, guardrails, stair and platform system against breakage during normal use, cracking, deterioration due to U.V., and loss of color for a period of three years.

1.07 TESTING

A. Submit for review of fiberglass decking, grating, handrail, guardrail, stair and platform systems, structural shapes, assemblies and hold downs, seven (7) copies of notarized certified test reports from a recognized independent laboratory (approved by the Authority) certifying that the material to be supplied is in accordance with the specifications contained herein. The cost of testing and any incidental costs required thereof shall be provided by the manufacturer.

1.08 PRODUCT DELIVERY AND STORAGE

A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken pallets, packages, containers or bundles bearing the label of the manufacturer. Adhesives, resins and their catalysts and hardeners shall be crated or boxed separately and noted as such to facilitate their movement to a dry indoor storage facility.

B. Storage of Products: All materials shall be carefully handled to prevent them from abrasion, cracking, chipping, twisting, other deformations and other types of damage. Adhesives, resins and their catalysts are to be stored in dry indoor storage facilities between 70 and 85 degrees Fahrenheit until they are required.

C. Stack the fiberglass decking or grating and strap in three (3) areas with non-metallic bands with the total height of any one stack not to exceed thirteen (13) panels.

D. Pack fiberglass hardware in weather-protective cartons. Each carton is to be plainly marked with seals unbroken and labels intact, indicating materials, quantity contained within, and name of manufacturer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include; but are not limited to, the following:

1. Strongwell.
2. Creative Pultrusions.
3. Deltatread.
4. Fibergrate and Chemgrate Corporation.
5. Fibertron Incorporated.
6. IKG Borden.
7. J. T. Ryerson & Sons.
8. Morrison Molded Fiberglass Company.
9. Approved Equal.

B. All fiberglass elements shall be colored gray unless indicated otherwise. The color shall be uniformly dispersed throughout the laminate with minimum variance in color between elements in any one lot and uniformly dispersed throughout each element with minimum variation in color.

2.02 FRP MATERIALS

A. Material: The FRP material shall be fabricated with continuous strand roving mat reinforced, thermoset unsaturated isophthalic polyester electrical insulating laminate produced by the pultrusion process. The reinforcements and the resins (2,2 dimethyl-1,3 propanediol based resins) used in the laminate are to provide the strengths required in the longitudinal and transverse directions. This material shall provide chemical resistance, water resistance, ultraviolet resistance, and electrical insulating properties. Fiberglass material shall meet, and as specified herein, exceed the requirements of the National Electrical Manufacturers Association (NEMA) Industrial

Laminate Specification LI-1-1983 Grade GP03.

B. All FRP items furnished under this section shall be composed of fiberglass reinforcement and resin in qualities, properties, arrangements and dimensions are necessary to meet the design requirements and dimensions as specified in the Contract Documents.

C. Fiberglass reinforcement shall be continuous roving in sufficient quantities as needed by the application and/or physical properties required.

D. Resin shall have chemical formulations as necessary to provide the corrosion resistance, strength and other physical properties as required. The resin shall have a flame retardant additive and UV inhibitor.

E. All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear and weathering.

F. All fire-retardant molded products shall have tested flame spread rating of 25 or less per ASTM E-84 Tunnel Test and shall not burn past the 25 mm reference mark and will be classified HB per ASTM D635.

G. All mechanical grating clips shall be manufactured by Tyoe 316SS (stainless steel).

H. All shapes shall be pultruded fiberglass structural shapes standard with the manufacturer.

I. FRP surfaces are to be smooth, free from voids and imperfections and uniform with no evidence of fiber orientation irregularities, interlaminar voids, porosity, resin rich or resin starved areas. Shapes with voids greater than 0.030 inches will not be accepted by the Authority.

J. Percentage of glass (by weight) shall be a minimum of 37%. After molding, no dry glass ffibers shall be visible on any surface of bearing bars or cross bars.

K. Resin shall be fire retardant vinyl ester meeting the requirements of a Class 1 rating of 25 or less per ASTM E-84 and meets the self-extinguishing requirements of ASTM D-635.

L. Resin shall be UV inhibited and the composite shall include a veil on all exposed surfaces.

M. Colors: Colors of fiberglass handrails, stair and platform components to be as selected by the Authority from manufacturer's standards. Match approved samples.

1. Fiberglass stair treads and railings to be "Safety Yellow" color as approved by the Authority; unless directed otherwise.

2.03 FRP PROPERTIES FOR RAILINGS

A. Properties: The following properties for fiberglass handrail material are requirements to be used in conjunction with NEMA Specification LI-11983 Grade GP03:

1. Flexural Strength: ASTM D 790, 30,000 psi min.
2. Flexural Modulus: ASTM D 790, (10^6) psi 2.0 min.
3. Tensile Strength: ASTM D 638, 30,000 psi min.
4. Tensile Modulus: ASTM D 638, (10^5) psi 8.0 min.
5. Perpendicular Dielectric: ASTM D 149, (0.25 in.) VPMO 200 min.
6. Arc Resistance: sec. ASTM D 495, 120 min.
7. Water Absorption: ASTM D 570, 0.8 % max.
8. Thermal Expansion: 5.2 x 10^6 in/in/^oF, max. Flammability: Self-extinguishing.
9. Flame Resistance: UL 94, V-0 min.

B. Design Loading: The handrail system shall be designed in accordance with the Chicago Code and for a concentrated force of 200 pounds live load applied in any direction at any point of the handrail system. The concentrated load may be distributed over a square area of one (1) square foot when applied to the infill areas of the railing system. The Chicago Code loads and the 200 lb. concentrated load need not be applied concurrently. Stairs, platforms and catwalks to be designed for applicable floor loads according to the code.

2.04 FRP PROPERTIES FOR GRATINGS, PLATFORMS AND STAIRS

A. Properties: The following properties for fiberglass grating material are requirements of the Authority to be used in conjunction with NEMA Specification LI-1-1983 Grade GP03.

1. Flexural Strength: ASTM D 790, 25,000 psi min.
2. Flexural Modulus: ASTM D 790, (10^6) psi 1.0 min.
3. Tensile Strength: ASTM D 638, 17,000 psi min.
4. Tensile Modulus: ASTM D 638, (10^5) psi 9.0 min.
5. Impact Strength: ASTM D 256, 25 ft.lb/in. min.
6. Perpendicular Dielectric: ASTM D 149, (0.25 in.) VPM 170 min.
7. Arc Resistance: ASTM D 495, 180 sec. min.
8. Water Absorption: ASTM D 570, 0.2 % max.
9. Thermal Expansion: 7 x 10^6 in/in/^oF max.
10. Flame Spread: ASTM E 162, 60 max.
11. Flame Resistance: UL 94, V-0 min.
12. Tracking Resistance: ASTM D 2303, 600 minutes min. at 2500V.
13. Specific Optical Smoke Density: ASTM E 662, 200 max. within 4 min. after start of test.
14. Smoke Toxicity: Shall comply with MIL-M-14G Type MAI-60 test as per AD 297-457. Gases emitted/produced shall not exceed the following values.

	Gases	Values (Max. PPM)
a.	Hydrogen Chloride	10
b.	Hydrogen Bromide	10
c.	Hydrogen Cyanide	10
d.	Hydrogen Sulfide	10
e.	Vinyl Chloride	10
f.	Ammonia	500
g.	Aldehydes	30

h.	Oxides of Nitrogen	100
i.	Carbon Dioxide	10,000
j.	Carbon Monoxide	1,000

B. Load/Deflection: Grating design loads shall be less than manufacturers maximum recommended loads. Maximum recommended loads shall be determined by acoustic emission testing. Grating shall be designed for a uniform load of 100 psf or concentrated load of 300 lbs. Deflection is not to exceed 0.375" or L/D = 120, whichever is less.

C. The manufacturer shall certify that the stiffness of all panels manufactured are never more than 2.5% below the published load deflection values.

D. Tolerance: Decking and grating panels, platform panels, stair and structural shape sections shall not deflect more than 0.25 inches, for a simply supported 48" span under a uniform distributed load of 200 PSF or when a concentrated load of 500 lbs. is applied at the midpoint of the span. In addition, grating panels shall sustain a uniformly distributed load of 2,000 PSF on a simply supported 48" span without failure.

2.05 FABRICATION

A. Shop Assembly: Shop fabricate system to the greatest extent possible to minimize field splicing and assembly. Dissemble units only as necessary for shipping and handling limitations. Use connections that maintain structural integrity of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut and drill material cleanly and accurately. Remove burrs and ease edges to a radius of 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form system components from materials of size, thickness and shapes indicated; but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Provide fiberglass kick plates attached to the vertical members of the fiberglass handrail assembly as shown on the drawings and as required.

F. Provide for anchorage of type indicated; coordinate with supporting structures and substrates. Fabricate and space the anchoring devices to secure the system components and supports rigidly in place and to withstand all loadings.

2.06 DECKING, GRATING, STAIR TREADS AND PLATFORMS

A. Manufacture: Grating shall be of one piece molded construction with tops and bottoms of bearing bars and cross bars in the same plane. Grating shall have a square mesh pattern providing bidirectional strength or a rectangular mesh pattern providing unidirectional strength as shown or selected by the Authority, Grating shall be reinforced with continuous rovings of equal number of layers in each direction. The top layer of reinforcement shall be no more than 1/8" below the tope surface of the grating so as to provide the maximum stiffness and prevent resin chipping of unreinforced surfaces. Percentage of glass (by weight) shall not exceed 35% so as to achieve maximum

corrosion resistance, and as required to maintain the structural requirements.

B. After molding, no dry glass fibers shall be visible on any surface of bearing bars or cross bars. All bars shall be smooth and uniform with no evidence of fiber orientation irregularities, interlaminar voids, porosity, resin rich or resin starved areas.

C. Grating bar intersections are to be filleted to a minimum radius of 1/16" to eliminate local stress concentrations and the possibility of resin cracking at these locations.

D. Fire rating: Grating shall be fire retardant with a tested flame spread rating of 25 or less when tested in accordance with ASTM E-84. Data performed only on the resin shall not be acceptable.

E. Panels shall be assembled using a 3-piece pultruded cross-rod system.

F. The cross-rods shall consist of a center core wedge and 2 spacer bars that are notched at each bearing bar so that each bearing bar is both mechanically locked and chemically bonded to the web of each bearing bar.

G. The spacer bars shall be continually bonded to the center of the core wedge.

H. Gratings shall be constructed of straight parallel solid 5/8" wide bars or straight parallel "T" cross-section bearing bars 1" wide on top and 0.6" at the bottom as shown on the drawings or as selected by the Authority. Bars to be 1-1/2 inches on center unless shown or selected otherwise. Bars to be joined into panels by continuous structural fiberglass cross ties spaced 6" on center and not more than 12" on center maximum. The cross ties shall pass through and both mechanically lock and bond to each side of the individual bearing bars.

I. Standard grating panels shall be 2 inches thick and 36 inches wide with a 50% open surface (meeting OSHA Specification Section 1910.23, Paragraph (a) 9). Field cutting of grating panels shall be kept to a minimum. Where indicated on the drawings provide grating sections of width by various length grating sections, as required by the drawings or actual conditions.

J. Top surface of decking, grating and platform panels shall be etched for adhesion and then have a nonskid surface of quartz grit affixed to that surface by a baked epoxy resin. Adhesion shall be such that the bonded grit surface cannot be cleanly separated from the fiberglass bearing bars with a well-sharpened wood chisel.

2.07 GRATING

A. Measurements: Grating supplied shall meet the dimensional requirements and tolerances as shown or specified. The Contractor shall provide and/or verify measurements in field for work fabricated to fit field conditions as required by grating manufacturer to complete the work. When field dimensions are not required, contractor shall determine correct size and locations of required holes or cutouts from field dimensions before grating fabrication.

B. Layout: Each grating section shall be readily removable, except where indicated on

drawings. Manufacturer to provide openings and holes where located on the contract drawings. Grating openings which fit around protrusions (pipes, cables, machinery, etc.) shall be discontinuous at approximately the centerline of opening so each section of grating is readily removable.

C. Sealing: All shop fabricated grating cuts shall be coated with vinyl ester resin to provide maximum corrosion resistance. All field fabricated grating cuts shall be coated similarly by the contractor in accordance with the manufacturer's instructions.

D. Hardware: Type 316 stainless steel hold-down clips shall be provided and spaced at maximum of four feet apart with a minimum of four per piece of grating, or as recommended by the manufacturer.

2.08 STAIR TREADS

A. Stair treads shall be of a one piece molded construction and shall have a 1" X 6" rectangular mesh pattern with double cross bars on 6" centers. There shall be no open areas of greater than 5/8". The treads shall be reinforced in each direction with continuous reinforcement, the top layer shall be no more than 1/8" below the top surface of the tread.

B. Thickness: 1-1/2" thick plus or minus 1/16".

C. Load/Deflection: Stair treads shall not exceed a maximum deflection of 0.25" when a concentrated load of 500 pounds is placed at the centerline of a 36" tread span. The concentrated load is applied at the centerline of the tread, over a width of 4" and a depth of 6", starting at the nosing edge.

D. If required by the Authority, stair treads shall be manufactured with a minimum of 2" solid, molded nosing. Nosing shall be gritted with an angular quartz grit, integrally molded into the top surface.

2.09 MISCELLANEOUS HARDWARE

A. All hangers, brackets, fasteners, anchors and accessories shall be type and size best suited for the intended purpose to hold material securely in place.

B. All hangers, brackets, fasteners, anchors, lag screws and accessories to be AISI Type 316 Stainless Steel.

C. Bolts, Nuts and Washers: Type 316 Stainless Steel, ASTM A 307 or A 325 as required.

D. The fiberglass washers shall comply with the requirements specified herein for stair and platform walkway system.

E. Neoprene hold down shall be "heavy-duty black" conforming to ASTM D 4247.

F. Sealing Compound: Hardening compound compatible with the fiberglass components to which applied.

G. For treads, stainless steel hold down clips shall be provided and spaced as

recommended by the manufacturer. A minimum of four hold down clips shall be required for each tread.

H. For handrail connections use Type 316 Stainless Steel bolts with Type 316 Stainless Steel nut and washers both sides conforming to ASTM A240.

I. Connection hardware to supporting steel shall be at spacings and type recommended by the manufacturer to adequately attach grating to support.

2.10 CERTIFICATION

A. All materials shall be certified non-conductive and corrosion resistant.

B. Manufacturer may be required to submit corrosion data from tests performed on actual grating products in standard chemical environments. Corrosion resistance data of the resin from the manufacturer is not a true indicator of grating product corrosion resistance and shall not be accepted.

PART 3 - EXECUTION

3.01 GENERAL

A. Contractor shall verify all conditions and dimensions in the field prior to fabricating and again prior to installing FRP decking, grating, handrails, guardrails, stairs and platforms.

B. Contractor shall install decking, gratings, handrails, guardrails, stairs and platforms in accordance with the manufacturer’s assembly drawings. Fasten decking, grating and platform panels securely in place with hold-down fasteners as specified herein. Field cut and drill fiberglass reinforced plastic products with carbide or diamond tipped bits and blades. Seal cut or drilled surfaces in accordance with the manufacturer’s instructions. Follow manufacturer’s instructions when cutting or drilling fiberglass products or using resin products; provide adequate ventilation.

3.02 FRP CONSTRUCTION, GENERAL

A. Seal all cut, drilled or sanded surfaces of fiberglass elements before assembly to prevent intrusion of moisture using a hardening resin compound, compatible with the original materials and per manufacturer's specifications.

B. Securely anchor all grating sections to steel members as indicated on the drawings or as per manufacturers' specifications using specified and approved fasteners.

C. Provide caps at ends of all tube sections. Provide connecting plugs, connecting rods, 4" fiberglass kickplate as indicated on the drawings or as required by manufacturer's standard system. Handrail sections shall be shop fabricated to the greatest extent allowed by existing conditions.

D. Provide stainless steel fasteners and washers to securely fasten support assemblies to decking, grating, handrails, guardrails, stair treads and platforms; to other members or other structural shapes and to substrates or structural supports. Provide stainless steel

hook bolts, washers, and nylon insert self-locking nuts to secure connections.

E. Where field cutting and erection may be required, provide manufacturer's standard components, adhesives, touch-up paints, etc., as required for complete, finished installation.

F. Provide shim plates and fasteners as per manufacturer's specifications and as required for installation and anchorage of assemblies.

3.03 STRUCTURAL SHAPES

A. Structural shapes, sizes as indicated on the drawings, approved shop drawings and as specified by manufacturer’s standards.

B. Fabricate structural shape support assemblies as indicated on the drawings, approved shop drawings and as specified by manufacturer's standards.

3.04 RAILS, HANDRAILS AND GUARDRAILS

A. Install as indicated on approved shop drawings and as recommended by the manufacturer and using approved fasteners and hardware.

B. Fabricate and install at code specified heights and secure to platform structure to withstand code specified loads and forces; conforming to OSHA requirements.

1. Top of handrails to be 36 inches to the surface of the tread, in line with the face of the riser at the forward edge of the tread.

2. Top of guardrails to be 42 inches above the walking or working level.

3.05 QUALITY CONTROL

A. All FRP members to be free from visual defects such as foreign inclusions, delamination, blisters, resin burns, air bubbles and pits. The surfaces shall have a smooth finish (except for grit top surfaces).

B. Installations shall be according to drawings and approved shop drawings. The anchorages and connections shall be solid and firm. There is to be no loose connections, insufficient support or other movements with the decking, grating, handrail, guardrail, stairs or platform installation. There is to be no deflection except as allowed herein.

C. Contractor shall replace any defective FRP materials and repair or replace any insufficient installations as determined and approved by the Authority and at no cost to the Authority.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work for FIBERGLASS HANDRAILS, STAIR AND PLATFORM shall not be measured

for payment.

4.02 PAYMENT

A. No separate payment shall be made for work covered in this section. Payment for the Work of FIBERGLASS HANDRAILS, STAIR AND PLATFORM shall be included in the contract lump sum price as shown in the Schedule for Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural work: 030000.

END OF SECTION

SECTION 07 13 54

SELF-ADHERING THERMOPLASTIC POLYOLEFIN (TPO) WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Self-adhering, thermoplastic polyolefin (TPO) waterproofing system, including:

1. TPO waterproofing membrane.

B. Related Sections:

1. Quality requirements: Section 01 40 00.
2. Cast-in-place concrete: Section 03 30 00.
3. Cold Formed Metal Framing: Section 05 40 00.
4. Wood blocking: Section 06 10 00.
5. Roof Hatches: Section 07 72 33.
6. Joint sealants: Section 07 92 00.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Installed waterproofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Waterproofing system and flashings shall remain watertight.

1. Impact Resistance: Waterproofing membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Waterproofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by waterproofing membrane manufacturer based on testing and field experience.

C. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Waterproofing Conference:

1. Arrange a meeting at the site with the Commissioner. Require subcontractors and Waterproofing Membrane Manufacturer's representative to attend.
2. Review project requirements (Drawings, Specifications and other Contract Documents).
3. Review required submittals, both completed and yet to be completed.
4. Review condition of substrate work, including drying, structural loading limitations and similar considerations.
5. Review availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.
6. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions including the possibility of temporary conditions.
7. Review procedures needed for protection of waterproofing during remainder of construction period.
8. Review availability of each part of building, access, requirements and noise.
9. Establish a schedule for time for each area of Work to be started and completed.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:
1.
2. Waterproofing membrane 12 inch x 12 inch piece.

C. Shop Drawings: Include waterproofing plans, sections, details, and attachments to other work, including the following:
1. Base flashings and membrane termination details.
2. Flashing details at penetrations.

1.6 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions/specifications for materials used in the system.
1.
2. Submit evidence of compliance with performance requirements.

B. Certification:

1. Written certification from the Waterproofing Membrane Manufacturer stating that the Waterproofing Contractor is a Certified or Licensed Installer of the Waterproofing Membrane Manufacturer.
2. Experience: Copies of Installing Contractor's recent experience with the selected membrane system.

3. Waterproofing Contractor's written certification of consecutive exclusive experience with the proposed membrane signed by the Waterproofing Membrane Manufacturer's local representative.

C. Waterproofing Membrane Manufacturer's Installation Certification: Copies of Waterproofing Membrane Manufacturer's Certification showing compliance with the specified requirements.

D. System Certification:

1. Copies of manufacturer’s test reports certifying that the system will provide required initial solar reflectance or will maintain required reflectance for 3 years after installation.
2. Copies of manufacturer’s test reports certifying the system will provide required minimum emissivity.
3. Waterproofing Membrane Manufacturer’s written certification of installation.

E. Waterproofing Warranty: Copies of the System Warranty in the form and content (terms) indicated, covering the waterproofing system and associated work indicated herein, signed by the Installer and the Manufacturer of the Waterproofing System.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For waterproofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Comply with applicable codes, laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the Work.

B. Provide materials and products specified herein for the waterproofing membrane system as the products of one manufacturer to ensure compatibility, uniformity and warranty of the waterproofing system.

C. Materials and Methods:

1. Provide materials and methods of installation in accordance with the current printed published instructions, details and specifications of the Principal Waterproofing Material Manufacturer and the National Roofing Contractor's Association (NRCA) Manual for slopes and type of substrates shown, except as hereafter modified and as approved by the Principal Waterproofing Material Manufacturer. In the event of a conflict between these specifications and those of the Principal Waterproofing material Manufacturer, the more stringent or greater is to take precedent and be the one utilized for the warranted installation.
2. Deviations from this Section must be requested in writing to the Commissioner for approval prior to submittals in accordance with the requirements of Section 01 60 00 - Product Requirements.

D. Installer Qualifications:

1. The Installer is to be acceptable to the Manufacturer of the Waterproofing Membrane and the Commissioner. The Installer is to also be a Certified Installer of the Specified Waterproofing Membrane and is to provide written evidence as part of the required submittals.
2. In addition to the above, the Waterproofing Contractor is to have installed not less than three waterproofing projects of similar scope or not less than 200,000 square feet of the specified membrane system in the past eighteen months. Provide written description of this experience to the Commissioner.
3. The Installer is to have not less five consecutive years experience installing the proposed manufacturer's membrane and is to provide written evidence as part of the required submittals.
4. The Installer is to be capable of responding to the installation site to perform repairs for leaks and other waterproofing system damage within 24 hours from receipt of such notice.

E. Provide a waterproofing membrane manufacturer's representative for inspection of the waterproofing system during installation and upon completion of the waterproofing system installation to ascertain that the waterproofing system has been installed in accordance with the manufacturer's published specifications, details of the waterproofing system, the reviewed shop drawings, and this Section.

F. The Waterproofing Membrane Manufacturer is to review the proposed waterproofing installation and the Contract Document Drawings. Include in the work additional work required by the Membrane Manufacturer for a complete warranted waterproofing system.

G. Manufacturer's Certification of Installation: The Waterproofing Membrane Manufacturer, after review of the proposed waterproofing installation and the Contract Document Drawings and Specifications, is to submit with a written certification stating the following:

1. That the proposed installation has been reviewed by the Waterproofing Manufacturer's Technical Department, including wind uplift analysis/review, for compliance with the manufacturer’s requirements and this specification.
2. List exceptions and required modifications to the proposed installation and the Contract Documents.
3. That the proposed installation will qualify for the herein specified warranty period and terms when installed in accordance with the Waterproofing Membrane Manufacturer's installation instructions, the Contract Documents and any accepted proposed exceptions or required modifications.
4. Certification signed by an officer the Waterproofing Membrane Manufacturer empowered to sign such certification as specified herein.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original unopened containers and packaging.

B. Provide containers labeled with manufacturer's name, brand name, UL classification, installation instruction and identification of various items.

C. Store materials, except membrane, between 60 deg F and 80 deg F. If exposed to lower temperature, restore to proper temperature before using.

D. Store materials, except membrane, in dry area and protect. Remove and replace damaged materials.

1.10 PROJECT/SITE CONDITIONS

A. Weather Conditions: Proceed with waterproofing work only when weather conditions are in compliance with manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with requirements and the manufacturer's recommendations.

B. Sequencing Protection:

1. Sequence operations to avoid exposure of Work on and in the building to the elements.
2. Provide protection from the elements.
3. Provide protection of the existing construction from damage by the construction operations. Repair or replace construction so damaged as reviewed by the Commissioner.

C. Protection:

1. Protect waterproofed areas crossed during work activities and rectify any waterproofing affected by use activities.
2. Install waterproofing during dry weather. Provide necessary protection and temporary covering of adjacent finished work to avoid damage by staining, spillage or otherwise until completion of waterproofing. Verify that ducts, piping, cants, drains, vents, curbs, grounds and other penetrations have been properly installed and secured. Give free access to waterproofing areas to work specified in other Sections or any other work necessary to be performed concurrently with work under this Section, and when installed, flash or otherwise treated to produce a complete and watertight installation.

D. Material Conditions:

1. Adhesives, primer, and sealants are extremely flammable and toxic. Use precautions as indicated on manufacturer's labels. Do not use near open flame, in a confined or unventilated area.
2. Provide surfaces to be welded dry and clean.
3. Do not install membrane when the outside ambient air temperature is below 40 deg F and falling.
   a. Extreme summer ambient conditions may dictate adhering lesser areas of membrane at a time to prevent over drying of adhesive.
4. Provide waterproofing surfaces free of ponded water, ice or snow to eliminate future condensation problems.

1.11 WARRANTY

A. The waterproofing membrane manufacturer's representative is to inspect the installation of the waterproofing membrane system, including base flashing and associated work of the system and upon approval, a Waterproofing Membrane Manufacturer's 15 year total system warranty is to be issued.

B. The Waterproofing Contractor and Waterproofing Membrane Manufacturer are to warrant the waterproofing membrane, base flashing and associated waterproofing work of the total system to be free of faults and defects for a period of fifteen years for watertightness under maximum wind speed and gusts up to 72 miles per hour.

C. The Manufacturer's warranty is to be fully paid for by the Waterproofing Contractor. Provide warranty covering both labor and material, without financial limits, to repair leaks on the waterproofing membrane, base flashing and associated waterproofing work of the total system.

D. Provide warranty signed by the Waterproofing Contractor and the Manufacturer and submit to the Commissioner.

E. This warranty is in addition to, and not a limitation of other rights the Commissioner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. TPO waterproofing membrane:

1. Carlisle SynTec Systems, Division of Carlisle Corporation; Carlisle, PA 17013.
2. Firestone Building Product Company, Division of the Firestone Tire and Rubber Company, Indianapolis, IN 46268.
3. Genflex Roofing Systems, Maumee, OH 43537.
4. GAF Materials Corporation, Wayne, NJ 07470.
5. Johns Manville International, Inc., Denver, CO 80217.

2.2 TPO WATERPROOFING SYSTEM

A. Self-Adhering reinforced TPO membrane and base flashing system with heat welded seams. Provide one of the following systems:

1. “Sure-Weld SAT TPO System” (Carlisle).
2. “UltraPly TPO SA” (Firestone).
3. “Genflex EZ TPO, Peel & Stick” (Genflex).
4. “Everguard Freedom TPO, HW Membrane” (GAF).
5. “JM TPO SA” (Johns Manville).

B. Waterproofing Membrane: Minimum 0. 0.060 inch thick, 76-1/2 inches wide, TPO based, polyester scrim (10 x 10 per square inch weave) reinforced thermoplastic sheet membrane, conforming to ASTM D 6878 minimum physical properties.

2.3 RELATED SYSTEM MATERIALS

A. Base Flashing: Same as waterproofing membrane, furnished by Membrane Manufacturer.

B. Perimeter Half Sheets: Same as waterproofing membrane for building perimeter edges, furnished by Membrane Manufacturer.

C. Bonding Adhesive: Compatible with materials to which the membrane is to be bonded, furnished by Membrane Manufacturer.

D. Mechanical Fasteners: corrosion resistant metal plates with corrosion resistant coated screws of length sufficient to penetrate deck as required by Membrane Manufacturer's standard installation instructions.

E. Multi-Purpose Sealant: Compatible with materials to be used for water cutoff and membrane to metal sealing, furnished by Membrane Manufacturer.

F. Seam Sealant: Compatible with materials to be used for sealing cut edges of reinforced membrane at seams, furnished by Membrane Manufacturer.

G. Night Seal: Compatible with materials with which it is used for tie-offs of membrane at the end of each work day, furnished by Membrane Manufacturer.

H. Base Flashing Rod Filler: Hollow center, closed cell expanded neoprene rod comply with ASTM D 1056, Type S, Class SC, diameter as shown on the Drawings, if not shown, provide not less than 2 inch diameter.

I. Treated Wood Nailers and Blocking: Refer to Section 06 10 00 - Rough Carpentry.

J. Metal Cap, Counterflashing, Termination Bars and Sheet Metal Work: Refer to Section 07 62 00 - Sheet Metal Flashing and Trim.

K. Sealants: Refer to Section 07 92 00 – Joint Sealants.

L. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.

M. Prefabricated Pipe Flashings: As recommended by waterproofing membrane manufacturer.

N. Incidental Materials: Waterproofing membrane manufacturer's components and materials required for preparation and installation of membrane and other waterproofing system components.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that waterproofing openings and penetrations are in place and curbs are set and braced.
   2. Verify that wood blocking, curbs, and nailers are securely anchored at penetrations and terminations.
   3. Verify that substrate is visibly dry and free of moisture as recommended by waterproofing system manufacturer.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SUBSTRATE PREPARATION AND INSPECTION

A. Do not apply waterproofing until vents, drains, curbs, blocking, nailing strips and projections through the deck have been installed.

B. Clean substrate of debris and deleterious materials which would impair the work.

C. Do not apply waterproofing membrane and associated materials in cold or wet weather, unless requirements of the manufacturer are complied with, and then only in accordance with waterproofing membrane manufacturer's instructions and concurrence of the Commissioner.

D. Install waterproofing membrane materials, base flashing and associated materials in accordance with current published instructions and specifications of the waterproofing membrane and material manufacturers.

3.3 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install wood blocking and nailers in conjunction with waterproofing work as shown on Drawings, as specified herein and as required by the waterproofing membrane manufacturer to locations, configurations and sizes detailed, specified and required.

B. Anchor wood blocking and nailers to deck and other substrates with membrane manufacturer approved hot-dip galvanized fasteners appropriate for the types of materials and methods used in the construction. Anchor nailers to deck not less than at a maximum of 12 inches on center and stagger 6 inches o.c. within 8 feet of corners. Provide 1/2 inch wide vent space between adjacent ends of nailers.

C. Coordinate installation of blocking and nailers with the installation of sheet metal flashing and trim, and waterproofing penetrations.

3.4 INSTALLATION OF WATERPROOFING MEMBRANE

A. Adhere waterproofing membrane over area to receive waterproofing according to waterproofing system manufacturer's written instructions.

B. Unroll waterproofing membrane and allow to relax before installing.

C. Start installation of waterproofing in presence of waterproofing system manufacturer's technical personnel and Commissioner's testing and inspection agency.

D. Accurately align waterproofing membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer.
   1. Stagger end laps.

E. Fold waterproofing membrane to expose half of sheet width's bottom surface.
   1. Remove release liner on exposed half of sheet.
   2. Roll waterproofing membrane over substrate while avoiding wrinkles.

F. Fold remaining half of waterproofing membrane to expose bottom surface.
   1. Remove release liner on exposed half of sheet.
   2. Roll waterproofing membrane over substrate while avoiding wrinkles.

G. In addition to adhering, mechanically fasten waterproofing membrane securely at terminations, penetrations, and perimeter of waterproofing.

H. Apply waterproofing membrane with side laps shingled. Apply primer, batten strips, and other incidental materials as recommended by the waterproofing manufacturer.

I. Seams: Clean seam areas, overlap waterproofing membrane, and hot-air weld side and end laps of waterproofing membrane and sheet flashings, to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity.
   2. Apply lap sealant to seal cut edges of waterproofing membrane and flashing sheet.
   3. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
   4. Repair tears, voids, and lapped seams in waterproofing membrane that do not comply with requirements.

3.5 INSTALLATION OF BASE FLASHING AND FLASHING

A. Flash perimeter at gravel stop fascias, parapets, walls, around vents, curbs and other waterproofing penetrations with membrane flashing specified using longest pieces practicable. Install flashing and terminations in accordance with the details shown on the Drawings and the Waterproofing Membrane Manufacturer's approved shop drawing details.

B. Complete seam weld between flashing and main waterproofing sheets before bonding flashing to vertical surface. Extend base flashing membrane over

fasteners and out onto waterproofing membrane a minimum of 4-1/2 inches from the vertical surface being flashed. Weld base flashing to waterproofing membrane as hereinbefore specified.

C. Apply bonding adhesive to the underside of membrane and to the surface which it is to be bonded in accordance with the manufacturer's printed directions. After adhesive has dried, roll flashing into place taking care not to cause bridging of the material at changes of direction. Completely roll the flashing membrane against the substrate using a hand roller applying pressure to the entire surface area.

D. Mechanically fasten base flashing at top of vertical surface with Membrane Manufacturer approved non-corroding fasteners spaced a minimum of 12 inches on center. Install a continuous strip of multi-purpose sealant under the top edges of base flashing prior to installing fasteners.

E. Flash penetrations (pipes and conduits) passing through the membrane.

1. Flash pipe with molded pipe flashing standard with membrane manufacturer.
2. Provide prefabricated pipe or conduit penetration cap and curb assembly for groups of pipes or conduit not appropriate for Membrane Manufacturer’s pre-molded flashing.

3.6 TEMPORARY CUTOFFS

A. Take care to ensure that the water does not flow beneath any completed sections of waterproofing membrane. At the end of each work day or when weather is threatening temporarily seal loose edge of membrane with manufacturer's night seal.

B. When work is resumed, pull sheet free and remove night seal before continuing installation.

3.7 INSTALLATION OF PLUMBING FLASHING

A. Install field fabricated flashing using flashing membrane. Attach membrane with bonding adhesive and extend a minimum of 4-1/2 inches on to waterproofing membrane and weld.

B. Install cap flashing membrane, and attach with bonding adhesive inside.

C. Install in accordance with the details shown on the Drawings, if not shown, install as per manufacturer's detail.

D. Install continuous sealant and stainless steel draw band (clamping ring) around plumbing.

3.8 INSTALLATION OF SHEET METAL FLASHING AND TRIM

A. Refer to Section 07 62 00 - Sheet Metal Flashing and Trim.

3.9 FIELD QUALITY CONTROL

A. The Commissioner's Inspection Service Waterproofing Membrane Manufacturer's Representative will determine during the course of the waterproofing work whether the material installation and the workmanship used in the work actually comply with the requirements of the Contract Documents and the Quality Assurance as specified herein.

B. Deficiencies:

1. Where inspections indicate deficiencies in the work, or non-compliance with this Section, the manufacturer specifications and the reviewed shop drawings, prepare recommendations for additional or remedial work to compensate for deficiencies. Recommendations will be reviewed by the Commissioner and Waterproofing Membrane Manufacturer's Representative prior to proceeding with remedial work.
2. When directed in writing by the Commissioner and Waterproofing Membrane Manufacturer, proceed with additional or remedial work as required to compensate for deficiencies.

3.10 CLEANING

A. Remove trash debris, equipment and excess materials from the building and site.

B. Remove stains and other waterproofing materials from finish building surfaces, walks, paving and landscaped areas of the site. Restore finishes to their original condition.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of SELF-ADHERING THERMOPLASTIC POLYOLEFIN (TPO) WATERPROOFING shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of SELF-ADHERING THERMOPLASTIC POLYOLEFIN (TPO) WATERPROOFING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 16 13
POLYMER MODIFIED CEMENT WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Polymer modified cement waterproofing for negative side application to cast-in-place concrete elevator pit foundation walls and floor slab, including accessory materials and surface preparation.

B. Related Sections:

1. Cast-in-place concrete: Section 03 30 00.
2. Joint sealants: Section 07 92 00.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: 6 inch x 6 inch samples on suitable solid substrate.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For waterproofing, patching, and plugging materials, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency.

D. Field quality control reports, prepared by manufacturer’s representative.

E. Warranty: Signed copies of warranty.

1.5 QUALITY ASSURANCE

A. Provide materials and products specified herein for the waterproofing system as the products of one manufacturer to ensure compatibility, uniformity and warrantability of the waterproofing system.

B. Installer Qualifications:

1. The Installer is to be acceptable to the Manufacturer of the Waterproofing System. The Installer is to also be a Certified Installer of the Specified Waterproofing System and is to provide written evidence as part of the required submittals.
2. The Installer is to have not less 5 consecutive years of experience installing the manufacturer's waterproofing system and is to provide written evidence as part of the required submittals.

C. The manufacturer of the Waterproofing System is to provide a qualified representative for inspection of the waterproofing system before and during installation and upon completion of the waterproofing system installation to ascertain that the waterproofing system has been installed in accordance with the manufacturer's published specifications, details of the waterproofing system and this Section.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit polymer modified cement waterproofing to be performed according to manufacturer's written instructions.

B. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.

C. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40 degF or above during work and cure period, and space is well ventilated and kept free of water.

D. Pre-installation Meeting:

1. Arrange a meeting at the site with the Commissioner. Require subcontractors and Waterproofing System Manufacturers' Representative to attend.
2. Review project requirements (Drawings, Specifications, and other Contract Documents.
3. Review required submittals, both completed and yet to be completed.
4. Review condition of substrate work, including drying, structural loading limitations and similar considerations.
5. Review availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.

6. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions including the possibility of temporary conditions.
7. Review procedures needed for protection of waterproofing system remainder of construction period.
8. Review availability of each part of building and access requirements.
9. Establish a schedule of time for each area of work to be started and completed.

1.7 WARRANTY

A. The Waterproofing Manufacturer's Representative is to inspect the installation of the waterproofing system and associated work prior to the start of work, during the work, and at completion of the work. Upon approval of the installation by the Waterproofing Manufacturer's Representative, a warranty is to be issued to the Commissioner.

B. Provide Waterproofing Manufacture's written warranty stating that the waterproofing will be free of faults and defects in accordance with the General Conditions, except that the Warranty is to be extended by the Waterproofing Manufacturer's 15 year written waterproofing warranty insuring the waterproofing performance of the waterproofing which has been applied on sound materials in accordance with the manufacturer's written instructions.

C. Provide a warranty covering the waterproofing performance of the waterproofing, including all costs of materials and labor (limited to the total original cost of the installation [labor and material]), to repair and/or replace the waterproofing and associated system materials installed on structurally sound materials.

D. Provide the warranty in writing and be signed by the Contractor, Installing Subcontractor and Waterproofing Manufacturer.

E. This warranty is in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 PREPACKAGED, POLYMER MODIFIED CEMENT WATERPROOFING

A. Negative Side, Polymer Modified Cement Waterproofing: Manufacturer's proprietary blend of dry cementitious and other ingredients for mixing with polymer admixture to produce a waterproof coating that is suitable for vertical and horizontal applications below or above grade, is breathable, resists negative side hydrostatic pressure, has VOC content complying with limits of authorities having jurisdiction, and has properties meeting or exceeding the criteria specified below.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. “TAMOSEAL” (Euclid Chemical Company (The); an RPM company).
   b. “Five Star Waterproofing” (Five Star Products, Inc.).

c. "Sika Top Seal 107" (Sika Corporation).
d. "AQUAFIN-1K" (AQUAFIN, Inc.).
e. "MasterSeal 581" (BASF Corporation).

2. Water Permeability: Zero for water at 30 feet when tested according to COE CRD-C 48.
3. Compressive Strength: Minimum 3,000 psi at 28 days when tested according to ASTM C 109.
4. Flexural Strength: Minimum 116 psi at 28 days when tested according to ASTM C 348.
5. Bond Strength: Minimum 180 psi at 14 days when tested according to ASTM C 321.
6. Color: Gray.

2.2 ACCESSORY MATERIALS

A. Patching Compound: Factory premixed cementitious repair mortar, crack filler, or sealant recommended by waterproofing manufacturer for filling and patching tie holes, honeycombs, reveals, and other imperfections; compatible with substrate and other materials indicated; and VOC content complying with limits of authorities having jurisdiction.

B. Plugging Compound: Factory premixed cementitious compound with hydrophobic properties and recommended by waterproofing manufacturer; resistant to water and moisture but vapor permeable for all standard applications (vertical, overhead, and horizontal surfaces not exposed to vehicular traffic); compatible with substrate and other materials indicated; and VOC content complying with limits of authorities having jurisdiction.

C. Polymer Admixture: Polymer bonding agent and admixture designed to improve adhesion to prepared substrates.

D. Water: Potable.

2.3 MIXES

A. Prepackaged, Polymer Modified Cement Waterproofing: Add prepackaged dry ingredients to mixing liquid according to manufacturer's written instructions. Mix together with mechanical mixer or by hand to required consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for suitable conditions where waterproofing is to be applied.

B. Proceed with application only after unsatisfactory conditions have been corrected.

C. Notify Commissioner in writing of active leaks or defects that would affect system performance.

3.2 PREPARATION

A. Protect other work from damage caused by cleaning, preparation, and application of waterproofing. Provide temporary enclosure to confine application operation and to ensure adequate ambient temperatures and ventilation conditions for application.

B. Do not allow waterproofing, patching, and plugging materials to enter reveals or annular spaces intended for resilient sealants or gaskets, such as joint spaces between pipes and pipe sleeves.

C. Stop active water leaks with plugging compound according to waterproofing manufacturer's written instructions.

D. Repair damaged or unsatisfactory substrate with patching compound according to manufacturer's written instructions.

1. At holes and cracks in substrate, remove loosened chips and cut reveal with sides perpendicular to surface, not tapered, and approximately 1 inch deep. Fill reveal with patching compound flush with surface.

E. Surface Preparation: Comply with waterproofing manufacturer's written instructions to ensure that waterproofing bonds to surfaces.

1. Etch, abrade, or blast-clean as appropriate.
2. Remove efflorescence, chalk, dust, dirt, mortar spatter, grease, oils, paint, curing compounds, and form release agents.
3. Concrete Joints: Clean reveals.

3.3 APPLICATION

A. General: Comply with waterproofing manufacturer's written instructions for application and curing.

1. Saturate surface with water and maintain damp condition until applying waterproofing. Remove standing water.
2. Apply waterproofing to surfaces indicated on Drawings.
3. Number of Coats: Minimum 2.
    a. Coating Thickness: Maximum application thickness of 40 mils per coat for total thickness of 80 mils.
    b. Apply first coat as a slurry with brush or roller, and apply subsequent coats with brush, roller, spray, or trowel.
    c. Vigorously work first coat onto the substrate, forcing the material into surface voids. Apply each subsequent coat into full contact with previous coat.
    d. Allow manufacturer's recommended time between coats. Dampen surface between coats.

B. Final Coat Finish: Smooth troweled or brushed.

C. Curing: Air cure waterproofing for not less than 2 days immediately after application and prior to being placed in service.

3.4 FIELD QUALITY CONTROL

A. Inspection: Engage manufacturer's representative to inspect completed application and provide a written report that application complies with manufacturer's written instructions.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of POLYMER MODIFIED CEMENT WATERPROOFING shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of POLYMER MODIFIED CEMENT WATERPROOFING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Mineral-wool board insulation.
2. Glass-fiber blanket insulation.
3. Vapor retarders.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.04 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.01 MINERAL-WOOL BOARD INSULATION

A. Unfaced, Mineral-Wool Board Insulation: ASTM C 612, Type 1A; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.02 GLASS-FIBER BLANKET INSULATION

A. Reinforced-Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.03 VAPOR RETARDERS

A. Reinforced-Polyethylene Vapor Retarders: Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft., with maximum permeance rating of 0.0507 perm.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

C. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.

D. Accessories as recommended by the vapor retarder manufacturer.

2.04 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.

2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.03 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.04 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive or loosely laid according to manufacturer's written instructions.

3.05 INSTALLATION OF ABOVE-GRADE INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to

substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

1. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

    a. Exterior Walls: Set units with facing placed toward interior of construction.

3.06 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.07 INSTALLATION OF CURTAIN-WALL INSULATION

A. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.

1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.08 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

C. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.09 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of THERMAL INSULATION shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of THERMAL INSULATION shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 42 12
STAINLESS STEEL PLATE PANEL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Stainless steel plate wall panel system, including but not limited to the following:

1. Stainless steel plate wall panels concealed fastener, rain screen installation.
2. Special fabricated units, coping, closures, trim, flashing, sills, counterflashing, and assembly required fabricated aluminum accessories and assemblies.
3. Sub (secondary) framing attachment system.
4. Accessories, anchors, attachments, fasteners, and miscellaneous items required for a complete watertight warranted wall panel assembly installation.

B. Stainless steel plate ceiling panel system, including but not limited to the following:

1. Stainless steel plate ceiling panels concealed fastener installation.
2. Special fabricated units, fascia, closures, trim, and assembly required fabricated aluminum accessories and assemblies.
3. Sub (secondary) framing attachment system.
4. Accessories, anchors, attachments, fasteners, and miscellaneous items required for a complete assembly installation.

C. Related Sections:

1. Cold-formed metal framing: Section 05 40 00.
2. Batt thermal insulation: Section 07 21 00.
3. Joint sealants: Section 07 92 00.
4. Gypsum Board: Section 09 29 00.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design:

1. Design stainless steel plate panel systems, including comprehensive engineering analysis by a qualified Structural Engineer, using performance requirements and design criteria indicated herein.
2. Engineer, design, and provide components and materials of the stainless steel plate panel systems.

B. Design loads for panel design and construction are to satisfy applicable codes and are not to be less than the minimum values specified herein.

C. Wall Panel System Design: The stainless steel plate wall panel system is composed of stainless steel formed (pan) panels attached to continuous pre-engineered stainless steel channel support system. The stainless steel channel support system is to be anchored to the primary support wall. The stainless steel plate wall panels system is to provide rain screen cover and does not provide the primary weather barrier for the building envelope. The system is to provide an open rain screen of pressure equalized formed stainless steel plate wall panels which are to control the forces that contribute to water penetration of the exterior envelope.

1. Provide fasteners and components of corrosion metals resistant to minimize deterioration, prevent failure, and eliminate streaking of panels by evacuated water.
2. Provide positive drainage system for a maximum anticipated moisture for 100 year rain cycle without overflowing and condensation occurring within the system.
3. Provide cavity baffles to define airtight compartments to restrict air flow while continuously maintaining equalized air pressure. Base size and configuration of compartments on predicted pressure differentials.
4. Design system to allow for movements within structure.
5. The Drawings indicate sizes, perforation patterns, profiles and dimensional requirements of the stainless steel plate wall panel system required and are based on specific products specified.

D. Ceiling Panel System Design: The stainless steel plate ceiling panel system is composed of stainless steel formed (pan) panels attached to continuous pre-engineered stainless steel channel support system. The stainless steel channel support system is to be anchored to the primary support above.

1. Provide fasteners and components of corrosion metals resistant to minimize deterioration, prevent failure, and eliminate streaking of panels by evacuated water.
2. Design system to allow for movements within structure.
3. The Drawings indicate sizes, profiles, perforation patterns, and dimensional requirements of the stainless steel plate ceiling panel system required and are based on specific products specified.

E. Structural Support Movement: Provide panel system, sub-framing and attachments which accommodate without damage to the assembly or components: movement within the assemblies; movement between panels, and sub-framing; dynamic loading and release loads and deflection of primary support framing.

F. Wind Loads: Design stainless steel plate panel system, secondary support framing, connections, fasteners, and associated components of the installation to conform with the Design Loads indicated in the Structural Drawings.

1. Deflection: 1/300 of the span of any member or surface with net residual deflection after load is removed not to exceed 1/1000 of the span.

G. Thermal Movements: Provide stainless steel plate wall panel system, including anchorage, that accommodates thermal movements of system and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on wall panels, failure of joint sealants, damaging loads on fasteners, noise or vibration, and other detrimental effects.

1. Temperature Change (Range): 120 deg F ambient; 180 deg F, material surfaces.

1.4 ACTION SUBMITTALS

A. Shop Drawings:

1. Plans, elevations, and large scale details of the complete system assembly, include framing plans indicating all sub-frame members, size, gage and spacing.
2. Indicate on Details: Metal materials, gages, finishes, methods of fabrication, welds, fasteners, fittings, accessories, supports, framing and anchors. Show internal and external drainage systems and access. Show primary support structure, adjacent construction and method of anchorage of fabricated items.
3. Seal and signature of the same engineer who signs the calculations.

B. Samples:

1. Verification Samples: 12 inch x 12 inch x 0.125 inch thick pieces of stainless steel with finish specified.
2. One 24 inch square sample fabrication of typical panel joints showing method of attachment for panels.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions for manufactured items and materials.

B. Design Calculations: Provide for fabricated items requiring design calculations to substantiate design and performance requirements, prepared, sealed, and signed by a qualified Engineer. Provide calculations for the following:

1. Sub-(secondary) framing.
2. Wall panels.
3. Ceiling panels.
4. Fasteners, attachments and anchors.

C. Warranties: Copies of the following:

1. Panel system fabrication and installation.

1.6 QUALITY ASSURANCE

A. Engineer Qualifications: Structural Engineer licensed in the State of Illinois and experienced in providing engineering services of the kind indicated that have resulted in the successful installations, similar in material, design, and extent to that indicated for this Project.

B. Fabricator Responsibilities:

1. The stainless steel plate panel system components and accessories of the systems are to be provided by a firm having undivided responsibility for the design, fabrication, and installation (except for primary support framing) as shown on the Drawings and specified herein.
2. Provide design, fabrication and installation in strict accordance with state and local building codes and ordinances and conforming with the specified performance requirements.

C. Fabricator Qualifications: Provide panel system design, fabrication, and installation by a firm specializing in type of work shown on the Drawings and specified herein as evidenced by a minimum of 5 years consecutive experience. The fabricator, upon request, is to submit such evidences of experience in writing to the Commissioner showing compliance with this requirement.

D. Provide panel system component finishes complying with the applicable portions of the NAAMM, Metal Finishes Manual, for compliance with surface preparation, prime and finish coating of fabricated components.

E. Factory Inspections:

1. Provide for the Commissioner's representatives to visit the factory where the plate panel systems are being manufactured. Do not ship the panels without the written approval of the Commissioner after conclusion of the factory visit.

1.7 MOCKUP INSTALLATION

A. Prior to fabrication and installation of the stainless steel plate panel systems, construct a mockup installation of typical panel system elements and materials as shown and indicated on the Drawings, including but not limited to; typical wall panels, ceiling panels, copings, fascia, corner units, parapet cap, trim, secondary framing, openings, sealant, and joints.

1. If not indicated on the Drawings, provide a representative mockup of not less than 6 feet wide and 8 feet high, including a typical corner unit.

B. Construct the mockup installation at a location on the project site mutually agreed upon by the Commissioner and Contractor. Include in the mockup all materials, details, accessories and techniques that will be used in the actual construction. Notify the Commissioner prior to the start of mockup construction.

C. The mockup installation will be reviewed by the Commissioner. Make changes or corrections to the mockup as directed by the Commissioner. After final review of

the mockup, it will be retained and used as a standard of quality and workmanship for the actual installation.

D. Protect and maintain mockup installation until completion of work. Provide adequate foundations, framing and bracing to support and protect mockup from wind damage. Cover exposed tops of walls and other elements to prevent passage of water. Install copings, closures, trim, flashings and other accessories as would be required in the actual building construction. Remove mockup installation including any foundations when so directed by the Contractor.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 DELIVERY, HANDLING AND STORAGE

A. Deliver panel system fabrications to the project site in as large of sections possible, clearly marked for proper identification. Wrap fabrications properly to protect paint finish from damage during delivery, storage and handling.

B. Store fabrications in accordance with manufacturer's instructions, above ground, wrapped and protected from weather, construction activities and other causes of damage or loss. Deliver to project site at time to allow for immediate installation so as to prevent damage.

C. Handle materials at the job site in such a manner as to prevent damage. When so ascertained, immediately remove all damaged or otherwise unsuitable material from the job site.

1.10 WARRANTIES

A. Panel System:

1. Provide manufacturer’s written warranty stating that the panel system installation and associated components will be free of faults and defects for a period of 5 years.
2. The warranty is to cover both labor and material (without limits to the cost) to repair assembly and fabrication faults and defects of the panel system and associated components of the installation.
3. Provide warranty signed 3 copies by the fabricator/installer and submit to the Commissioner.

B. This warranty is in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

A. Basis of Design Product: "Europlate System" (Pohl Inc.) or comparable products, as approved by Architect of:

1. Alply Inc., De Kalb, MS 39328.
2. Architectural Specialty Products, Inc., Chicago, IL 60638.
3. Firestone Metal Products, Anoka, MN 55303.
4. Pohl Inc. of America, Salt Lake City, UT 84108.

2.2 MATERIALS

A. Stainless Steel Alloy Sheet and Plate: ASTM A 240, UNS S31600.

B. Stainless Steel Bars and Shapes: ASTM A 276, UNS S31600.

C. Metal to Metal Fasteners: Comply with FS FF-S-92 for machine screws. Provide the type of fasteners shown on the Drawings or required by conditions of fabrication or installation. Provide Phillips flat-head screws for exposed fasteners, unless otherwise shown on the Drawings.

1. Stainless-Steel Items: ASTM A 276, UNS S31600.

D. Bituminous Paint - Asphalt Emulsion: ASTM D 1187.

E. Joint Sealants and Installation Accessories: Refer to Section 07 92 00 - Joint Sealants.

2.3 SYSTEM DESCRIPTION

A. Provide system consisting of formed and corner welded (pan) stainless steel plate panels and supporting assemblies, fastening devices, trim and accessories required for complete system installation.

1. Provide wall system which is back ventilated with self-weeping panel and drainage track system providing a rain screen. No exposed fastening.

B. Pre-formed stainless steel panels of minimum 0.125 inch thick flat plate, factory fabricated and finished.

C. Provide continuous vertical supporting stainless steel drainage tracks at vertical joints. Finish to match panels.

D. Provide mounting brackets for attachment of vertical carrier tracks at structural connection points.

E. Provide concealed carrier pin and isolator clip for suspending the panels from vertical tracks and for quiet, low resistance thermal movement.

2.4 FABRICATION - PANEL SYSTEMS

A. Fabricate panels to the thicknesses (not less than 0.125 inch thick), sizes and shapes shown on the Drawings, or if not shown, as required to produce work of adequate strength and durability, without deflections beyond that specified. Use proven details of fabrication, as required to achieve proper assembly and alignment of the various components of the work. Provide exposed to view surfaces of the fabrications free from pitting, seam marks, roller marks, oil-canning, stains, grinder marks, discolorations or other imperfections on the finished units.

B. Perforate indicated panels to pattern indicated on drawings.

C. Shop fabricate panels in accordance with the practices of the panel manufacturer forming panels as pan units with formed and welded returns.

D. Provide concealed reinforcements and stiffeners on backsides of panels as required by the conditions of the fabrication, installation and anchorage to the building construction and to comply with the specified performance requirements.

E. Provide brackets, carrier pins and isolation clips with each fabricated assembly, as may be required for proper support and anchorage to the sub-frame and for other work.

F. Cut, reinforce, drill and tap fabricated metal work as may be required to receive other items of work.

G. Complete the fabrication and assembly of units prior to the application of finish coating, so that uncoated edges will not be exposed.

H. Copings, Fascia, Closures, Corners, Trim, and Accessories: Formed of same material, thickness and finish as specified for panels, as standard or non-standard with manufacturer. Provide components and accessories required for a complete panel system installation.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.6 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Directional Satin Finish: No. 4.

2.7 PROTECTION

A. Protect panels and fabrication surfaces by covering with kraft paper, polyethylene sheeting or other suitable protective covering prior to shipment from the fabrication shop.

PART 3 - EXECUTION

3.1 PREPARATION AND INSPECTION

A. Examine surfaces and conditions of the installation prior to fabrication and installation. If unsatisfactory conditions exist, notify the General Contractor in writing, who will be responsible for making such corrections. Fabrication and/or installation of the sub-framing, panels, and associated fabrications constitutes acceptance of the conditions present at the site.

B. Install panels and associated components in accordance with the manufacturer's current printed installation instructions, specifications, the final reviewed shop drawing and the requirements stated herein.

3.2 INSTALLATION OF PANELS

A. Set panels accurately as measured from established building lines and levels, plumb and in true alignment with existing and previously completed new work. Allow for expansion and contraction of materials and building construction.

B. Panel Support:

1. Install channel mounting brackets attached to primary support framing at locations indicated on the final reviewed shop drawings. Shim between the channel brackets and the substrate to assure a tight mounting in a true and uniform plane vertically and horizontally. Attach to secondary support framing with not less than four screws per bracket.
2. Mount carrier track at panel joints. Ensure that carrier track is in a true and level or vertical plane. Fasten through flange to mounting bracket with one bolt fastener each side.
3. Install flashing and trim in appropriate locations and sequence.

C. Panels:

1. Anchor panels carrier channel track in the manner shown on the final reviewed shop drawings, using concealed carrier pin and isolator clips.
2. Install panels with smooth continuous surfaces with no distortion between panels or at panel joints. Provide a consistent 3/4 inch wide open joint at panel vertical and horizontal joints.

3. Install panels by engaging panel hooks with snap lock isolator clip, to carrier pins in carrier track. Ensure panels are seated on pins.
4. Safety Screw: To prevent disengagement of panels, fasten a panel flange to panel face flange with one screw per panel.
5. Hard fastening of any work to the panel is not allowed.

D. Do not cut or abrade finishes which cannot be completely restored in the field. Return units with such finishes to the shop for required alterations, followed by complete refinishing.

E. Separate aluminum components from corrodible surfaces and other sources of corrosion or electrolytic action by plastic shims or a coating of bituminous paint. Do not allow coatings to be exposed to view or come in contact with paint finishes.

F. Installation Tolerances: Install panels and associated components in accordance with the following tolerances:

1. Deviation from plumb, level, or dimensioned angle shall not exceed 0.125 inch per 12 feet of length of any member, 0.25 inch in any total run in any line.
2. Deviation from theoretical position in plan or elevation, including deviation from plumb, level, or dimensioned angle, shall not exceed 0.375 inch total at any location. Change in deviation shall not exceed 0.125 inch for any 12 foot run in any direction.
3. Maximum offset from true alignment between two consecutive members placed end to end shall not exceed 0.062 inch.

G. Install coping, fascia, trim, sills, closures, flashing, and other fabrications in accordance with the final reviewed shop drawings. Anchor to the construction allowing for expansion and contraction of the building construction and the fabrication while maintaining watertight conditions.

3.3 JOINT SEALANTS

A. Provide sealants and installation accessories required at penetrations, perimeter of wall panel system and at windows and other openings. Provide sealant colors matching the exposed to view wall panel paint color.

B. Clean surfaces of excess sealant with cleaning materials that will not affect paint finishes. Tool joint surfaces to a slightly concave finish surface. Refer to Section 07 92 00 - Joint Sealants for additional requirements of sealant work.

3.4 CLEANING AND PROTECTION

A. After erection, cover and protect exposed portions of the panel assemblies and associated components from damage.

B. Touch-up finish of imperfections as recommended by the manufacturer of panel system. Remove and replace panels or components of the installation that cannot be successfully repaired.

C. Just prior to final acceptance remove temporary protective coverings and clean surfaces as recommended by manufacturer of panel system. Maintain in clean condition until final acceptance of the Work.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of STAINLESS STEEL PLATE PANEL SYSTEM shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of STAINLESS STEEL PLATE PANEL SYSTEM shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 52 16
MODIFIED BITUMEN ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Modified bitumen (SBS) roofing system, including providing and installing the following:

1. Base ply and granular (acrylic coated) surfaced top ply roof membrane system.
2. Base flashing system.
3. Roof insulation.
4. Insulation saddles, crickets, tapered system and cants.
5. Walkways.
6. Electric field vector mapping (EFVM) quality control testing to locate leaks.

B. Related Sections:

1. Wood blocking: Section 06 10 00.
2. Sheet metal flashing and trim: Section 07 62 00.
3. Manufactured coping: Section 07 71 13.
4. Manufactured roof curbs: Section 07 72 13.
5. Vegetated Roof Systems: Section07 72 73.
6. Sealants: Section 07 92 00.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.

1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the indicated wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897. Design Loads are indicated in the Structural Drawings.

D. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

F. Factory Mutual (FM) Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4470 as part of a membrane roofing system, as applicable. Identify materials with FM Approvals markings.

1. Fire/Windstorm Classification: Class 1A-90.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preconstruction Meeting:

1. Arrange a meeting at the site with the Commissioner. Require subcontractors and Roof Membrane Manufacturers' Representative to attend.
2. Review project requirements (Drawings, Specifications and other Contract Documents).
3. Review required submittals, both completed and yet to be completed.
4. Review condition of substrate work, including drying, structural loading limitations of the existing roof deck construction and similar considerations.
5. Review availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.
6. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions including the possibility of temporary conditions.
7. Review regulations concerning health code compliance, environmental protection, health, safety, fire (including torching methods and equipment), materials and similar considerations.
8. Review procedures needed for protection of roofing during remainder of construction period.
9. Review procedures required for protection of walls, and other finish construction and surfaces which will be installed at the time of roof membrane installation.
10. Review procedures for transporting new materials from street level to roof, placement on the roof and space available for street unloading.

11. Review availability of each part of building, access requirements, noise and dust control.
12. Establish a schedule for time for each area of work to be started and completed.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

1. Roofing membrane 12 inch x 12 inch piece.
2. Roof insulation 12 inch x 12 inch piece.

C. Shop Drawings: Provide shop drawings indicating review and approval, signed by the Roof Membrane Manufacturer. Include the following:

1. Outline of each roof or roof area, numbered for reference, showing the location and type of penetrations, and keyed locations for details.
2. Perimeter and penetration details and special details including methods of attachment, splices, sizes, spacing and types of anchors and fasteners.
3. Insulation Crickets, Saddles, Tapered System and Cants: layout, dimensions, slopes, details and method of attachment to substrate.

1.6 INFORMATIONAL SUBMITTALS

A. Certification:

1. Written certification from the Roof Membrane Manufacturer stating that the Roof Contractor is a Certified or Licensed Installer of the Roof Membrane Manufacturer.
2. Experience: Copies of Installing Contractor's recent experience with the selected membrane system.
3. Roofing Contractor's written certification of consecutive exclusive experience with the proposed membrane signed by the Roof Membrane Manufacturer's local representative.

B. Roof Membrane Manufacturer's Installation Certification: Copies of Roof Membrane Manufacturer's Certification showing compliance with the specified requirements.

C. Electric Field Vector Mapping (EFVM) Leak Detection Certification: Copies of leak detection testing certification of the installed roof membrane.

D. Roofing Warranty: Copies of the Roofing Warranty in the form and content (terms) indicated, covering the roofing system and associated work indicated herein, signed by the Installer and the Manufacturer of the Roofing System.

1.7 QUALITY ASSURANCE

A. Comply with laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the Work.

B. Provide materials and products specified herein for the roof membrane system as the products of one manufacturer to ensure compatibility, uniformity and warrantability of the roof system.

C. Materials and Methods:

1. Provide materials and methods of installation in accordance with the current printed published instructions, details and specifications of the Principal Roofing Material Manufacturer and the National Roofing Contractor's Association NRCA (manual) for slopes and type of substrates shown, except as hereafter modified and as approved by the Principal Roofing Material Manufacturer. In the event of a conflict between these specifications and those of the Principal Roofing Material Manufacturer, the more stringent or greater is to take precedent and be the one utilized for the warranted installation.
2. Deviations from this Section must be requested in writing to the Commissioner for approval prior to submittals in accordance with the requirements of Section 01 60 00 - Product Requirements.

D. Installer Qualifications:

1. The Installer is to be acceptable to the Manufacturer of the Roof Membrane and the Commissioner. The Installer to also be a Certified Installer of the specified roof membrane and is to provide written evidence as part of the required submittals.
2. In addition to the above, the Installer is to have installed not less than 3 roofing projects of similar scope or not less than 100,000 square feet of the specified membrane system in the past 18 months. Provide written description of this experience to the Commissioner.
3. The Installer is to have not less than 5 consecutive years of experience installing the manufacturer's membrane and is to provide written evidence as part of the required submittals.
4. The Installer is to be capable of responding to the installation site to perform repairs for leaks and other roof system damage within 24 hours from receipt of such notice.

E. Provide a roof membrane manufacturer's representative for inspection of the roofing system during installation and upon completion of the roofing system installation to ascertain that the roofing system has been installed in accordance with the manufacturer's published specifications, details of the roofing system, the reviewed shop drawings, and this Section.

F. The Roof Membrane Manufacturer is to review the proposed roofing installation and the Contract Document Drawings. Include in the work in addition to that shown on the Drawings and specified herein additional work required, including that required

by the wind protect analysis by the Membrane Manufacturer as required for a complete warranted roofing system.

G. Manufacturer's Certification Of Installation: The Roof Membrane Manufacturer, after review of the proposed roofing installation and the Contract Document Drawings, is to submit a written certification stating the following:

1. That the proposed installation and details have been reviewed by the Roofing Manufacturer's Technical Department.
2. List exceptions and required modifications to the proposed installation and the Contract Documents.
3. That the proposed installation will qualify for the herein specified warranty period and terms when installed in accordance with the Roof Membrane Manufacturer's installation instructions, the Contract Documents and any accepted proposed exceptions or required modifications.
4. Submit Certification signed by an officer of the Roof Membrane Manufacturer empowered to sign such certification as specified herein.

1.8 TESTING SERVICES

A. The testing laboratory will be responsible for conducting and interpreting tests, state in each report whether or not the test specimens conform to requirements of the Contract Documents and specifically note any deviation therefrom.

B. General requirements for testing are specified in Section 01 40 00 - Quality Requirements. Specific test and inspection requirements are specified herein.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's unopened containers identified to show name, brand, type, grade and UL label. Store, protect and keep materials dry until roofing is completely installed. Remove damaged or materials that are wet or damp from the site and replace at the Contractor's expense.

B. The Roof Membrane Manufacturer's representative and/or the Commissioner may periodically inspect the roofing materials used in the installation to assure compliance with the manufacturer's and this Section for storage and acceptable materials.

1.10 PROJECT/SITE CONDITIONS

A. Weather Conditions: Proceed with roofing work only when weather conditions are in compliance with manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with requirements and the roof membrane manufacturer's recommendations.

B. Sequencing Protection:

1. Sequence operations installation to avoid exposure of work on the building to the elements.
2. Provide protection from the elements.
3. Provide protection of the construction from damage by the construction operations. Repair or replace construction so damaged to conditions of construction before damage.

C. Protection:

1. Protect roof areas crossed during work activities and rectify any roofs affected by activities.
2. Install roofing during dry weather and when atmospheric temperature is above 40 deg F. Provide necessary protection and temporary covering of adjacent finished work to avoid damage by staining, spillage or otherwise until completion of roofing. Verify that ducts, piping, cants, curbs, grounds, and other penetrations have been properly installed and secured. Give work specified in other Sections, or any other work necessary to perform concurrently with work under this Section, free access to roof areas and, when installed, flashed or otherwise treated to produce a complete and watertight installation.
3. Provide water cutoffs around exposed roofing at end of day's work. Remove cutoffs before starting work next day.
4. Protection of Walls: Provide the following during the installation of roof membrane system:
   a. Cover and protect completed wall construction, including windows and doors, with fireproof tarpaulins extending from the top of the wall down 10 feet. Secure tarpaulins independent of the wall (do not attach to wall).
   b. Maintain wall protection during roof construction. Remove protection from the project site after inspection and completion of roof membrane system.

1.11 WARRANTY

A. The Roof Membrane Manufacturer's Representative is to inspect the installation of the roof membrane system and associated work of the system prior to the start of work, during the work, and at completion of the work. Upon approval of the installation by the Roofing Membrane Manufacturer's Representative a 25 year (no limit liability coverage) warranty is to be issued to the Commissioner.

B. The Installer and Roof Membrane Manufacturer are to warranty the total roof system, including but not limited to; membrane, base flashing and associated roof materials and work to be free of faults and defects in accordance with the General Conditions, except that the warranty is to be extended by the Roof Membrane Manufacturer's standard 25 year, no limit of liability coverage, written warranty of materials and watertightness of the installation. Provide Roof Membrane Manufacturer's Warranty fully paid for by the Roofing Contractor.

C. Provide warranty covering both labor and materials, without financial limits, required to repair roof leaks on the roof membrane, base flashing and associated roof work. Provide warranty signed by the Installer and the Roof Membrane Manufacturer, and submit to the Commissioner.

D. This warranty is in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Roof Membrane:

1. Firestone Building Product Company, Indianapolis, IN 46268.
2. GAF Materials Corporation, Wayne, NJ 07470.
3. Johns Manville International, Inc., Denver, CO 80217.
4. Siplast, Inc., Arkadelphis, AR 71923.
5. Soprema Roofing & Water Proofing Inc., Wadsworth, OH 44281.

B. Insulation:

1. Firestone Building Product Company, Indianapolis, IN 46268.
2. GAF Materials Corporation, Wayne, NJ 07470.
3. Johns Manville International, Inc., Denver, CO 80217.
4. CertainTeed Corporation, Malvern PA 19355.

2.2 MATERIALS

A. Asphalt Primer: ASTM D 41.

B. Inter-ply Adhesive (Insulation Adhesive):

1. Asphalt: ASTM D 312, Type III and Type IV.
2. Roof Membrane manufacturers modified asphalt adhesive specially formulated for inter-ply and substrate bonding of roof membrane plys and/or roof insulation.

C. Plastic Bituminous Cement: ASTM D 2822, Type I.

D. Primer: Standard product of Roof Membrane Manufacturer for priming surfaces vertical and dissimilar materials.

E. Cold Applied Adhesive: Roofing system manufacturer's standard asphalt based, one or two part, asbestos free, cold applied adhesive/cement specially formulated for compatibility and use with insulation, roofing membrane and base flashing.

F. Plywood Deck Base Sheet: Fibrous glass mat impregnated with asphalt, conforming with ASTM D 2178, Type IV.

G. Plywood Deck Base Sheet Mechanical Fasteners: Square head cap nail annular thread with 1 inch diameter cap as recommended and approved by membrane manufacturer.

H. Base Ply: Glass fiber and/or polyester reinforced and polymer modified (SBS Styrene Butadiene Styrene) bitumen, complying with, as applicable: ASTM D 6162 Type III, ASTM D 6163, Type I or II, or ASTM D 6164, Type I or II, Grade S.

I. Top Ply: Glass fiber and/or polyester reinforced and polymer modified (SBS Styrene Butadiene Styrene) bitumen, granular surfaced (smooth surface) cap sheet, complying with, as applicable: ASTM D 6163 or ASTM D 6164, Type I or II, Grade G.

J. Base Flashing System: Roof manufacturer's standard glass fiber and/or polyester reinforced modified (SBS) bitumen, two-ply base flashing system, complying with, as applicable: ASTM D 6162, ASTM D 6163 and/or ASTM D 6164, Type I or II, Grade G and/or S, compatible with roof membrane materials.

1. Backer: Grade S.
2. Base Flashing Top: Granular surfaced, Grade G.

K. Roof Insulation: Polyisocyanurate foam with glass fiber reinforced felt facing on both sides, complying with ASTM C 1289, Type II, Grade 3 (25 psi min. compressive strength) minimum R=6.0 per 1 inch thickness, if thickness of total R-value are not shown on the Drawings, provide a minimum single 2-1/2 inch thickness.

L. Underlayment:

1. Gypsum Board: Complying with ASTM C 1177, glass mat faced noncombustible, water resistant treated gypsum core underlayment panel, "Dens- Deck Prime" (Georgia-Pacific Corporation) or other as approved by Commissioner.

M. Insulation Crickets and Saddles and Tapered System: Polyisocyanurate foam with glass fiber reinforced felt facing on both sides. Thickness as shown on the Drawings and specified herein. Thickness, slopes and sizes of units as shown on the Drawings, if not shown, provide slopes not less than 1/2 inch for crickets and saddles and 1/4 inch for tapered system vertically per 1 foot horizontally.

N. Mechanical Fasteners: Self-tapping, screw and plate fasteners for FM Class I-90, screw length as required by insulation thickness.

O. Insulation Adhesive (Alternate Material to Asphalt): Cold fluid applied or foamed-in-place adhesive formulated to adhere roof insulation to substrate as a product of the roof insulation manufacturer or a roof insulation manufacturer approved product.

P. Tapered Easement Strips: Perlite mineral boards, complying with ASTM C 728. Provide a minimum of 12 inches wide and same thickness as roof insulation at one end.

Q. Cants (If required by the Roof Membrane Manufacturer): Perlite mineral boards, complying with ASTM C 728. Provide beveled cants with 5-5/8 wide face, minimum 2 inches thick.

R. Sealants: As shown on the Drawings in conjunction with roofing work, one part polyurethane sealant, refer to Section 07 92 00 - Joint Sealants.

S. Wood Blocking and Nailers: As shown on the Drawings, refer to Section 06 10 00 - Rough Carpentry.

T. Vapor Retarder: Roofing Manufacturer's standard self-adhering membrane of rubberized asphalt integrally bonded to cross laminated polyethylene film sheeting, formed into uniform flexible sheets .

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 13 "Steel Decking."

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions.

1. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.

1. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Perform fastener-pullout tests according to roof system manufacturer's recommendations.

1. Submit test result within 24 hours of performing tests.

a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

D. Install vapor retarder and related materials in accordance with the manufacturer's current printed installation instructions, specifications, and details.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast.

1. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Asphalt Heating: Heat and apply roofing asphalt according to roofing system manufacturer's written instructions.

3.4 INSTALLATION OF WOOD BLOCKING

A. Install wood blocking in conjunction with roof work as shown on the Drawings and specified herein to configurations and sizes detailed and specified.

B. Anchor wood blocking to deck and other substrates with hot-dip galvanized fasteners appropriate for the types of materials and construction present. Anchor nailers to deck at a maximum of 24 inches on center to resist a pullout force of 175 lbs./ft. in any direction. Provide a 1/2 inch wide vent space between adjacent end of nailers.

C. Coordinate installation of blocking with the installation of sheet metal flashing and trim, gravel stop/fascias, roof insulation and roof penetrations.

3.5 INSTALLATION OF UNDERLAYMENT

A. Mechanically fasten one course of underlayment in thickness as required to span deck flutes. Use FM approved fasteners specifically designed for securing insulation boards to steel roof deck and driven through discs. Space fasteners in accordance

with FM requirements for specified wind uplift resistance specified. Locate end joints over deck flutes.

3.6 INSTALLATION OF ROOF INSULATION

A. Coordinate installing roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Install roof insulation starting at low point of roof in two offset layers in accordance with the manufacturer's current printed instructions and specifications for the type of substrate and roof membrane.

C. Install roof insulation in courses parallel to edges with the mopping surface up. Stagger end joints of each course a minimum of 6 inches with adjoining courses. Offset layer joints not less than 6 inches.

D. Over Metal Deck:

1. Mechanically attach base layer of insulation to the metal deck using the herein specified and manufacturer approved fasteners.
2. Provide screw length which penetrates the metal deck a minimum of 3/4 inch.
3. Install roof insulation in two layers, in courses parallel to edges of roof. Stagger end joints of each course staggered a minimum of 6 inches with adjoining courses. Offset joints of layers not less than 6 inches.
4. Attach insulation to metal deck in accordance with the Insulation Manufacturer's requirements but not less than the FM Global Requirements for 1-90 wind uplift and the following:
   a. Field: Minimum 17 fasteners per 4 foot x 8 foot board, 2.0 square feet per fastener.
   b. Corners and Perimeter: Minimum 24 fasteners per 4 foot x 8 foot board, 1.3 square feet per fastener.
5. Set top layers of insulation or underlayment firmly in a solid mopping of hot asphalt (within 20 deg F of the EVT) applied at the approximate rate of 30 pounds per 100 square feet of roof insulation. Walk-on boards to assure full contact with bottom insulation layer.

E. Over Wood Deck:

1. Over previously installed base sheet, set both layers of insulation and underlayment in a solid mopping of hot asphalt (within 20 deg F of the EVT) applied at the approximate rate of 30 pounds per 100 square feet of roof insulation, or cold fluid applied or foamed-in-place adhesive applied in accordance with the manufacturer’s printed instructions.
2. Walk on boards to assure full contact with roof deck and bottom insulation layer.

F. Install insulation boards with joints tightly butted with no joint greater than 1/8 inch in width. Fill joints greater than 1/8 inch in width with slivers of insulation board.

G. Install insulation flush with tops of wood blocking and nailers.

H. Install only as much insulation as can be covered by roof membrane on the same day. Install temporary cutoffs to prevent moisture entry into ends of insulation boards. Remove temporary cutoffs prior to resumption of work.

3.7 INSTALLATION OF CANTS AND EASEMENT STRIPS

A. Install cants on top of insulation set in a solid mopping of Type III hot steeped asphalt, plastic bituminous cement or cold fluid applied or foamed-in-place adhesive. Adhere to both vertical and horizontal surfaces.

B. Install tapered easement strips at roof drains, 24 inches square to provide inclines to the top surface of the insulation. Set tapered easement strips Type III hot steeped asphalt or plastic bituminous cement.

3.8 INSTALLATION OF CRICKETS, SADDLES AND TAPERED SYSTEM

A. Install insulation crickets, saddles and tapered system over top layer of roof insulation set in a solid mopping of Type III hot steeped asphalt, plastic bituminous cement or cold fluid applied or foamed-in-place adhesive.

3.9 INSTALLATION OF ROOFING MEMBRANE, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Commissioner's testing and inspection agency.

C. Where roof slope exceeds 1/2 inch per 12 inches, install roofing membrane sheets parallel with slope.

1. Backnail roofing sheets according to roofing system manufacturer's written instructions.

D. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
2. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.

3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.10 INSTALLATION OF BASE PLY

A. Install an overall base ply with plies laid in single fashion over the roof insulation starting at the low point of the roof, place membrane so edge of lap will be center on the roof drain.

B. Unroll base ply onto insulation for alignment and install with minimum 3 inch side laps and 6 inch ends laps.

C. Attachment:

1. Reroll base membrane halfway one end at a time. Roll base membrane into a solid mopping of Type IV asphalt at a rate of 23 pounds per 100 square feet. Squeegee base ply so as to firmly and uniformly set without voids producing a smooth surface free of air pockets, wrinkles, fishmouths or tears.
2. Alternate Method: Install base ply in a solid mopping of cold fluid applied adhesive applied in accordance with the manufacturer’s printed instructions.

D. Seal side laps by running a hot trowel along the edge of seams.

E. Base Ply Terminations:

1. Run base ply tight up against vertical surfaces such as curbs and vents.
2. Run base ply up to the top edge of cants.
3. Run base ply into drain bowl of roof drains, cut out base ply at opening.

F. Base Ply Flashing:

1. Prior to application, prime vertical surfaces to receive base flashing at rates in accordance with the Roof Membrane Manufacturer's written application instructions.
2. Install base flashing in strips a minimum of 3 feet wide with minimum 3 inch side laps set on horizontal and vertical surfaces and extending down and a minimum of 4 inches from the bottom edge of the cant onto the horizontal roof surface. Stagger laps of base flashing a minimum 4 inches from ends laps of base ply.
3. Torch weld or set in solid mopping of hot asphalt ply flashing to substrates. Check seams of torched on base ply flashing by running a heated trowel along the edge of seams.
4. Alternate Method: Install base ply flashing in cold fluid applied adhesive applied in accordance with the manufacturer’s printed instructions.

3.11 INSTALLATION OF TOP PLY

A. Install an overall top ply with plies laid in single fashion over the roof base ply starting at the low point of the roof, stagger top ply laps a minimum of 12 inches from base ply membrane.

B. Unroll top ply onto base ply for alignment and install with minimum 3 inch side laps and 6 inch ends laps.

C. On the edge of first ply, embed the granules 4 inches wide and 6 inches wide at end laps by torch heating the membrane surface and pressing the granular into the melted asphalt with a hot trowel.

D. Attachment:

1. Roll top ply membrane into a solid mopping of Type IV asphalt at a rate of 23 pounds per 100 square feet. Squeegee top ply so as to firmly and uniformly set on base ply without voids producing a smooth surface free of air pockets, wrinkles, fishmouths or tears.
2. Broadcast identical colored granules into the asphalt bleed out during the application and before asphalt cooling.
3. Alternate Method: Install top ply in a solid mopping of cold fluid applied adhesive applied in accordance with the manufacturer's printed instructions.

E. During installation, avoid asphalt seepage at seams greater than 1/4 inch. Cover asphalt seepage by sprinkling on loose granules matching the membrane surface into the hot asphalt.

F. Top Ply Terminations:

1. Run top ply tight up against vertical surfaces such as curbs and vents.
2. Run top ply up to the top edge of cants.
3. Run top ply into drain bowl of roof drains and around plumbing vents, cut out top ply at opening of drain or vent pipe flashing.
4. Seal seams and edges of top ply with heated trowel.

G. Top Ply Flashing:

1. Install top ply flashing in strips a minimum of 3 feet wide with minimum 3 inch side laps staggered a minimum of 4 inches from base ply laps.
2. On the top surface of the roof membrane, lay out a line 6 inches from the base of the cant. Using a torch and heated flat trowel embed the surface granules into the heated asphalt from the 6 inch line to the top edge of the top roof membrane ply at the top of the cant.
3. Install top flashing on horizontal and vertical surfaces and extending down cant and onto the top roof membrane 6 inches from bottom edge of the cant to cover the entire area of the embedded granules.
4. Torch weld or set in solid mopping of hot asphalt top ply flashing to substrates without voids producing a smooth surface free of air pockets,

wrinkles, fishmouths or tears. Check lap seams of torched on top ply flashing by running a heated trowel along the edge of seams.

5. Form inside and outside corners using precut flashing pieces and gussets in accordance with the manufacturer's standard details. Seal voids in corners and seams.
6. During installation, avoid asphalt seepage at seams greater than 1/4 inch. Cover asphalt seepage by sprinkling on loose granules matching the membrane surface into the hot asphalt.
7. Alternate Method: Install base top flashing in cold fluid applied cement applied in accordance with the manufacturer’s printed instructions.

3.12 INSTALLATION OF FLASHING AND STRIPPING

A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:

1. Prime substrates with asphalt primer if required by roofing system manufacturer.
2. Backer Sheet Application:

    a. Mechanically fasten backer sheet to walls or parapets.
    b. Adhere backer sheet over roofing membrane at cants.
    c. Seal laps.

3. Backer Sheet Application:

    a. Adhere backer sheet to substrate.
    b. Seal laps.

4. Flashing Sheet Application: Install flashing system according to manufacturer's recommendations.

B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

1. Seal top termination of base flashing with a strip of glass-fiber fabric set in asphalt roofing cement.

D. Install liquid flashing system according to manufacturer's recommendations.

1. Extend liquid flashing not less than 3 inches in all directions from edges of item being flashed.
2. Embed granules, matching color of roof membrane, into wet compound.

E. Install roofing cap-sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.

3.13 EFVM LEAK DETECTION TESTING

A. Provide electric field vector mapping (EFVM) technology to locate leaks on the installed roof membrane. Coordinate installation and testing of the system prior to project startup and to review the leak detection system manufacturer's testing procedures. "ProtecSys" (International Leak Detection (ILD), Rosemont, IL 60018).

B. After installing membrane verify installed membrane is waterproof. Provide testing to verify membrane is free of any holes, open seams and capillary defects that will allow water to pass.

C. The Leak Detection System Manufacturer's technician shall perform the integrity test of the roofing membrane using Electric Field Vector Mapping processes after completion of the following:

1. Completion of roof membrane installation.
2. Within one year after building occupancy or prior to the expiration of the roofing warranty to verify the integrity of the membrane.

D. Testing:

1. Thoroughly wet the roofing membrane in area of test. Wetting can be accomplished by hand or mechanical spray devises. Membrane must be wet during the testing procedures. Ponded water is not necessary.
2. Place the prefabricated conductor wire on wetted, bare membrane. Secure wire with small strips of waterproofing or other compatible membrane or tape. Do not install overburden, drainage composites and filter fabric prior to the initial test.
3. Allow the testing technician to locate membrane breaches, if any.
4. Visually inspect entire membrane area and repair breaches found. Performed by Roofing Contractor.
5. Document location of breaches found by the test and visual inspections.
6. Retest membrane until no breaches or defects are found.

3.14 INSTALLATION OF TEMPORARY CUTOFFS

A. Install temporary cutoffs (water dams) to seal edges of installed roof membrane and insulation at the end of each day's work and in the event of impending rain conditions. Install cutoffs in accordance with the Roof Membrane Manufacturer's printed specification. Remove temporary cutoffs (water dams) before resuming installation of the roof membrane.

3.15 INSTALLATION WALKWAY SURFACE

A. Install walkway surface where shown on the Drawings.

B. Install an additional ply of top ply membrane, approximately 36 inches wide and in lengths not exceeding 10 feet, leaving a space of 6 inches between strips.

C. Adhere walkways in same type of hot roofing asphalt or by torch method used to adhere top ply of roof membrane.

3.16 INSTALLATION OF VENT FLASHING

A. Inspect base ply to ensure a tight seal around the pipe.

B. Install 4 lb. sheet lead vent flashing 24 inches x 24 inches square, set in plastic roof cement. Extend flashing up vent pipe and turn lead flashing down 2 inches into vent pipe.

1. Alternate Method: Over base ply membrane, set lead flashing flanges in plastic roof cement or cold fluid applied adhesive and nail to wood blocking.

C. Prime metal surfaces. Torch a 36 inch square piece of base ply membrane over the vent flashing base. Seal seams and edges with a heated trowel.

1. Alternate Method: Install a base ply over metal flashing set in a solid mopping of hot asphalt or cold fluid applied adhesive.

D. Install top ply as specified in Article - Installation of Top Ply. Cut membrane to fit tight against stack metal flashing and seal by running a heated trowel around base.

1. Alternate Method: install top ply over primed metal flashing set in a solid mopping of hot asphalt or cold fluid applied adhesive.

3.17 INSTALLATION OF ROOF DRAIN FLASHING

A. Clean bituminous residues from the inside of the drain bowl and at the clamping ring.

B. Extend base ply membrane under clamping rings.

C. Install 4 lb. sheet lead drain flashing 30 inches x 30 inches square over base ply. Set lead flashing in plastic roof cement and turn lead down into drain bowl.

D. Prime top surface of lead flashing. Torch a 36 inch square piece of base ply membrane over lead and extend 6 inches beyond edge of lead flashing. Seal seams and edges with a heated trowel. Extend base flashing under clamping ring.

1. Alternate Method: install a base ply over metal flashing set in a solid mopping of hot asphalt or cold fluid applied adhesive.

E. Seal edges of plies with a hot trowel or plastic roof cement.

F. Install clamping ring and tighten hold down bolts uniformly and securely.

G. Water test drains to ensure a watertight installation, correct or reinstall to eliminate any defects.

3.18 SHEET METAL FABRICATIONS

A. Provide and install sheet metal fabrications, assemblies and accessories as shown on the Drawings for roof areas under the Work of this Section. Refer to Section 07 62 00 - Sheet Metal Flashing and Trim.

B. Coordinate the installation of sheet fabrications with the work of other trades affecting the installation.

3.19 INSTALLATION – SEALANTS

A. Provide and install sealants and accessories as shown on the Drawings for roof areas under the Work of this Section. Provide one-part polyurethane sealant for roof related work, refer to Section 07 92 00 - Joint Sealants.

B. Install sealants in conjunction with the roofing, sheet metal and counterflashing work as is required to provide a watertight and warranted installation.

C. Coordinate the sealant work with the work of other trades affecting the installation.

3.20 FIELD QUALITY CONTROL

A. The Commissioner and Roof Membrane Manufacturer's Representative will determine during the course of the roofing work whether the material, installation and the workmanship used in the work actually comply with the requirements of the Contract Documents and Article - QUALITY ASSURANCE of this Section.

B. Deficiencies:

1. Where inspections indicate deficiencies in the Work, or non-compliance with this Section and the Roof Membrane Manufacturer's specifications, prepare recommendations for additional or remedial work to compensate for deficiencies. The Commissioner and Roof Membrane Manufacturer's Representative will review recommendations prior to proceeding with remedial work.
2. When directed in writing by the Commissioner, proceed with additional or remedial work as required to compensate for deficiencies.

3.21 CLEANING

A. Remove trash debris, equipment and excess materials from the building and project site.

B. Remove stains, roof bitumen and other roofing materials from finish building surfaces, walks, paving and landscaped areas of the site. Restore finishes and grounds to their original condition. Replace such construction which cannot be successfully cleaned, repaired or refinished.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of MODIFIED BITUMEN ROOFING shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of MODIFIED BITUMEN ROOFING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Formed roof-drainage sheet metal fabrications.
2. Formed gutter sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed equipment support flashing.
5. Formed overhead-piping safety pans.
6. Platform closure board system galvanized steel flashing.

B. Related Requirements:

1. Manufactured Roof Curbs and Penetration Assemblies: Section 07 72 13.
2. Expansion Joint Cover Assemblies: Section 07 95 13.

1.03 REFERENCES

A. Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA); 1993.

1.04 COORDINATION

A. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review repair procedures.

1.06 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details of termination points and assemblies.
6. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
7. Include details of roof-penetration flashing.
8. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
9. Include details of special conditions.
10. Include details of connections to adjoining work.

C. Samples for Verification:

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.

D. Product Certificates: For each type of coping and roof edge flashing that is FM Approvals approved.

E. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance. A company familiar with installing products included in this section and which has completed at least 20 installations similar in scope to work included in this section.

1. For copings and roof edge flashings that are FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Provide gutters for mockups, including supporting construction cleats, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless the Commissioner specifically approves such deviations in writing.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.09 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Applied Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.02 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish: Fluoropolymer: AAMA 2605.
2. Color: Match Commissioner's sample.
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; with smooth, flat surface.

1. Finish: 2D (dull, cold rolled).

2.03 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Screws, Bolts and Nuts: ASTM B 221, Alloy 6061-T6.

C. Cleats: 2 inches wide, 3 inches long and continuous pieces of sheet metal; same thickness as flashing or fabrication, unless otherwise indicated.

D. Rivets: ASTM B 221, Alloy 1100-H14, 0.187 inch minimum shank diameter.

E. Nails: Aluminum, ASTM B 221, Alloy 6061 or 5056, conforming with FS FF-N-105B, Type 2, Style 20.

F. Fasteners: ASTM A 276, UNS S31600 stainless steel:

1. Concealed: Hex head, self-drill screws.
2. Exposed: Hex head, self-drilling screws with aluminum backed neoprene washers for exterior applications; color coated to match adjoining metal, where exposed to view.
3. Furnish bolts, nuts, screws, clips, washers and other fasteners and accessories necessary to secure and assemble fabrications.

G. Slip Sheet for separating sheet metal from underlayment: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

H. Bituminous Paint: Asphalt emulsion, ASTM D 1187 Type A.

I. Joint Sealant: Refer to Section 07 92 00 – Joint Sealants.

J. Solder for Stainless Steel: ASTM B32, with acid flux of type recommended by stainless steel sheet manufacturer.

K. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

2.04 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

2.05 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Gutters: Fabricate to cross section required, with soldered joints, complete with end pieces, outlet tubes, and other special accessories as required. Fabricate in minimum 96-inch long sections. Fabricate expansion joints and accessories from same metal as gutters unless otherwise indicated.

1. Fabricate gutters with built-in expansion joints.
2. Fabricate from the Following Materials:

a. Stainless Steel: 0.0431 inch thick.

2.06 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Penetration Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

B. Roof-Drain Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

2.07 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 UNDERLAYMENT INSTALLATION

A. Apply slip sheet, wrinkle free, over underlayment or directly on substrate before installing sheet metal flashing and trim.

3.03 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.

5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.04 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated.

Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Gutters: Join sections with soldered joints. Provide for thermal expansion. Slope to downspouts. Provide end closures and seal watertight with sealant.

1. Install gutter with expansion joints at locations indicated, but not exceeding, 36 feet apart at high points. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.

3.05 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches.

D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with sealant and clamp flashing to pipes that penetrate roof.

3.06 INSTALLATION OF PLATFORM CLOSURE BOARD SYSTEM GALVANIZED STEEL FLASHING

A. Field verify galvanized steel flashing width along the length of each platform to provide a 3” minimum overlap of the 2”x10” timber closure board attached to the track ties.

B. Provide a 1” minimum gap above the 2”x10” timber closure board attached to the track ties.

C. Provide a 6” minimum overlap between galvanized steel sheets.

D. Provide a uniformly positioned flashing breakline along the entire length of the platform.

E. Mechanically fasten galvanized steel flashing at 2ft. c-c spacing to the platform steel stringer bottom flange as depicted in the plans.

3.07 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.08 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.09 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of SHEET METAL FLASHING AND TRIM shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of SHEET METAL FLASHING AND TRIM shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 71 13
MANUFACTURED COPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Manufactured pre-finished, formed, aluminum coping units, including required fabrication and installation accessories.

B. Related Sections:

1. Unit masonry: Section 04 20 00.
2. Rough carpentry: Section 06 10 00.
3. Joint sealants: Section 07 92 00.
4. Aluminum curtain walls: Section 08 44 13.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Provide coping designed, fabricated, and installed to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. FM Approvals' Listing: Manufacture and install copings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.

C. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressures:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F ambient; 180 deg F, material surfaces.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

C. Color Selection Samples: Three 8 inch square samples of aluminum with finish specified.

D. Pre-production Samples:

1. One 24 inch long sample of each type or profile of coping shown on the Drawings.
2. Deliver pre-production samples to the project site (or other Commissioner and Contractor mutually agreed upon location) for Commissioner's review, prior to the start of production fabrication.
3. The approved pre-production samples will be kept at the project site in a protected location and be used as a standard for judging the precast fabrications.
4. If not approved by the Commissioner, make adjustments as reviewed by the Commissioner and submit additional pre-production samples for review.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions for factory fabricated items and paint finish system.

B. Fabricator's Qualifications: Fabricator's qualification statement showing compliance with the specified requirements.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for coping showing compliance with the specified performance requirements.

D. Warranty: 3 signed copies of the following:

1. Coping assembly.

2. Paint finish.

1.6 QUALITY ASSURANCE

A. Provide coping and finish complying with the following:

1. National Association of Architectural Metal Manufacturer's (NAAMM), Metal Finishes Manual.
2. Aluminum Association (AA), Aluminum Standards and Data.
3. AA, Specifications for Aluminum Sheet Metal Work in Building Construction.
4. Sheet Metal and Air Conditioning Contractors National Association, Inc., (SMACNA), Architectural Sheet Metal Manual.
5. Specified requirements of the metal manufacturer.

B. Manufacturer/Fabricator Qualifications:

1. Provide prefabricated coping units by a manufacturing firm or sheet metal fabricator skilled, experienced and specializing in the manufacture and fabrication of custom pre-finished coping units of type and scope shown on the Drawings and specified herein.
2. The manufacturer/fabricator is to have a minimum of 5 consecutive years of experience with projects similar in scope and quality.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, handle and store prefabricated coping units and associated materials in such a manner as to prevent damage or deterioration in accordance with the manufacturer's recommendations.

B. Provide packaged materials and fabrications in original containers and wrappings with seals unbroken and labels intact until time of installation. Store materials and fabrications above ground in a dry place under weatherproof covers.

C. Immediately remove from the job site damaged or otherwise unsuitable materials, when so ascertained.

1.8 PROJECT CONDITIONS

A. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Coping Units:

1. Provide manufacturer/fabricator’s written warranty stating that the coping units will be free of faults and defects including warping, oil canning, buckling

and distortions in accordance with the General Conditions, except that the warranty is to be for 5 years instead of 1 year.

2. Provide warranty covering both labor and material (without limits to the cost) to repair fabrication and assembly faults and defects coping assembly.
3. Provide warranty signed by the coping manufacture/fabricator and installing contractor and Contractor and submit to the Commissioner.
4. Submit signed copies to the Commissioner.

B. Paint Finish:

1. Provide coping manufacturer's written warranty stating that the paint finish used on prefabricated components and units will be free from fading, chalking, cracking, checking, peeling, or failure of paint to adhere to bare metal, in accordance with the General Conditions except the warranty period is to be for 20 years instead of 1 year.
2. Provide warranty signed by the coping manufacturer and pant finish applicator (if different from coping manufacturer).
3. Submit signed copies to the Commissioner.

C. This warranty is in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents.

1.10 MOCKUP

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical coping, approximately 10 feet long, including typical joint between unit sections, corner unit, attachments, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Commissioner specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Coordinate installation of coping mockup when part of other wall construction mockups.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Architectural Products Company; Hebron, KY.

B. Hickman Company, W. P; Asheville, NC 28813.

C. Metal-Era, Inc.; Waukesha, WI 53186.

D. Merchant and Evans; Burlington NJ 08016.

2.2 MATERIALS

A. Aluminum Sheet and Plate (Coping): ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required. Provide thicknesses minimum 0.125 inch thickness or as shown on the Drawings.

B. Galvanized Steel Sheet (Concealed Accessories): ASTM A 653, commercial quality, or lock forming quality, G90 zinc hot-dip galvanized steel sheet.

C. Underlayment: Self-Adhering, High-Temperature Sheet. Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

D. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish Series 300 stainless steel.

E. Welding Rods and Bare Electrodes: AWS A5.10.

F. Bituminous Paint: Asphalt emulsion, ASTM D 1187 Type A.

G. Joint Sealant: Refer to Section 00 79 20 – Joint Sealants.

2.3 FABRICATION

A. Provide formed coping assemblies with concealed joint covers. Provide coping units with joints as shown on the Drawings but not more than 10 feet long.

B. Form coping units to shapes and dimensions shown on the Drawings. Provide internal reinforcing as required by shapes and fabrication size. Reinforcements are not to telegraph on finish surfaces. Fabricate with 10 inch wide concealed joint splice plates of 18 gage galvanized sheet steel.

C. Cutting and Forming:

1. Cut curved shapes using templates to produce uniform smooth and consistent edges. Optional method of cutting may be a computer guided plasma arc (water jet) cutter.
2. Form and bend fabrications with curved surfaces in jigs or formed using CNC rolling machines which produce smooth consistent surfaces which show no surface irregularities or other imperfections. Fabricate coping units to produce uniform sightlines which are level, plumb and in the same plane as adjacent units.

D. Fabricate assemblies with concealed fasteners.

E. Corner and Special Units: Provide special shapes and corner units at outside and inside corners and intersections. Provide with continuously welded flush seams, grind welds and finish smooth so the finish surface will not affect the application and appearance of the specified paint finish.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Coil-Coated Aluminum Sheet Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

E. Color selection will be made by the Commissioner from non-standard colors.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate fabrication and installation of fabricated units with other construction. Fabrications requiring extensive field modification for their assembly and installation at the site are to be removed and returned to the Fabricator for modification in the fabricator's shop or provide new fabrications.

B. Examine surfaces and construction to receive the prefabricated coping units and accessories. Verify dimensions of in-place and subsequent construction prior to fabrication. Fabrication or installation of the coping assembly constitutes acceptance of the existing and related construction.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

1. Apply continuously under copings.
2. Coordinate application of self-adhering sheet underlayment under copings with requirements for continuity with adjacent air barrier materials.

3.3 COPING INSTALLATION

A. Install and anchor prefabricated coping units and accessories in accordance with the manufacturer's printed instructions and the reviewed Shop Drawings.

B. Assemble and anchor coping assembly components to the construction to allow for expansion and contraction, maintaining a watertight condition. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action by a coat of bituminous paint, do not expose coatings to view.

C. Install and anchor coping units without the use of exposed fasteners. Install units straight, plumb, level and in proper alignment with other work.

D. Install units using coping manufacturer’s standard internal reinforcing and support clips and accessories. Install with flush butt joints and concealed joint covers. Install sealant tape or prefabricated seals in coping unit splice joints to maintain water tight conditions. Allow for expansion and contraction of the coping assembly and the construction to which it is attached.

E. Seal perimeter joints of coping assembly at abutting construction in accordance with the requirements specified in Section 07 92 00.

3.4 CLEANING AND PROTECTION

A. After installation, cover and protect exposed portions of the coping units from damage.

B. Just prior to final acceptance, remove protective coverings and clean surfaces with plain water, or if required with a solution of water and mild household detergent as recommended by manufacturer of finish paint system.

3.5 TOUCH-UP OF SURFACES

A. Repair and refinish damaged surfaces of coping units.

B. Submit materials and methods of surface repair to the Commissioner for reviewed prior to application.

C. Remove and replace any fabrication which in the opinion of the Commissioner cannot be successfully repaired.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of MANUFACTURED COPING shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of MANUFACTURED COPING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 72 13
MANUFACTURED ROOF CURBS AND PENETRATION ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Manufactured roof curbs, equipment supports, penetration cover assemblies, including accessories for fabrication and installation.

B. Related Sections:

1. Rough Carpentry: Section 06 10 00
2. Modified Bitumen Roofing: Section 07 52 16
3. Sheet Metal Flashing and Trim: Section 07 62 00

1.3 SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions.

B. Shop Drawings: Plans, elevations and details and dimensions of construction on each curb and roof penetration assembly. Show conditions and related construction. Method of attaching roof accessories to roof or building structure.

1. Show and describe anchors, fasteners and or welds on the shop drawings submitted to the Commissioner.

1.4 QUALITY ASSURANCE

A. Provide welding complying with American Welding Society Structural Welding Code for Steel, AWS D1.1.

B. Provide sheet metal fabrications complying with the applicable portions of the Architectural Sheet Metal Manual, Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), current edition.

1.5 COORDINATION

A. Coordinate layout and installation of roof curbs and penetration assemblies with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Pate Manufacturing Co.; Broadview, IL 60153.

B. Thybar Corporation; Addison, IL 60101.

C. Commercial Products Group, Grand Rapids, MI 49512.

2.2 ITEMS

A. Prefabricated roof curbs: One of the following, with liner where so indicated:

1. Style PC-5, Pate
2. Model TC-1, Thybar
3. Model RC-4A, Commercial Products Group

B. Prefabricated Equipment Supports: One of the following with 18 gage galvanized sheet metal cap and 2 inch x 4 inch treated wood nailer:

1. Style ES-5, Pate
2. Model TEMS-1, Thybar
3. Model EC-4A, Commercial Products Group

C. Pipe and Conduit Penetration Cover Assemblies: One of the following with EPDM compression seals and stainless steel draw bands and clamping rings:

1. PCC 1-05, Pate
2. Model TP-1, Thybar
3. Roof Curb Portal with caps, Commercial Products Group

2.3 FABRICATION

A. Prefabricated Curbs:

1. Prefabricate curbs of 18-gage galvanized steel, ASTM A 653, Grade 40, Structural Steel (SS), galvanized in accordance with ASTM A 924, Class G90 zinc coating, welded construction with integrally formed four (4) inch high 45 degree cants with step to match roof insulation thickness.
2. Fabricate units to sizes and heights as shown on the Drawings (if not shown, minimum 12 inches high above roof insulation.) Provide curbs with corners joined by continuous welds. Internally reinforce curbs and factory-insulated with 1-1/2 inch thick 3-pound density fiberglass insulation, and have factory-installed continuous treated wood nailers anchored from underside with TEK screws. Fabricate tops of roof curbs level with pitch built into bottom of curb when deck slopes 1/4 inch per foot or greater unless shown or required otherwise.
3. Field verify roof opening sizes, locations, roof slopes, thickness of roof insulation and conditions prior to fabrication and submittal of shop drawings.

B. Prefabricated Equipment Supports:

1. Prefabricate equipment supports of 18 gage galvanized steel, ASTM A 653, Grade 40, Structural Steel (SS), galvanized in accordance with ASTM A 924, Class G90 zinc coating, reinforced with internal bulkheads of welded construction.
2. Fabricate units to lengths and heights as shown on the Drawings, if not shown, minimum 12 inches high above roof insulation and 6 inches longer than equipment being supported with integrally formed 4 inch high 45 degree cants on both sides and ends of support with step to match roof insulation thickness. Continuously join corners with welds. Supply supports with continuous treated wood nailer anchored to support with TEK screws. Provide 18 gage galvanized steel, welded cap/counterflashing. Fabricate supports with tops level with pitch built into equipment support bottom when roof deck slopes 1/4 inch per foot or greater unless shown or required otherwise.
3. Field verify support lengths, locations, roof slopes, roof insulation thickness and conditions prior to fabrication and submittal of shop drawings.

C. Roof Penetration Assemblies:

1. Provide prefabricated assemblies consisting of minimum 20-gage galvanized sheet steel ASTM A 653, Grade 40, Structural Steel (SS), galvanized in accordance with ASTM A 924, Class G90 zinc coating. curb cover, EPDM (ethylene propylene diene monomer) compression seals fitted to curb cover and stainless steel clamping rings.
2. Fabricate roof penetration assemblies to maintain watertight conditions at roof penetrations.
3. Field verify roof penetration locations, conditions, and curb sizes prior to fabrication and submittal of shop Drawings.

2.4 FASTENERS

A. When not shown on the Drawings, it is the Fabricating and Installing Contractor's responsibility to anchor and fasten the fabrications to the building structure or

construction for the sizes and types of fabrications shown on the Drawings and specified herein as required for each condition and type of installation. This responsibility includes determining the locations, quantities, capacity and design for anchors, fasteners and or welds used in the installation subject to review by the Commissioner.

B. Furnish bolts, nuts, screws, clips, washers, welding materials and other fasteners and accessories necessary to secure and assemble the specified fabrications.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive the roof curbs, equipment supports, and accessories. Verify dimensions of in-place and subsequent construction. Installation of the roof curbs, expansion joint curbs, equipment supports and accessories constitutes acceptance of the related construction.

3.2 INSTALLATION

A. Coordination:

1. Coordinate locations and sizes of vents, fans, equipment, duct, pipe and conduit penetrations into the roof with mechanical and electrical contractors.
2. Coordinate locations and sizes of fire, smoke and explosion relief vents, and skylights as shown on the Drawings for those items requiring curbs.

B. Install roof curbs and accessories as shown on the Drawings and the reviewed shop drawings. Anchor in accordance with manufacturer's printed installation instructions for the conditions and types of substrate present.

C. Anchoring:

1. The installer/fabricator is to determine the locations, quantities, capacity and design for anchors and fasteners used in the installation subject to review by the Commissioner, if not shown or noted on the Drawings.
2. Provide anchorage devices and fasteners as required to anchor, secure or attach the prefabricated curbs, equipment supports and penetration covers to the in place or subsequent construction, including but necessarily limited to bolts, nuts, screws, clips, washers, toggle bolts, through bolts, and other devices required to complete the installation of each fabrication.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of MANUFACTURED ROOF CURBS AND PENETRATION ASSEMBLIES shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of MANUFACTURED ROOF CURBS AND PENETRATION ASSEMBLIES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 72 33
ROOF HATCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Roof hatches as shown on the Drawings and specified herein, including anchoring devices.

B. Related Sections:

1. Cast-in-Place Concrete: Section 03 30 00.
2. Metal Fabrications: Section 05 50 00.
3. Self-Adhering Thermoplastic Polyolefin (TPO) Waterproofing: Section 07 13 54.
4. Modified Bitumen Roofing: Section 07 52 16.
5. Painting: Section 09 91 00.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Plans, elevations and details of each item, include method of attachment to the roof deck and descriptions of fasteners and their spacing.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions.

B. Roof Hatch Warranty: Signed copies.

1.5 QUALITY ASSURANCE

A. Comply with the following:

1. SMACNA Architectural Sheet Metal Manual details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
2. NRCA Roofing and Waterproofing Manual details for installing units.

1.6 WARRANTY

A. Provide written warranty stating that the roof hatches units will be free of faults and defects in accordance with the General Conditions, except the warranty period is to be for five years instead of one year.

B. Provide warranty signed by the Contractor, Installing Subcontractor and Roof Hatch Manufacturer.

C. This warranty is in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Babcock-Davis Hatchways Inc., Brooklyn Park, MN 55428.

B. Bilco Company (The), New Haven, CT 06505.

C. Milcor; Commercial Products Group of Hart & Cooley, Inc., Carol Stream IL 60188.

2.2 ITEMS

A. Roof Hatch: 2 feet-6 inches x 3 feet-0 inches, one of the following:

1. Babcock-Davis, BA3630.
2. Bilco, Type S-20.
3. Milcor, M-1.

2.3 FABRICATION

A. Roof Hatch:

1. Cover:
   a. Provide cover fabricated from 0.079 inch thick galvanized steel with 3 inch beaded flange, welded.
   b. Provide 1 inch thick fiberglass insulation fully covered and protected by a metal liner of 0.034 inch thick galvanized steel.
2. Curb:
   a. Provide curb 12 inches in height, of 0.079 inch thick galvanized steel, formed with a 3-1/2 inch flange with holes provided for securing to roof deck.
   b. Equip curb with an integral metal cap flashing of the same gauge and material as the curb, fully welded at the corners for weathertightness.
   c. Provide rigid fiberboard insulation on the exterior of the curb, 1 inch thick.
3. Hardware:

a. Completely assemble hatch with heavy pintle hinges, compression spring operators enclosed in telescopic tubes, positive snap latch with turn handles and padlock hasps inside and outside and neoprene draft seal.
b. Equip cover with an automatic hold open arm complete with grip handle to permit easy and one hand release. Provide plated sheet metal hardware.

4. Factory Finish: Factory prime coat.

2.4 FASTENERS

A. General: When not shown on the Drawings, it is the Installing Contractor's responsibility to anchor and fasten the roof hatches to the building structure or construction for the sizes and types of hatches shown on the Drawings and specified herein as appropriate for each condition and type of installation. This responsibility includes determining the locations, quantities, capacity, size and design for anchors and fasteners used in the installation subject to review by the Commissioner. Show and describe anchors and fasteners on the shop drawings submitted to the Commissioner.

B. Furnish bolts, nuts, screws, clips, washers and other fasteners and accessories necessary to secure and assemble the specified roof hatches.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine surfaces to receive the roof hatches. Verify dimensions of in-place and subsequent construction. Installation of the roof hatches constitutes acceptance of related construction.

B. Install roof hatches as shown on the Drawings, or in the absence of details, in accordance with manufacturer's instructions and the reviewed shop drawings. Anchor to the roof deck with fasteners appropriate to the materials present.

C. Following installation of the roof hatches, clean surfaces, lubricate and test operation of moving parts in the presence of the Commissioner's representative. Make adjustments in operation as necessary.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of ROOF HATCHES shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of ROOF HATCHES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 72 73
VEGETATED ROOF SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Continuous vegetated roof assemblies.

B. Related Sections:

1. Modified bitumen roofing: Section 07 52 16.

1.3 DEFINITIONS:

A. Captured Water: Water that is retained in the drainage layer of a vegetated roof assembly after new water additions have ceased and that cannot escape the roof except through evaporation or plant transpiration.

B. Finish Elevation: Elevation of finished growing-media surface of planting area.

C. Planting Area: Areas to be planted.

D. Plant; Plants; Plant Material: Vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

E. Growing Medium: Manufactured, lightweight soil mixture that promotes good growing conditions for specific varieties of plants.

F. FLL guidelines: Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau guidelines.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each vegetated roof assembly.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include material descriptions for each growing medium.

B. Shop Drawings: For each vegetated roof assembly.

1. Include plans, sections, slopes, and drain locations.
2. Indicate dimensions, weights, and loads.
3. Detail field assembly of components, depth of growing media, and attachments to other work.

C. Samples for Verification: For each of the following components of vegetated roof assembly:

1. Preplanted Vegetative Mat: 12 by 12 inches.
2. Growing Media: 1-pint volume of each growing medium, in sealed plastic bags labeled with content and source. Each Sample shall be typical of the lots of growing media to be furnished. Provide an accurate representation of texture and composition.
3. Moisture-Retention Mat: 12 by 12 inches.
4. Drainage Panels: 12 by 12 inches.
5. Root Barrier: 12 by 12 inches.
6. Separation Geotextile: 12 by 12 inches.
7. Access Boxes: One in each size and color required.
8. Soil Retainer: Manufacturer's standard size to verify configuration and color selected.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of manufactured product.

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory, according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Product Test Reports: For complete analysis of each growing medium, for tests performed by manufacturer and witnessed by a qualified testing agency or by a qualified testing agency.

D. Field quality-control reports.

E. Sample Warranty: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For vegetated roof assembly and plants, including a recommended maintenance plan with procedures for inspection and care during a calendar year. Submit before start of required warranty and maintenance periods.

B. Continuing Maintenance Proposal: From vegetated roof assembly Installer approved by roofing-membrane manufacturer to Commissioner, in the form of a standard two-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.8 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials on or near structures, utilities, walkways and pavements, or existing roof areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of debris-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with product certificates.

C. Handle and store materials, and place equipment in a manner to avoid overloading roof structure or damaging roofing membrane.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTIES

A. Special Warranty for Vegetated Roof Assembly: Installer agrees to repair or replace components of vegetated roof assembly that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, ponding water or prolonged wetness of growing medium caused as a result of failure of the assembly to properly drain.
2. Warranty Period: 5 years from date of Substantial Completion.

B. Special Warranty for Plant Growth: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Foliage Cover: Planted materials shall grow to achieve and maintain at least 80 percent foliage cover over planting area commencing 24 months after planting, through the duration of this warranty.
2. Failures include, but are not limited to, death and unsatisfactory growth except for defects resulting from abuse, lack of adequate maintenance, neglect by Commissioner, or incidents that are beyond Contractor's control.
3. Warranty Period: From date of Substantial Completion as follows:

    a. Ground Covers, Perennials, Vines, and Ornamental Grasses: 5 years.

4. Include the following remedial actions as a minimum:

    a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
    b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
    c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.

5. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Source Limitations: Obtain vegetated roof assembly components and growing medium from single source from single manufacturer.

2.2 VEGETATED ROOF ASSEMBLIES

A. Continuous Vegetated Roof Assembly: Continuous-coverage assembly consisting of manufacturer's standard vegetated roof assembly components for installation over roofing system.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. "Greenroof-Roofscape Low Profile" (Barrett Company).
    b. "Shallow Assembly Roof Garden" (Carlisle SynTec Incorporated).
    c. "SkyScape Multilayer System" (Firestone Building Products).
    d. "790-11 Green Roof System for Extensive Vegetation" (Henry Company).
    e. "Sopranature" (Soprema, Inc.).
2. Assembly Depth, Nominal: Extensive system as shown on Drawings, including growing medium.

3. Assembly Weight: Maximum 15 lb/sq. ft., including growing medium and plants and saturated with captured water, but not including weight of roofing system.
4. Plantings: Preplanted vegetative mat as selected by Commissioner from manufacturer's standard mixes.

2.3 VEGETATED ROOF ASSEMBLY COMPONENTS

A. Moisture-Retention Mat: Assembly manufacturer's standard water-retaining fabric manufactured from recycled synthetic fibers.

B. Drainage Panels: Assembly manufacturer's standard drainage board formed from geotextile-faced, molded-plastic sheet with a geotextile face and "cups" of the molded sheet facing upward like small reservoirs to retain water while allowing excess water to drain away below the board

C. Root Barrier: Vegetated roof assembly manufacturer's standard plastic sheet manufactured from recycled polyethylene or polypropylene plastic; formulated to resist root growth and bacteria.

D. Erosion-Control Fabric: Vegetated roof assembly manufacturer's standard erosion-control fabric.

E. Anti-Slip Devices: Vegetated roof assembly manufacturer's standard anti-slip devices.

2.4 MANUFACTURED GROWING MEDIA

A. Growing Medium: Vegetated roof assembly manufacturer's lightweight, manufactured soil mixture designed for plants indicated on Drawings.

1. General Condition at Time of Planting: Free of aggregates 1/2 inch or larger in any dimension; free of roots, plants, clods, pockets of sand, paint, building debris, oils, solvents, roofing materials, and other extraneous materials harmful to plant growth; free of weeds, disease-causing plant pathogens, and other undesirable organisms.
2. Maximum Media Density: ASTM E 2399, for basic growing-medium mixture.
3. Maximum Media Water Retention: ASTM E 2399, for basic growing-medium mixture at maximum media density.
4. Water Permeability: ASTM E 2399, for basic growing-medium mixture at maximum media density.
5. Organic Material Content: ASTM F 1647, Method A, organic material as measured using the loss-on-ignition procedure.

6. Chemical Properties: required for optimal plant growth of plants indicated.

2.5 SOIL AMENDMENTS

A. Lime: ASTM C 602, Class T or Class O agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.

F. Superphosphate: Commercial, phosphate mixture, soluble; minimum 20 percent available phosphoric acid.

G. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen (50 percent derived from natural organic sources of urea formaldehyde), 4 percent phosphorous, and 2 percent potassium, by weight.

H. Slow-Release Fertilizer: Granular or pelleted fertilizer, consisting of 20 percent nitrogen (50 percent of which is water insoluble), 10 percent phosphorus, and 10 percent potassium, by weight.

2.6 PREPLANTED VEGETATIVE MAT

A. Preplanted Vegetative Mat: Pre-vegetated Sedum blankets with mature large field grown clumps. Field grown for a minimum of 12 months, on largely mineral based substrate, on a biodegradable coir carrier with a minimum plant canopy coverage of greater than 85 percent.

B. Characteristics of Sedum Blanket

1. Measurements: 48 inches x 75 inches.
    a. Weights: +/- 4 lbs per sq ft (dry) and +/- 5 lbs per sq ft saturated.
    b. Vegetative Coverage: greater than 85 percent plant canopy coverage.
    c. Plant Structure: greater than 85 percent multi-branched mature plants 12-18 months old.
    d. Diversity: 9-12 plant species per 100 sq ft.
    e. Climatic Exposure: 12 months minimum time of outdoor growing .
    f. Plant Carrier: 97 percent biodegradable materials (coir).
    g. Sedum blanket substrate: Largely inorganic mineral based components. Maximum of 10 percent peat based on organic materials to avoid hydrophobic characteristics and potential lateral fire movement.
    h. System Substrate Match: Air porosity of the Substrate of Sedum blanket is to have greater than 80 percent match with Growing

Substrate underneath. (Critical that Sedum blanket Substrate is mapped to Vegetative System Substrate.)

i. Wind Uplift Prevention: The Sedum blanket substrate layer at 0.5 inch 0.75 inch thickness is to weigh a minimum of 4 lbs per sq ft (dry) 0.5 inch to 0.75 inch mineral based substrate depth on coir carrier to avoid wind uplift concerns.

j. Sedum Blanket Substrate: Meets greater than 80 percent of overall FLL guidelines.

k. Plant Coverage: greater than 85 percent in Vegetation Cover to protect Growing Substrate from Solar radiation, evaporation, and to meet ANSI/SPRI RP-14 wind uplift regulations.

l. Species diversity: Species allocation upon delivery to the Roof:

1) Shallow rooting creeping Sedums: 30-50 percent of the vegetative cover:
   a) Sedum album 'Murale'.
   b) Sedum album.
   c) Sedum Stefco
   d) Sedum acre 'Aureum'.
   e) Sedum acre.
   f) Sedum sexangulare.

2) Deep rooting broadleaf Sedums: 50-70 percent of vegetative cover:
   a) Phedimus spurium 'John Creech'.
   b) Phedimus spurium 'Fuldaglut'.
   c) Phedimus spurium 'Red Carpet'.
   d) Phedimus takesimensis.
   e) Phedimus kamtschaticum.
   f) Phedimus kamtschatium 'Variegatum'.
   g) Sedum x hybridum Immergrunchen.
   h) Sedum floriferum 'Weihenstephaner Gold'.
   i) Sedum reflexum 'Blue Spruce'.

3) Accent and structural perennials: Plug sized in spacing of 8 inches to 12 inches on center:
   a) Allium cernuum
   b) Amorpha canescens
   c) Antennaria plantaginifolia
   d) Asclepias verticillata
   e) Coreopsis lanceolata
   f) Coreoposis palmata
   g) Geum triflorum
   h) Ruellia humilis
   i) Symphyotrichum laeve
   j) Talinum calycinum

2.7 ACCESSORIES

A. Protection Board: As recommended by roofing-membrane manufacturer.

B. Soil Retainer: Vegetated roof assembly manufacturer's standard edging with drainage openings.

1. Color: Black or Mill-finish metal.
2. Method of Attachment: Manufacturer's standard adhesive compatible with the roofing system.

C. Extruded Polystyrene Insulation: Vegetated roof assembly manufacturer's standard insulation installed for levelling layers.

1. Insulation shall meet ASTM C-578, Type VI or VII.
2. Minimum compressive strength, ASTM D-1621, 60 psi (variance by type of product). Provide 60 psi insulation under garden system.
3. Maximum water absorption by volume per ASTM C-272, 0.1 percent.
4. Water vapor permeance for 1" product per ASTM E-96, 1.0 perm max.
5. Insulation shall have an R value of 5.0°F ft2 h/Btu/in. of thickness when tested at 75 deg F mean temperature in accordance with ASTM C-518.
6. Product shall be free of CFC's.

D. Pea Gravel Maintenance Zone: Vegetation-free zones at the vegetated roof assembly perimeter, drainage zones and roof penetration areas as indicated on drawings.
1. Well screened and washed stone gravel meeting ASTM D-448, gradations #57, 2, 4 or 5.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine each area to receive vegetated roof assembly for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Verify that roof insulation over roofing membrane is in place, secure, and flush along seams.
2. Verify that perimeter and other flashings are in place and secure along entire lengths where they will be covered by vegetated roof assembly.

B. Inspect growing medium.

1. Verify that no foreign or deleterious material or liquid, such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in growing medium within a planting area.
2. If growing medium is contaminated by foreign or deleterious material or liquid, remove growing medium and contamination and replace with new growing medium.

3.2 INSTALLATION, GENERAL

A. Protection Course: Cover roofing system with protection board with butted and fully taped joints before roofing system is subject to vegetated roof assembly installation work.

B. Install insulation as required and vegetated roof assembly according to manufacturer's written instructions.

C. Small Plant Stabilization: Install over planting area to secure small plants according to manufacturer's written instructions.

3.3 PLANTING

A. Perform planting according to vegetated roof assembly manufacturer's written instructions.

B. Do not place growing medium or plants during frozen, wet, or muddy conditions.

C. Suspend spreading, grading, and planting operations during periods of excessive moisture until the moisture content in growing medium reaches acceptable levels to attain the required results.

D. Uniformly moisten an excessively dry growing medium that is too dusty or unworkable.

E. Preplanted Vegetative Mat: Install in full contact with growing medium and secure in position.

3.4 SOIL-RETAINER INSTALLATION

A. Install soil retainer where indicated according to manufacturer's written instructions.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests.

B. Perform the following tests:

1. Flood Testing: Flood test each deck area for leaks, according to procedures in ASTM D 5957, after completing and protecting roofing membrane but before placing overlaying construction. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

    a. Flood to an average depth of 2-1/2 inches, with a minimum depth of 1 inch and a maximum depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
    b. Flood each area for 24 hours.

2. Proceed with installation of vegetated roof assembly only after unsatisfactory conditions have been corrected.

C. Manufacturer's Field Service: Engage roofing-membrane manufacturer's authorized service representative to provide inspection of vegetated roof assembly installation and prepare inspection reports.

D. Correct deficiencies in work that do not comply with requirements.

E. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect vegetated roof assemblies from damage, including growing-medium contamination, due to operations of other contractors and trades. Repair or replace damaged vegetated roof assemblies.

3.7 PLANT STEWARDSHIP

A. Upon substantial completion, Installer to provide selected vegetative roof manufacturer’s recommended service and maintenance visits for a minimum two-year, establishment period. A minimum of 80 percent vegetative coverage of the measurable growing area is required after 24 months. If 80 percent coverage is not met, Installer will be required to continue plant maintenance and stewardship after that date without additional compensation until threshold is achieved.

B. Provided 80 percent vegetative coverage is achieved after upon completion of two year establishment period, Installer will provide station operator with a bid for an additional, extended two-year maintenance agreement for their consideration.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of VEGETATED ROOF SYSTEMS shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of VEGETATED ROOF SYSTEMS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.

B. Related Sections:

1. Joint Firestopping: Section 07 84 43.

1.03 PERFORMANCE REQUIREMENTS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."
3) FM Approvals in its "Building Materials Approval Guide."

C. For penetration firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant penetration firestopping.
2. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide penetration firestopping capable of supporting the floor loads involved either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide penetration firestopping not requiring removal of insulation.

D. For penetration firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

E. Systems and Product Selection:

1. Unless otherwise indicated on the Drawings, select systems and products which are appropriate for the types of penetrations, construction systems and the required fire resistance ratings shown on the Drawings and which comply with the requirements of this specification.
2. Proprietary products and UL designs when indicated on the Drawings are not intended to imply that products and UL designs of the manufacturer are required to the exclusion of equivalent products of other named acceptable manufacturers.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

C. Pre-installation Meeting: Meet with Installer, Commissioner, firestopping manufacturer's technical representative, if so requested, and other trades involved in coordination with firestopping work at the Project Site. Review procedures and time schedule proposed for installation of penetration firestopping in coordination with other work. Review each major penetration firestopping application required on the Project.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping

condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.09 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Commissioner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. A/D Fire Protection Systems Inc.
2. Hilti, Inc.
3. 3M; Fire Protection Products Division.
4. Tremco; Sealant/Weatherproofing Division.
5. USG Corporation.

2.02 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Fire-resistance-rated walls include fire walls and fire partitions.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Horizontal assemblies include floor/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
4. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

2.03 FILL MATERIALS

A. General: Provide penetration firestopping containing the types of fill materials indicated in the Penetration firestopping Schedule at the end of Part 3 by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

I. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

2.04 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.03 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.05 FIELD QUALITY CONTROL

A. Commissioner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.06 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of PENETRATION FIRESTOPPING shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of PENETRATION FIRESTOPPING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 84 43
JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Joint firestopping, including but not limited to the following:

1. Joints in or between fire-resistance-rated constructions.
2. Joints at exterior curtain-wall/floor intersections.

B. Related Sections:

1. Cast-In-Place Concrete: Section 03 30 00.
2. Unit Masonry: Section 04 20 00.
3. Building thermal insulation: Section 07 21 00.
4. Penetration firestopping: Section 07 84 13.
5. Joint sealants: Section 07 92 00.
6. Expansion joint cover assemblies: Section 07 95 13.
7. Aluminum curtain walls: Section 08 44 13.
8. Gypsum board: Section 09 29 00.

1.3 PERFORMANCE REQUIREMENTS

A. Joint Firestopping Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Joint firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."

C. System and Product Selection: Unless otherwise indicated on the Drawings, select systems and products which are appropriate for the types of penetrations, construction systems and the required fire ratings as shown on the Drawings, complying with the requirements of this specification.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meeting: Meet with Installer, Commissioner, firestopping manufacturer's technical representative, if so requested, and other trades involved in coordination with firestopping work at the Project Site. Review procedures and time schedule proposed for installation of joint firestopping in coordination with other work. Review each major joint firestopping application required on the Project.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of joint firestopping, signed by product manufacturer.

C. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain joint firestopping for each kind of joint and construction condition indicated through one source from a single manufacturer.

B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver joint firestopping products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for joint firestopping to prevent deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping when ambient or substrate temperatures are outside limits permitted by joint firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate joint firestopping per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.10 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping is installed according to specified requirements.

B. Coordinate sizing of joints to accommodate joint firestopping.

C. Notify Commissioner's inspecting agency at least seven days in advance of joint firestopping installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up joint firestopping installations that will become concealed behind other construction until Commissioner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the specified requirements, provide system products by one of the following:

1. Joint firestopping:
   a. 3M Fire Protection Products, St. Paul, MN 55144.
   b. Hilti Construction Chemicals, Inc., Tulsa, OK 74146.
   c. The RectorSeal Corporation, Houston, TX 77023.

d. Nelson Firestop Products, a brand of Emerson Industrial Automation, Tulsa, OK 74145.
e. Specified Technologies Co., Sommerville, NJ 08876.
f. NUCO Industries, Lake Forest, IL 60045.
g. Thermafiber, Inc., an Owens Corning company, Wabash, IN 46992.
h. Tremco; Cleveland, OH 44104.
i. ROXUL Inc.
j. A/D Fire Protection Systems Inc.

2.2 JOINT FIRESTOPPING SYSTEMS

A. Compatibility: Provide joint firestopping that is compatible with joint substrates, under conditions of service and application, as demonstrated by joint firestopping manufacturer based on testing and field experience.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.

1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E 2307.

1. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.

D. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. Accessories: Provide components of joint firestopping, including primers and forming materials, that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by joint firestopping manufacturer and approved by the qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Application or installation of material constitutes acceptance of the substrate.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing joint firestopping to comply with joint firestopping manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Use masking tape to prevent fill materials of joint firestopping from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from joint firestopping materials. Remove tape as soon as possible without disturbing joint firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install joint firestopping to comply with Performance Requirements and joint firestopping manufacturer's written installation instructions.

B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install fill materials for joint firestopping systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing Work, tool sealants to form smooth, uniform surface of flush configuration.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping

system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Commissioner will engage a qualified independent inspecting agency to perform tests and inspections according to ASTM E 2393.

B. Where joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping with other construction only after inspection reports are issued and inspecting agency has approved installed joint firestopping.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping is without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated joint firestopping immediately and install new materials to produce joint firestopping complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified joint firestopping systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

B. Where Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Listed Building Products" under product category Expansion/Seismic Joints or Firestop Systems.

C. Where UL-classified joints at exterior curtain-wall/floor intersections are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHDG.

D. Floor-to-Floor, Joint Firestopping System:

1. UL-Classified Products:
   a. Movement: FF-D-0999
   b. No Movement: FF-S-0999
2. Assembly Rating: 1 hour / 2 hours
3. Nominal Joint Width: As indicated on Drawings, if not indicated, provide joint width not more than 1/2 inch.
4. Movement Capabilities: Class II

E. Floor-to-Wall, Joint Firestopping System:

1. UL-Classified Products:
   a. Movement: FW-D-0999
   b. No Movement: FW-S-0999
2. Assembly Rating: 1 hour / 2 hours
3. Nominal Joint Width: As indicated on the Drawings, if not indicated, provide joint width not more than 1/2 inch.
4. Movement Capabilities: Class II

F. Head-of-Wall, Joint Firestopping System:

1. UL-Classified Products:
   a. Movement: HW-D-0999
   b. No Movement: HW-S-0999
2. Assembly Rating: 1 hour / 2 hours
3. Nominal Joint Width: As indicated on the Drawings, if not indicated, provide joint width not more than 1 inch.
4. Movement Capabilities: Class II

G. Wall-to-Wall, Joint Firestopping System:

1. UL-Classified Products:
   a. Movement: WW-D-0999
   b. No Movement: WW-S-0999
2. Assembly Rating: 1 hour / 2 hours
3. Nominal Joint Width: As indicated on the Drawings, if not indicated, provide joint width not more than 1/2 inch.
4. Movement Capabilities: Class II

H. Bottom-of-Wall, Joint Firestopping System:

1. UL-Classified Products:
   a. Movement: BW-D-0999
   b. No Movement: BW-S-0999
2. Assembly Rating: 1 hour / 2 hours
3. Nominal Joint Width: As indicated on the Drawings, if not indicated, provide joint width not more than 1 inch.

4. Movement Capabilities: Class II

I. Perimeter Joint Firestopping System:

1. UL-Classified Products:
   a. No Movement: CW-S-2001
   b. Movement: CW-D-XXXX
2. Integrity Rating: 2 hours
3. Insulation Rating: 1 hour.
4. Linear Opening Width: As indicated on the Drawings, if not indicated, provide joint width not more than 2-1/2 inches.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of JOINT FIRESTOPPING shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of JOINT FIRESTOPPING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Joint sealants and installation accessories, including the following:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Preformed joint sealants.
5. Acoustical joint sealants.
6. Installation accessories and materials for the above.

B. Related Sections:

1. Cast-in-place concrete: Section 03 30 00.
2. Unit masonry: Section 04 20 00.
3. Metal wall panels: Section 07 42 12.
4. Sheet metal flashing and trim: Section 07 62 00.
5. Penetration firestopping systems: Section 07 84 13.
6. Joint firestopping: Section 07 84 43.
7. Hollow metal doors and frames: Section 08 11 13.
8. Aluminum curtain walls: Section 08 44 13.
9. Glazing: Section 08 80 00.
10. Aluminum louvers: Section 08 91 00.
11. Gypsum board: Section 09 29 00.
12. Tiling: Section 09 30 10.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with stone or masonry substrates.
4. Submit not fewer than 8 pieces of each kind of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
7. Testing will not be required if joint sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field Adhesion Testing: Before installing sealants, field test their adhesion to project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Commissioner.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Commissioner seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
   a. Test Method: Test joint sealants according to ASTM C 1193, Appendix X1, Method A - Field-Applied Sealant Joint Hand Pull Tab, or ASTM C 1521, Method A - Tail Procedure.
      1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2 inch wide joints formed between two 6 inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint Sealant Schedule: Include the following information:

1. Joint sealant application, joint location, and designation.
2. Joint sealant manufacturer and product name.
3. Joint sealant formulation.
4. Joint sealant color.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.
4. Proposed test.
5. Number of samples required.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Laboratory Reports: From sealant manufacturer, indicating the following:
1. Materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Preconstruction Field Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

G. Field Adhesion Test Reports: For each sealant application tested.

H. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

A. Comply with the applicable portions of ASTM C 1193 - Standard Guide for Use of Joint Sealants for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint sealant installations with a record of successful in-service performance.

C. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

D. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

E. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.8 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint sealant manufacturer agrees to furnish joint sealants to repair or replace those that

do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

D. This warranty is in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40CFR59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Stain Test Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Colors of Exposed Joint Sealants: As selected by Commissioner from manufacturer's full range.

2.2 JOINT SEALANTS

A. S-1: Immersible Multicomponent, Pourable, Traffic Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade P, Class 25, for Use T and I. Subject to compliance with requirements, provide one of the following:

1. "Vulkem 45" (Tremco Incorporated).
2. "Masterseal SL2" (BASF).
3. "Sikaflex-2c, SL" (Sika Corporation).

B. S-2: Single Component, Nonsag Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT. Subject to compliance with requirements, provide one of the following:

1. "Dynatrol I-XL" (Pecora Corporation).
2. "Sikaflex - 1a" (Sika Corporation, Construction Products Division).
3. "Dymonic 100 and Vulkem 116" (Tremco Incorporated).
4. "Masterseal NP1" (BASF).

C. S-3: Multicomponent, Nonsag Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T. Subject to compliance with requirements, provide one of the following:

1. "Dynatred" (Pecora Corporation).
2. "Sikaflex - 2c NS" (Sika Corporation, Construction Products Division).
3. "Masterseal NP2" (BASF).
4. "Dymeric 240FC" (Tremco Incorporated).

D. S-4: Acrylic Latex or Siliconized Acrylic Latex Joint Sealant: ASTM C 834, Type OP, Grade NF. Subject to compliance with requirements, provide one of the following:

1. "AC-20+" (Pecora Corporation).
2. "Tremflex 834" (Tremco Incorporated).
3. "Masterseal 520" (BASF).

E. S-5: Single Component, Nonsag Neutral Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT. Subject to compliance with requirements, provide one of the following:

1. "DOWSIL 790 Silicone Building Sealant" (The Dow Chemical Company).
2. "SilPruf LM SCS2700" (GE Silicones).
3. "Spectrem 1" (Tremco Incorporated).
4. "890NST" (Pecora Corporation).

F. S-6: Single Component, Nonsag Neutral Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50/50, for Use NT and nonstaining to porous substates per ASTM C 1248. Subject to compliance with requirements, provide one of the following:

1. "Spectrem 3" (Tremco, Inc.).
2. "DOWSIL 756 SMS Building Sealant or DOWSIL 795 Silicone Building Sealant" (The Dow Chemical Company).

3. "SilPruf NB SCS9000" (GE Silicones).
4. "864NST", "895NST", or "898NST" (Pecora Corporation).

G. S-7: Single Component, Nonsag, Neutral Curing Silicone Joint and Structural Glazing Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT. Subject to compliance with requirements, provide one of the following:

1. "DOWSIL 795 Silicone Building Sealant" (The Dow Chemical Company).
2. "SilPruf SCS2000" (GE Silicones).
3. "Proglaze SSG" (Tremco Incorporated).

H. S-8: Mildew Resistant, Single Component, Acid Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT. Subject to compliance with requirements, provide one of the following:

1. "DOWSIL 786 Silicone Sealant" (The Dow Chemical Company).
2. "Sanitary SCS1700" (GE Silicones).
3. "Tremsil 200 Sanitary" (Tremco Incorporated).
4. "898NST" (Pecora Corporation).

I. S-9: Butyl sealant: material with a movement capability of plus or minus 5 percent, conforming to ASTM C 1085.

1. "Butyl Rubber Sealant BC-158" (Pecora Corp.).
2. "PTI 757" (H. B. Fuller Company).
3. "Tremco Butyl Sealant" (Tremco, Inc.).

J. S-10: Polyurea Joint Sealant: Two-part, fast setting, self-leveling, 100 percent solids, semi-rigid, for sealing parking garage floor slab, saw-cut, construction and control joints:

1. "Euco QWIK Joint 200" (Euclid).
2. "Masterseal CR 100" (BASF).

K. S-11: Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90. Subject to compliance with requirements, provide one of the following:

1. "AC-20 FTR or AIS-919" (Pecora Corporation).
2. "SHEETROCK Acoustical Sealant" (USG Corporation).
3. "Acoustical Sealant" (Tremco, Inc.).

L. Acoustical Sealant for Fire Rated Partitions: refer to Section 07 84 43 Joint Firestopping.

2.3 PREFORMED JOINT SEALANTS

A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low modulus silicone extrusion, in sizes to fit joint widths indicated,

combined with a neutral curing silicone sealant for bonding extrusions to substrates. Subject to compliance with requirements, provide one of the following:

1. "123 Silicone Seal" (The Dow Chemical Company).
2. "UltraSpan US1100" (GE Silicones).
3. "Sil-Span" (Pecora Corporation).

B. Preformed Compressible Seals: Preformed, precompressed, impregnated open cell foam sealant manufactured from high density urethane foam impregnated with a nondrying, water repellent agent; factory produced in precompressed sizes and in roll form to fit joint widths indicated on the Drawings and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; neoprene rubber suspended in water based emulsion, density 9-10 pcf, with pressure sensitive adhesive factory applied to one side with protective wrapping. Subject to compliance with requirements, provide one of the following:

1. "Emseal 25V" (EMSEAL Joint Systems, Ltd.).
2. "Wilseal 600" (illbruck Sealant Systems, Inc.).
3. "Polytite Standard" (Polytite Manufacturing Corporation).
4. "illmod 600" (Tremco, Inc.).

2.4 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, and primers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, type and material as recommended and approved in writing by joint sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

1. Remove foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Remove laitance and form release agents from concrete.
3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint sealant manufacturer or as indicated by preconstruction joint sealant substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile complying with ASTM C 1193, Figure 8A, unless otherwise indicated.
4. Provide flush joint profile complying with ASTM C 1193, Figure 8B.
5. Provide recessed joint configuration of recess depth and at locations complying with ASTM C 1193, Figure 8C.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Silicone Sealant System: Comply with the following requirements:

1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure

and ensure uniform contact between sealant and both extrusion and substrate.

4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

I. Acoustical Sealant Installation: At sound rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field Adhesion Testing: Field test joint sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

   a. Perform 10 tests for the first 1,000 feet of joint length for each kind of sealant and joint substrate.
   b. Perform one test for each 1,000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to ASTM C 1193, Appendix X1, Method A - Field-Applied Sealant Joint Hand Pull Tab, or ASTM C 1521, Method A - Tail Procedure.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field adhesion hand pull test criteria.

4. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test

locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT SEALANT SCHEDULE

A.	Joints in curtain wall construction	S-5
B.	Joints in structural glazing construction	S-7
C.	Joints in exterior traffic surfaces	S-2, S-3 and S-5
D.	Joints in exterior traffic surfaces subject to water immersion	S-1
E.	Joints in exterior vertical surfaces and horizontal nontraffic surfaces (nonstaining for stone and cementitious)	S-2, S-3 and S-6
F.	Joints in interior traffic surfaces	S-10
G.	Joints in interior, moving construction, including door frames and tops of interior walls and partitions	S-2, S-3 and S-5
H.	Joints exposed in non-moving interior construction	S-4
I.	Joints concealed non-moving interior construction	S-9

J. Joints in moist interior environment S-8

K. Acoustical sound rating locations S-11

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of JOINT SEALANTS shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of JOINT SEALANTS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Exterior and Interior expansion joint cover assemblies including, assembly and installation accessories required to complete each installation.

B. Related Sections:

1. Cast-In-Place Concrete: Section 03 30 00.
2. Unit masonry: Section 04 20 00.
3. Aluminum storefront and entrances: Section 08 41 13.
4. Aluminum curtain walls: Section 08 44 13.
5. Gypsum board: Section 09 29 00.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Floor plan lay-out locating each type of assembly.
2. Details of installations showing dimensions, width of joints, methods, types and spacing of anchors and adjacent related construction.

C. Samples: 6 inch long sample pieces of each type joint assembly specified.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions.

B. Product Test Reports: From a qualified testing agency indicating architectural joint systems comply with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain joint systems through one source from a single manufacturer. Coordinate compatibility with adjoining joint systems specified in other Sections.

B. Fire-Test-Response Characteristics: Where indicated, provide joint systems incorporating fire barriers that are identical to those of assemblies tested for fire resistance per ASTM E 1966 and ASTM E 814 UL 2079, including hose-stream test of vertical wall assemblies, by a testing and inspecting agency acceptable to authorities having jurisdiction.

C. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

D. Accessibility Requirements: Comply with applicable provisions in Americans with Disabilities Act (ADA).

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, handle and store expansion joint assemblies and associated materials in such a manner as to prevent damage or deterioration in accordance with the manufacturer's recommendations. Packaged materials shall be in original containers and wrappings with seals unbroken and labels intact until time of installation. Store materials above ground in a dry place under weatherproof covers. Damaged or otherwise unsuitable materials shall be immediately removed from the job site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. MM Systems Corporation, Tucker. GA 30085.

B. Construction Specialties (C/S), Muncy, PA 17756.

C. Balco USA, Wicthita, KS 67217.

2.2 ITEMS

A. Exterior:

1. Floor To Floor (EJ-01): Basis of Design Product: “Model AL-200-HD” (C/S.).
2. Floor To Floor, Isolation (EJ-02): Basis of Design Product: “Model RFD-300” (C/S.).

2.3 MATERIALS

A. Aluminum:

1. Extrusions: ASTM B 221, 6063-T5.
2. Plate: ASTM B 209, 6061-T6.
3. Finishes:
   a. Concealed: Mill finish
   b. Exposed to View: Class I, Clear Anodic Finish, complying with AAMA 611.

B. Seals:

1. Manufacturer's standard compressible resilient synthetic rubber extrusions designed to engage into continuous races in aluminum expansion joint cover extrusions.
2. Manufacturer's standard acrylic impregnated compressible foam design to expand into the joint width with factory applied cured silicone face.

C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required rating period.

D. Moisture Barrier: Manufacture’s standard flexible elastomeric material, PVC minimum 30 mils thick, EPDM minimum 45 mils thick or Santoprene.

E. Bituminous Paint: Asphalt emulsion ASTM D 1187.

F. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, flexible moisture barrier and filler materials, drain tubes, lubricants, adhesives, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.4 FABRICATION

A. Provide expansion joint cover assemblies fabricated from aluminum extrusions and plate with mill finish.

B. Provide expansion joint assemblies to accommodate joint widths shown on the Drawings for specified joint condition types. Fabricate special transitions, corner fittings and end closures as shown on the Drawings or as required by conditions of the installation.

C. Factory paint aluminum surfaces which will be in contact with concrete one coat of zinc chromate primer paint.

D. Provide anchors and accessories as required by conditions and materials present to installation and complete each installation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces and construction to receive the joint cover assemblies and accessories. Verify dimensions of in-place and subsequent construction prior to fabrication.

B. Fabrication or installation of the joint cover assemblies constitutes acceptance of the existing and related conditions and construction. Coordinate locations of assemblies in the construction for work to be accomplished by others required prior to joint assembly installation.

3.2 INSTALLATION

A. Install and anchor joint cover assemblies and accessories in accordance with the manufacturer's printed instruction and the final reviewed Shop Drawings. Make allowance for change in joint size due to difference between installation and construction operating temperatures.

B. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action by factory applied primer paint or a coat of bituminous paint, coatings shall not be exposed to view.

C. Install units straight, plumb, level and in proper alignment with other work. Use tamperproof fasteners when exposed to view. Flush butt joints of the installation. Adjust cover to freely accommodate joint movement.

D. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

E. Maintain continuity of joint systems with a minimum number of end joints and align metal members. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials, if any, to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

F. Water Barrier: Provide water barrier at exterior joints and where called for on Drawings. Provide drainage fittings at a maximum of 50 feet or where indicated.

G. Electrical Isolation: Maintain isolation consistent with Drawings.

3.3 CLEANING AND PROTECTION

A. After installation, cover and protect exposed portions of the joint cover assemblies from damage.

B. Just prior to final acceptance, remove protective coverings and clean surfaces with plain water, or if required with a solution of water and mild household detergents as recommended by manufacturer. Remove and replace any component that cannot be successfully repaired.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of EXPANSION JOINT COVER ASSEMBLIES shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of EXPANSION JOINT COVER ASSEMBLIES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Hollow metal doors and frames (welded), including fabrication and installation accessories.

B. Related Sections:

1. Unit Masonry: Section 04 20 00.
2. Finish Door Hardware: Section 08 71 00.
3. Glazing: Section 08 80 00.
4. Non-Load Bearing Metal Framing: Section 09 22 16.
5. Gypsum Board: Section 09 29 00.
6. Painting: Section 09 91 00.

1.3 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
3. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

B. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.40 deg Btu/F x h x sq. ft. when tested according to ASTM C 518.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 ACTION SUBMITTALS

A. Product Data: Copies of manufacturer's data for fabrication and installation instructions.

B. Shop Drawings:

1. Submit shop drawings for the fabrication and installation. Include details of each frame type, elevations of door design types, conditions at openings, details of anchorage to construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections.
2. Provide a schedule of doors and frames using same reference numbers for details and openings as those on the Drawings. Indicate fire-rated doors and frames, welded and knockdown frames.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

B. Certification: When door assemblies required to be fire-rated that exceed manufacturer's capabilities or UL design maximum sizes, submit copies of Door and Frame Manufacturer's Label Certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to the requirements for labeled assemblies or products or units tested in accordance with ASTM E 2074.

1.7 QUALITY ASSURANCE

A. Products: Provide welded hollow steel doors and frames by a single firm specializing in the production of hollow steel work as evidenced by a minimum of 10 consecutive years production experience.

B. Provide hollow steel doors and frames conforming to the applicable recommended practices contained in the following:

1. Steel Door Institute (SDI), Standard Steel Doors and Frames, SDI 100/ANSI/SDI A250.8, Recommended Specifications, except as herein modified.

1.8 DELIVERY, STORAGE AND HANDLING

A. Inspection: Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided the finish items are equal to new work; otherwise, remove and replace damaged items as directed.

B. Storage: Store at the building site under cover. Place units on at least 4 inch high wood sills or on floors in a manner that will prevent rust and damage. Avoid the use of non-vented plastic or canvas shelters, which could create a humidity chamber. If the cardboard wrapper on the door becomes wet, remove the carton immediately. Provide a 1/4 inch space between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide hollow metal work by one of the following:

1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Steelcraft; an Allegion company.
4. Republic Doors and Frames.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strips: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 1011/ A 1011 M and ASTM A 568/ A 568M.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 1008/ A 1008M and ASTM A 568/ A 568M.

C. Metallic Coated Steel Sheets (Exterior Door Faces and Channels, Door Frames): ASTM A 653/ A 653M Commercial Steel (CS), Type B, with an A60 zinc-iron-alloy (galvannealed) coating; stretcher leveled standard of flatness.

D. Electrolytic Zinc Coated Steel Sheet: ASTM A 591/ A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher leveled standard of flatness where used for face sheets.

E. Structural Steel Shapes: ASTM A 36/ A 36M.

F. Steel Bars: ASTM A 108.

G. Steel Plate: ASTM A 283/ A 283M.

H. Supports and Anchors: Fabricate of not less than 0.053 inch thick sheet metal. Galvanized after fabrication for units to be built into exterior walls, complying with

ASTM A 1008/ A 1008M or ASTM A 1011/ A 1011M, hot-dip galvanized according to ASTM A 153/ A 153M, Class B.

I. Shop Primer: Modified alkyd rust inhibiting primer paint as standard with door and frame fabricator.

J. Galvanizing Repair Paint: High zinc dust content paint for repairing galvanizing at welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with SSPC-Paint 20.

K. Galvanized Primer: FS TT-P-641F.

2.3 FABRICATION – GENERAL

A. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp, buckle and shadows or surface deformations from welds. Accurately form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at the project site. Weld exposed joints continuously, grind, dress, and make smooth, flush, and invisible.

B. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Specifications for Door and Frame Preparation for Hardware, current edition.

C. Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with National Builders' Hardware Association "Recommended Locations for Builder's Hardware," current edition.

2.4 DOOR FABRICATION

A. Provide full flush design doors, seamless hollow construction. Bevel both vertical edges 1/8 inch.

B. Fabricate of hot or cold-rolled, stretcher leveled steel sheets. Construct doors with smooth, flush surfaces, continuously welded edge seams without visible joints or seams on exposed faces or stile edges.

C. Reinforce inside with vertical, hot-rolled steel not less than 0.042 inch thick for interior (SDI - Level 2) and 0.053 inch thick for exterior (SDI - Level 3) steel channel shaped sections or interlocking Z-shaped steel sections. Space vertical reinforcing 6 inches o.c. and extend full door height. Spot weld at not more than 5 inches o.c. to both face sheets.

D. Interior Doors: SDI - Level 2 - Heavy Duty, Full Flush and Seamless, but not less than the following:

1. Reinforce tops and bottoms of interior doors with 0.042 inch thick horizontal steel channels spot welded at not more than 5 inches o.c. to the outer sheets.
2. Provide not less than 0.042 inch thick steel faces.
3. Provide sound insulation filler of fiberboard, mineral board or other non-combustible material solidly packed full door height to fill the voids between inner core reinforcing members.
4. Fire Door Core: As required to provide hourly fire and temperature rise ratings indicated.

E. Exterior Doors: SDI - Level 3 - Extra Heavy Duty, Full Flush and Seamless, but not less than the following:

1. Reinforce tops and bottoms of exterior doors with 0.053 inch thick, horizontal galvanized steel channels welded continuously to the outer sheets. Close top edges to provide weather seal, as integral part of door construction or by addition of inverted steel channels.
2. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape.
3. Provide not less than 0.053 inch thick galvannealed steel face.
4. Insulate doors with door manufacturer's standard fiberglass or mineral fiber insulation core for the full thickness of the door.

F. Reinforce doors with rigid tubular frames where stiles and rails are less than 8 inches wide. Form tubular frames with 0.053 inch thick galvanized steel, welded to outer sheets.

G. Finish Hardware Reinforcement: Unless otherwise indicated herein, reinforce doors for scheduled finish hardware, as follows:

1. Butt Hinges: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide x 6 inches longer than hinge, secured by not less than six spot welds.
2. Continuous Hinges: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide continuous, secured by spot welds 8 inches o.c.
3. Mortise Locksets and Dead Bolts: Not less than 0.067 inch thick steel sheet, secured with not less than two spot welds.
4. Cylindrical Locks: Not less than 0.093 inch thick steel sheet, secured with not less than two spot welds.
5. Flush Bolts: Not less than 0.093 inch thick steel sheet, secured with not less than two spot welds.
6. Surface Applied Closers: Not less than 0.093 inch thick steel sheet, secured with not less than six spot welds.
7. Push Plates and Bars: Not less than 0.053 inch thick steel sheet (except when through bolts are shown or specified), secured with not less than two spot welds
8. Surface Panic Devices: 0.067 inch thick sheet steel (except when through bolts are shown or specified), secured with not less than two spot welds.

2.5 HOLLOW-METAL PANELS

A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.6 FRAME FABRICATION

A. General:

1. Fabricate frames unless noted otherwise of full welded unit construction, with corners full mitered, reinforced, continuously welded inside the full depth and width of frame miter, including returns, soffits and stops.
2. Knockdown frames will not be acceptable as alternates for welded frames.
3. Form frames of either cold or hot-rolled sheet steel.
4. Interior Frames: Provide not less than 0.053 inch thick steel for interior openings, including 4 feet wide.
5. Exterior Frames: Provide not less than 0.067 inch thick galvannealed steel for exterior openings up to and including 4 feet wide.
6. For openings over 4 feet wide, increase thickness by at least 2 standard thickness.

B. Welded Frame Corner Joints (Full Profile Welded):

1. Fabricate frame members stamped in the flats to a predetermined pattern, designed to provide mitered faces or trims and mitered stops.
2. After fabricating head and jamb members, fit frames together engaging projecting tabs into corresponding slots in the head.
3. Tightly close contact edges so that trim and faces are aligned straight, level and true.
   a. Secure interlocking tabs where they pass thru head slots by welding.
   b. Continuously weld back bends, soffits and returns together.
   c. Continuously weld mitered trim joints on each side inside the frame section. Dress and finish exposed joints to produce invisible connections.
   d. Weld head and jamb together along their intersecting depth and width inside the frame.
   e. Weld jambs to head overhang along the length of each rabbet, inside the frame completely welding the full joint perimeter.
   f. Grind welds on exposed surfaces smooth and flush with adjoining surfaces.

C. Welded Frame Jamb Anchors: Furnish jamb anchors as required to secure frames to adjacent construction and as required by fire-rated assemblies, formed of not less than 0.042 inch thick galvanized steel unless noted otherwise.

1. Masonry Construction: Adjustable, flat or corrugated or perforated, T-shaped to suit frame size with leg not less than 2 inches wide, by 10 inches long. Furnish at least three anchors per jamb up to 7 feet-6 inches height; four anchors up to 8 feet jamb height; one additional anchor for each 24 inches or fraction thereof over 8 feet height.
2. Metal Stud Partitions: Insert type with notched clip to engage metal stud, welded to back of frames. Provide at least four anchors for each jamb for frames up to 7 feet-6 inches in height; five anchors up to 8 feet jamb height; one additional anchor for each 24 inches or fraction thereof over 8 feet height.
3. In-Place Concrete or Masonry: Fabricate frames jambs to accept minimum 3/8 inch diameter concealed bolts into expansion shields or inserts at 6 inches

from top and bottom and 26 inches o.c., unless otherwise shown. Reinforce frames at anchor locations. Provide non-removable snap-on covers over anchor bolts, unless otherwise indicated.

D. Floor Anchors: Provide floor anchors for each jamb and mullion which extends to floor, formed of not less than 0.067 inch thick galvanized steel sheet; clip type anchors, with two holes to receive fasteners, welded to bottom of jambs.

E. Structural Reinforcing Members: Provide structural reinforcing members as a part of frame assembly, where indicated at mullions, transoms or other locations which are to be built into frame.

F. Head Reinforcing: For frames over 4 feet wide in masonry wall openings, provide continuous steel channel or angle stiffener, not less than 0.093 inch thick for full width of openings, welded to back of frame at head, except where not allowable for label requirements.

G. Finish Hardware Reinforcement: Unless otherwise indicated herein, reinforce frames for scheduled finish hardware, as follows:

1. Butt Hinges and Pivots: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide x 6 inches longer than hinge, secured by not less than six spot welds.
2. Continuous Hinges: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide x continuous, secured by spot welds 8 inches o.c.
3. Strike Plate Clips: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide x 3 inch long.
4. Surface Applied Closers: Not less than 0.093 inch thick steel sheet, secured with not less than six spot welds.
5. Concealed Closers: Removable steel access plate, not less than 0.093 inch thick internal reinforcement of size and shape required, and enclosing housing to keep closer pocket free of mortar or other materials.

H. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.

I. Rubber Door Silencers: Drill stop to receive three silencers on single door frames and four silencers on double door frames. Install plastic lugs to keep holes clear during construction.

J. Plaster Guards: Provide 0.016 inch thick steel plaster guards or dust cover boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware installation.

2.7 STOPS AND MOLDINGS

A. Provide stops and moldings around openings in hollow metal door units and frames to receive lights where indicated.

B. Form fixed stops and moldings integral with door or frame. Provide fixed stops on outside of hollow metal units exposed to exterior and on corridor side of interior units, unless otherwise indicated.

C. Provide removal stops and molds at other locations, formed of not less than 0.032 inch thick steel sheets. Secure with countersunk machine screws spaced uniformly not more than 1/2 inch o.c. form corners with butted hairline joints.

D. Coordinate width of rabbet between fixed and removable stops with type of glass or panel and type of installation indicated.

2.8 LOUVERS

A. Provide louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.020-inch thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.

B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

2.9 SHOP PAINTING

A. Clean surfaces of fabricated units of mill scale, rust, oil, grease, dirt and other foreign matter.

B. After fabrication, dress, fill and sand tool marks and surface imperfections as required to make faces and vertical edges smooth, level and free of irregularities.

C. Pretreat cleaned surface in accordance with SSPC-PT-2, SSPC-PT3 or SSPC-PT4. Verify compatibility of primer with galvanized surfaces. Provide primer on galvanized surfaces that will not affect finish paint materials.

D. Shop Applied Paint:

1. Plain Steel: For steel surfaces, use rust inhibitive enamel or paint, either air drying or baking, suitable as a base for finish paints, complying with ANSI/SDI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces.
2. Galvanized Steel: Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified to comply with ASTM A 780. After applying repair paint, clean surfaces and apply galvanized metal primer compatible coatings to be applied over it.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install hollow metal units and accessories in accordance with the final reviewed shop drawings, manufacturer's written instructions, and as herein specified.

B. Setting Masonry Anchorage Devices:

1. Provide masonry anchorage devices where required for securing hollow metal frame to in-place concrete or masonry construction.
2. Set anchorage devices opposite each anchor location in accordance with details on final shop drawings, fire-rated assembly requirements and anchorage device manufacturer's instructions. Leave drilled holes rough, not reamed and free from dust and debris.

C. Floor Anchors: Floor anchors may be set with power actuated fasteners instead of masonry anchorage devices and machine screws, if so approved by the Commissioner.

D. Placing Frames: Comply with SDI A250.11.

1. Set frames accurately in position, plumbed, aligned and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
2. For masonry construction, refer to Section 04 20 00 - Unit Masonry.
3. Install fire-rated frames in accordance with NFPA 80.
4. At in-place concrete or masonry construction, set frames and secure in place with machine screws and masonry anchorage device.
5. Make field splices in frames as detailed on final shop drawing, welded and finished to match factory work.
6. Remove spreader bars only after frames or bucks have been properly set and secured.
7. Installation Tolerances: Adjust hollow metal door frames to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

E. Door Installation: Comply with SDI A250.8.

1. Fit hollow metal doors accurately in their respective frames, with the following clearances:
   a. Jambs and Head: 3/32 inch.
   b. Meeting Edges, Pairs of Doors: 1/8 inch.

c. Bottom: 3/4 inch, where no threshold or carpet (except where scheduled as undercut).
d. Bottom: At threshold, carpet or thin-set ceramic tile: Not less than 1/4 inch and not greater than 3/8 inch from floor finish or top of threshold.

2. Install fire-rated doors in accordance with NFPA 80.
3. For hardware refer to Section 08 71 00 - Finish Door Hardware.

3.2 ADJUST AND CLEAN

A. Final Adjustment: Check and readjust operating finish hardware items in hollow metal work just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of HOLLOW METAL DOORS AND FRAMES shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of HOLLOW METAL DOORS AND FRAMES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 08 11 19

STAINLESS-STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Stainless-steel, hollow-metal doors.
2. Stainless-steel, hollow-metal frames.

B. Related Sections:

1. Unit Masonry: Section 04 20 00.
2. Finish Hardware: Section 08 71 00.

1.03 REFERENCES

A. ANSI/NFPA 80 - Fire Doors and Windows.

B. ANSI A250.4 – Test procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.

C. ASTM A 240/A 240M – Standard Specification or Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

D. ASTM E 152 - Methods of Fire Tests of Door Assemblies.

E. NAAMM CHM-1-74 - Recommended Architectural Specifications for Custom Hollow Metal Doors and Frames.

F. NAAMM Hollow Metal Technical and Design Manual - Section 6: Installation of Doors and Frames.

G. NAAMM Hollow Metal Technical and Design Manual - Section 8: Fire Rated Door and Frames.

H. NFPA 252 - Fire Tests of Door Assemblies.

I. SDI 100 - Steel Door Institute Recommended Specifications - Standard Steel Door and Frames.

J. SDI 117 – Manufacturing Tolerances Standard Steel Doors and Frames.

K. UL 10B - Fire Tests of Door Assemblies.

L. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

M. ASTM E2074 – Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.

N. DHI A115.IG – Installation Guide for Doors and Hardware.

O. NAAMM CHM-1-74 – Recommended Architectural Specifications for Custom Hollow Metal Doors and Frames.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Verification:

1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
2. Doors: Include section of vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement.
3. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

D. Schedule: Provide a schedule of stainless-steel, hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with a door hardware schedule.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of stainless-steel, hollow-metal door and frame assembly.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain stainless-steel, hollow-metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

C. Smoke- and Draft-Control Door Assemblies: At corridors, provide assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Shipping Spreaders: Deliver welded frames with two removable spreader bars across bottom of frames, tack welded or mechanically attached to jambs and mullions.

C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.

1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.08 COORDINATION

A. Coordinate installation of anchorages for stainless-steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 STAINLESS-STEEL DOORS AND FRAMES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering Stainless-Steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

1. Stainless-Steel Doors and Frames:

a. Ceco Door Products; an Assa Abloy Group company.
b. Curries Company; an Assa Abloy Group company.
c. Steelcraft; an Allegion brand.
d. Next Door Company.

2.02 STAINLESS-STEEL DOORS

A. Description: Stainless-steel doors, not less than 1-3/4 inches thick, of seamless, hollow-metal construction. Construct doors with smooth, flush surfaces without visible joints or seams on faces.

1. Face Sheets: Fabricate from 0.078-inch- thick, stainless-steel sheet.

2. Core Construction: Fabricate doors with core indicated.

a. Welded Steel-Stiffened Core: 0.031-inch- thick, stainless-steel vertical stiffeners extending full-door height, spaced not more than 6 inches apart, spot welded to face sheets a maximum of 5 inches o.c. Fill spaces between stiffeners with mineral-fiber insulation.

b. Fire-Rated Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Vertical Edges for Single-Acting Doors: Beveled 1/8 inch in 2 inches.

4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.

5. Top and Bottom Channels: Closed with continuous channels, 0.062-inch- thick stainless steel.

a. Spot welded to both face sheets.

6. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 866 with reinforcing plates from stainless steel.

7. Electrical Hardware Enclosures: Provide enclosures and junction boxes within doors for electrically operated door hardware, interconnected with UL-approved, 1/2-inch- diameter conduit and connectors.

    a. Where indicated for installation of wiring, provide access plates to junction boxes, fabricate from same material and thickness as face sheet and fasten with at least four security fasteners spaced not more than 6 inches o.c.

B. Performance: Level A, ANSI A250.4.

C. Materials:

1. Stainless-Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, UNS S31600.
2. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

D. Stainless-Steel Finishes:

1. Comply with ASTM A480/A480M. Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

    a. Run grain of directional finishes with long dimension of each piece.
    b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
    c. Directional Satin Finish: No. 4.

2.03 STAINLESS-STEEL FRAMES

A. Description: Fabricate stainless-steel frames of construction indicated, with faces of corners mitered and contact edges closed tight.

1. Door Frames: Machine mitered and full welded.

    a. Weld frames according to HMMA 820.

2. Door Frames : Fabricate from 0.109-inch- thick, stainless-steel sheet.
3. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 866 with reinforcing plates from stainless steel.
4. Head Reinforcement: 0.109-inch- thick, stainless-steel channel or angle stiffener for openings widths more than 48 inches.
5. Jamb Anchors:

a. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.064-inch- nominal thickness metallic-coated steel with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.156 inch thick.
b. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.050-inch- thick stainless steel.
c. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter, stainless-steel bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

6. Floor Anchors: Not less than 0.078-inch- thick stainless steel, and as follows:

a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
b. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

7. Ceiling Struts: Minimum 3/8-inch-thick by 2-inch- wide from stainless steel.

B. Performance: Level A, ANSI A250.4.

C. Materials:

1. Stainless-Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, UNS S31600.
2. Frame Anchors: Stainless-steel sheet. Same type as door face.
3. Inserts, Bolts, and Anchor Fasteners: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts.

D. Stainless-Steel Finishes:

1. Comply with ASTM A480/A480M. Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

a. Run grain of directional finishes with long dimension of each piece.
b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
c. Directional Satin Finish: No. 4.

2.04 ACCESSORIES

A. Grout: Comply with ASTM C 476, with a slump of not more than 4 inches as measured according to ASTM C 143/C 143M.

B. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

C. Mineral Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

2.05 FABRICATION

A. Stainless-Steel Door Fabrication: Stainless-steel doors to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal.

1. Seamless Edge Construction: Door face sheets joined at vertical edges by continuous weld extending full height of door; with edges ground and polished, providing smooth, flush surfaces with no visible seams.
2. Exterior Doors: Close top edges flush and seal joints against water penetration. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape.
3. Stops and Moldings: Factory cut openings in doors. Provide stops and moldings around glazed lites. Form corners of stops and moldings with butted or mitered hairline joints.

    a. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

4. Hardware Preparation: Factory prepare stainless-steel doors to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08 71 00 "Finish Hardware"

    a. Reinforce doors to receive nontemplated mortised and surface-mounted door hardware.

5. Locate hardware as indicated, or if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
6. Tolerances: Fabricate doors to tolerances indicated in ANSI/NAAMM-HMMA 866.

B. Stainless-Steel Frame Fabrication: Fabricate stainless-steel frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

1. Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where frames are fabricated in sections due to shipping or

handling limitations, provide alignment plates or angles at each joint, fabricated from same thickness metal as frames.

2. Provide countersunk, flat-, or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
4. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb from 60 to 90 inches in height.
        2) Four anchors per jamb from 90 to 96 inches in height.

    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Four anchors per jamb from 60 to 90 inches in height.
        2) Five anchors per jamb from 90 to 96 inches in height.
        3) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.

    c. Compression Type: Not less than two anchors in each jamb.
    d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

5. Head Reinforcement: For frames more than 48 inches wide, provide continuous head reinforcement for full width of opening, welded to back of frame at head.
6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

7. Hardware Preparation: Factory prepare stainless-steel frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08 71 00 "Finish Hardware"

    a. Reinforce frames to receive nontemplated mortised and surface-mounted door hardware.
    b. Locate hardware as indicated, or if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."

8. Tolerances: Fabricate frames to tolerances indicated in ANSI/NAAMM-HMMA 866.

2.06 LOUVERS

A. Provide louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.020-inch thick, stainless-steel sheet set into 0.032-inch- thick stainless-steel sheet frame.

1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.

B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stainless-steel doors and frames.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of stainless-steel, door-frame connections before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation and with installation spreaders in place, adjust and securely brace stainless-steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.03 INSTALLATION

A. General: Install stainless-steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with ANSI/NAAMM-HMMA 866 and manufacturer's written instructions.

B. Stainless-Steel Frames: Install stainless-steel frames of size and profile indicated.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install door silencers in frames before grouting.
    d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    e. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    f. Apply corrosion-resistant coating to backs of grout-filled frames.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors, if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.

7. Installation Tolerances: Adjust stainless-steel frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Stainless-Steel Doors: Fit non-fire-rated doors accurately in frames with the following clearances:

1. Non-Fire-Rated Doors:

    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Install glazing in sidelights, transoms, and borrowed lights to comply with installation requirements in Section 088000 "Glazing."

1. Secure stops with countersunk, flat-, or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work including stainless-steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off stainless-steel doors and frames immediately after installation.

C. Stainless-Steel Touchup: Immediately after erection, smooth any abraded areas of stainless steel and polish to match undamaged finish.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of STAINLESS-STEEL DOORS AND FRAMES shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of STAINLESS-STEEL DOORS AND FRAMES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Access doors, including installation accessories.

B. Related Sections:

1. Unit masonry: Section 04 20 00.
2. Non-structural metal framing: Section 09 22 16
3. Gypsum plaster: Section 09 23 00.
4. Portland cement plaster: Section 09 24 00.
5. Gypsum board: Section 09 29 00.
6. Acoustical ceilings: Section 09 51 00
7. Painting: Section 09 91 00.

1.2 ACTION SUBMITTALS

A. Shop Drawings: Plan, elevation and details of construction for each type of door specified.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions.

B. Coordination Drawings: Provide plans drawn to scale coordinating access doors with items of construction, systems and equipment concealed in ceilings and walls requiring access. Include subcontractor signatures certifying coordination.

C. Certification: Copies certification of UL listing for fire-rated doors.

1.4 QUALITY ASSURANCE

A. Provide access doors in fire-rated construction complying with UL listed and bearing labels required.

B. Coordination:

1. Coordinate the required sizes, locations and quantities of access panels with the Mechanical, Electrical, Plumbing and Fire Protection Contractors. Provide coordination drawings signed by Mechanical, Electrical, Plumbing and Fire Protection Contractors certifying coordination.

2. Furnish inserts and anchoring devices to be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Karp Associates, Inc., Maspeth, NY 11378.

B. Milcor Incorporated, Lima, OH 45804.

C. Nystrom, Inc., Minneapolis, MN 55413.

2.2 ITEMS

A. Type VII: Flush panel access door with exposed flange for various non-fire-rated constructions, one of the following:

1. Karp, DSC-214M.
2. Milcor, Style M.
3. Nystrom, NT.

2.3 FABRICATION

A. Type VII: Flush panel access door with exposed flange for various non-fire-rated constructions:

1. Provide frame of 0.060 inch thick steel door frame with 0.075 inch thick flush steel door.
2. Provide door and frame factory prime coated with baked enamel over a protective phosphate coating on the steel.
3. Provide continuous pin mounted hinges on longest side opening 180 degrees.
4. Provide flush locks, with metal cam and be a key operated cylinder lock.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive the access doors. Verify dimensions of in-place and subsequent construction. Installation of the access doors shall constitute acceptance of the related construction.

3.2 INSTALLATION

A. Install access doors as shown, or in the absence of details, in accordance with manufacturer's instructions.

B. Following installation of the access doors, clean surfaces, lubricate and test operation of moving parts. Make adjustments in operation as necessary.

C. Deliver keys for access doors to the Commissioner with tags identifying each door, its location and description of access.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of ACCESS DOORS shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of ACCESS DOORS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 08 31 19
FLOOR HATCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Aluminum floor hatches.

B. Related Sections:

1. Cast-in-Place Concrete: Section 03 30 00.
2. Metal Fabrications: Section 05 50 00.
3. Roof Hatches: Section 07 72 33.
4. Access Doors: Section 08 31 00.
5. Painting: Section 09 91 00.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Plans, elevations and details of each item, include method of attachment to the floor construction and descriptions of fasteners to be used and their spacing.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions.

B. Warranty: Signed copies.

1.5 WARRANTY

A. Provide manufacturer's written warranty stating that the floor hatches will be free of faults and defects in accordance with the General Conditions, except the warranty period is to be for 5 years instead of 1 year.

B. Provide warranty signed by the Floor Hatch Manufacturer and the Installing Contractor.

C. This warranty is in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents.

1.6 DELIVERY, STORAGE, and HANDLING

A. Store floor hatches under cover in a dry and clean location off the ground. Remove materials that are damaged or otherwise not suitable for installation from job site and replace with acceptable materials.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The Bilco Company; New Haven, CT 06505.

B. Babcock-Davis Hatchways Inc.; Arlington, MA 02174.

C. Milcor; Holland, OH 43528.

D. Nystrom, Inc., Minneapolis MN 55428.

2.2 ITEMS

A. Provide pedestrian loading aluminum floor hatch of the sizes and configurations shown on the Drawings, one of the following:

1. "Model K (Single Leaf)" (Bilco).
2. "Type FCA (Single Leaf)" (Babcock-Davis).
3. "Type FC (Single Leaf)" (Milcor).
4. "Type FDRP (Single Leaf)" (Nystrom).

2.3 MATERIALS

A. Aluminum Diamond Tread Plate: ASTM B 632/ B 632M, minimum 1/4 inch 6061-T6 aluminum with mill finish.

B. Aluminum Extrusion: ASTM B 221 6061-T6 aluminum with protective paint finish to safeguard effects of concrete.

C. Anodized Aluminum: AAMA 611 clear and colored.

D. Steel Angle: ASTM A 36/ A 36M steel frame with baked on rust-inhibitive gray prime finish.

E. Frame Anchors: Same material as door face.

F. Fasteners: Type No. 316 stainless steel. ASTM F 593 for bolts and ASTM F 594 for nuts.

G. Epoxy Paint: Manufacturer's standard applied epoxy paint.

2.4 FABRICATION

A. Aluminum Floor Door: Minimum 1/4 inch thick extruded-aluminum angle frame with, minimum 1/4 inch thick diamond-pattern, aluminum tread plate door; nonwatertight; loading capacity to support 150-lbf/sq. ft. pedestrian live load.

1. Frame Finish: Protective epoxy coating at areas that contact concrete.
2. Door Finish: Mill finish.

B. Operating Hardware:

1. Material and Finish: Type 316 stainless steel, including latch and lifting mechanism assemblies, hold-open arms, and brackets, hinges, pins, and fasteners.
2. Hinges: Heavy-duty butt hinges with stainless steel pins.
3. Operating Mechanism: Adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release handle with vinyl grip that allows for one-handed closure, and recessed lift handle.
4. Latch: Stainless steel slam latch.

C. General: Provide floor doors manufactured as integral units ready for installation.

D. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

E. Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure floor doors to types of supports indicated.

F. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder locks, furnish two keys per lock and key locks alike.
2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

G. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that comes in contact with concrete.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine surfaces to receive the floor hatches. Verify dimensions of in-place and subsequent construction. Installation of the floor hatches constitutes acceptance of the related construction.

B. Install floor hatches as shown on the Drawings and in accordance with manufacturer's instructions. Anchor to the floor construction with fasteners appropriate to the materials present.

3.2 CLEAN AND ADJUST

A. Following installation of the floor hatches, clean surfaces, lubricate and test operation of moving parts in the presence of the Commissioner's representative. Make adjustments in operation as necessary.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of FLOOR HATCHES shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of FLOOR HATCHES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 08 44 13
ALUMINUM GLAZED CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Aluminum curtain walls, including the following:

1. EWS-01 - Custom 2-side SSG aluminum curtain wall, vertical steel reinforcement, weatherseal at glass joints. Concealed deadload support.

2. EWS-02 - Custom, 2-Sided SSG aluminum curtain wall with metal panels.

B. Related Sections:

1. Cast-In-Place Architectural Concrete: Section 03 33 00.
2. Architecturally Exposed Structural Steel 05 12 13
3. Building Thermal Insulation: Section 07 21 00.
4. Stainless Steel Plate Wall Panel System: Section 07 42 12.
5. Sheet Metal Flashing and Trim: Section 07 62 00.
6. Joint Sealants: Section 07 92 00.
7. Glazing: Section 08 80 00.
8. Stainless Steel Louvers: Section 08 91 30.
9. Painting: 09 91 00.

B. Provide the components for a complete system including, but not limited to the following:

1. Brackets and fixings.
2. Project Out Opening exhaust/intake vent.
3. Incorporated doors.
4. Framing.
5. Glazing.
6. Metal back pans and insulation.
7. Metal Panels, both rainscreen system and insulated metal panels.
8. Sealants.
9. Gaskets and beads.
10. Fixings and fastenings.
11. Flashings.
12. Finishes.
13. Penetrations for services.
14. Fin tube enclosure.

15. Doors.

C. Sizes and profiles of mullions shown on drawings are for aesthetic intent and are subject to verification.

D. Submit changes for review by the Commissioner.

E. The work in this section shall be executed by a firm responsible for installations similar to that specified during the immediate past five years and with adequate plant, equipment and skilled workers to perform work expeditiously.

F. Provide aluminum glazed curtain wall work as shown in or inferred from the requirements of the Contract Documents, including but not limited to the following:

1. Design, engineer, test, fabricate, deliver, install, and guarantee construction necessary to provide for the Curtain walls with fixed glazing metal panels, Entry Doors and for the complete airtight and watertight enclosure of the building. Curtain wall shall be complete.
2. Provide different façade types as stick system curtain wall, unitized system curtain wall as dry gasket system, with and without exterior glass fins, trim covers, painted metal panel systems, back pan materials, anchors, reinforcements, and aluminum copings as indicated.
3. Incorporate a dual-sealed system throughout, including perimeter conditions and connections to adjacent construction.
4. Incorporate a continuous vapor barrier system throughout, including perimeter conditions and connections to adjacent construction.
5. Provide signed and sealed calculations by a State of Illinois licensed Structural Engineer.
6. Sealants and gaskets in conjunction with components for weather tight performance in the fabrication and erection of the curtain wall systems.
7. Anchorage of components, including pre-set inserts in concrete slab, bracing to or bracing of structure, kickers, reinforcing, etc. as needed.
8. Submittals.
9. Coordination.
10. Visual mockup as indicated. Provide for mockup trip and inspection.
11. Reinforcing.
12. Vents, weeps, weep tubes, bellows, baffles, closures, end dams, gutters, flashings, trim as shown or as may be needed in conjunction with system or to join systems to adjacent construction.
13. Fire safing and smoke seals at slab edges, including support system.
14. Insulation and air barrier required.
15. Complete lightning protection if a separate system is not available.
16. Coordination and reinforcing for building maintenance equipment, tie-back, anchors, brackets, rails, etc. that interface with the system.
17. Integration of exterior light fixtures, wiring conduit, transformers and associated accessories.
18. Quality management system
19. Field testing of installed work.
20. Field touch up of finishes after installation and final adjustment.
21. Temporary Protection and cleaning.
22. Attic stock.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design Aluminum Glazed Curtain walls, including comprehensive engineering analysis by a qualified Structural Engineer, using performance requirements and design criteria indicated.

B. Performance Criteria: Comply with performance requirements specified, as determined by preconstruction testing of manufacturer's standard Aluminum Glazed Curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum Glazed Curtain walls shall withstand movements of supporting structure.
2. Failure includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

C. Building Movements:

1. The Aluminum Glazed Curtain walls shall be designed to accommodate dead load and live load deflection, thermal expansion, creep, elastic shortening, sway, or torsion of the building frame, and resist seismic forces as may be anticipated.

2. It is anticipated that the typical joint width shall be a consistent dimension as indicated. Structural deflection calculations should be used to determine the maximum anticipated panel deflection in three dimensional twist plus movement manner. Joint compression, expansion or sheer shall be limited to 50 percent of the joint width.

D. Structural Loads:

1. Design Loads indicated in the Structural Drawings.
2. Design Wind Load: Determine loads based on Chicago Building Code and ASCE.
3. Building Maintenance-Equipment Loads: 0.6 kip in any direction in accordance with AAMA 503.3 and ANSI/ASME A39.

E. Structural-Test Performance: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Deflection of Framing Members at design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller and an amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
    a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
3. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.
4. Do not permit any permanent deformation (set) in the metal framing work. Permanent deformation, fastener, weld, or gasket failure, component breakage or disengagement shall not occur under wind loading equal to 1.5 times the wind loads (positive or negative). Permanent deformation shall be taken as deflection without recovery exceeding 1/1000 span for simple spans and 2/1000 for cantilever conditions.

G. Air Infiltration per ASTM E 283: Maximum air leakage of 0.06 cfm/ft at an air pressure differential of 6.24 psf.

H. Water Penetration under Static Pressure per ASTM E 331: No evidence of water penetration through fixed glazing and framing areas when tested at a minimum static-air pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.

I. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.
1. According to AAMA 501.1. there shall be no uncontrolled water penetrating assemblies or water appearing on assemblies normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.

J. Thermal Movements: Provide systems, including anchorage, that allow for thermal movements resulting from the following maximum range in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Range for single skin: 120 deg F for ambient; 180 deg F for material surfaces.
2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

K. Thermal Stress Resistance:

1. Ensure that no glass or glazing combination develops stresses that may lead to damage of glass, glazing materials, components and /or framing systems. Conduct a thermal stress analysis and make due allowance for thermal treatment or edge working of annealed glass which may be required.

L. Energy Performance:

1. Glass types: Refer to Section 08 80 00 "Glazing".

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop drawings:

1. Include plans, elevations, sections, full-size details, and attachments to other work.
2. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
3. Include full-size isometric details of each vertical-to-horizontal intersection of wall enclosures, showing the following:
   a. Joinery, including concealed welds.
   b. Anchorage.
   c. Expansion provisions.
   d. Glazing.
   e. Flashing and drainage.
   f. Air barrier transitions (i.e. fluid applied, roofing etc.).
4. Resubmit Shop Drawings with changes made to wall enclosures to successfully complete preconstruction testing.

C. Samples:

1. Samples for Initial Selection: For units with factory-applied color finishes.
2. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
3. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12inch lengths of full-size components and showing details of the following:
   a. Joinery, including concealed welds.
   b. Anchorage.
   c. Expansion provisions.
   d. Glazing.
   e. Flashing and drainage.

1.5 INFORMATIONAL SUBMITTALS

A. Calculations: Submit, for information only, copies of structural calculations for the exterior wall. Calculations shall be prepared, signed and sealed by a Structural Engineer registered in the State of Illinois.

B. Certifications: For qualified Fabricator/Installer and preconstruction testing agency and testing agency.

1. Welding certificates as required.
2. Energy performance certificates for wall enclosures, accessories, and components, from manufacturer.
3. Product test reports based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for wall enclosures, indicating compliance with performance requirements.

C. Warranties: Sample of warranties, coordinated with Building Commissioning.

D. Installation Drawings: After approval of shop drawings, provide a detailed set of field installation drawings and a written installation procedure. Identify each part by size and number.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wall enclosures to include.

1. Written or graphic re-glazing and replacement strategy.
2. Operation and Maintenance Manuals, including component list with Manufacturers reference numbers descriptions of materials and procedures for repairing and replacing and cleaning of finishes and cleaning frequency.

B. Written maintenance instructions for the care, cleaning and servicing of components.

C. A complete set of record shop drawings.

1.7 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Work of this section to be performed by a company which specializes in the type of glazed curtain wall work required for this Project, with a minimum of 5 years of documented successful experience, using skilled workers thoroughly experienced in the necessary crafts.

B. Installer’s Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project. An experienced installer with more than 5 years of experience who has completed similar projects and whose work has resulted in construction with a record of successful in-service performance. Submit a written description of the proposed installer giving the

qualifications of personnel, years of experience in installing similar projects and list of reference projects.

C. Source Limitations: Provide single source aluminum glazed curtain wall system, glazing and accessories for each product and installation method indicated.

D. Submit proposed details, engineering calculations confirming proposed sizes of glass and structural members and loading reactions to the perimeter structure adjacent to this scope of work.

1. Shop Drawings, preconstruction-testing program development, and comprehensive engineering analysis by a qualified Structural Engineer registered in Illinois.

E. Structural-Sealant Glazing: Comply with ASTM C 1401, "Guide for Structural Sealant Glazing" for design and installation of structural-sealant-glazed systems.

F. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

1.8 DELIVERY, STORAGE AND HANDLING

A. Comply with application provisions of AAMA CW-10 for care and handling of Curtain wall work from shop to site.

B. Identify components of curtain wall work after fabrication by marks clearly indicating their location in building.

C. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of metals.

D. Protect units adequately against damage from elements, construction activities and other hazards, before, during and after installation until acceptance by the Commissioner.

1.9 PROJECT/SITE CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify actual locations of structural supports for Aluminum Glazed Curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

C. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.10 MOCKUP INSTALLATION

A. Refer to Sections 01 40 00 - Quality Requirements and 01 43 41 - Special Mockups.

1.11 WARRANTY

A. Standard Finish Warranty: Repair finishes that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: 20 years from date of Substantial Completion.

B. High Performance Organic Coatings: Submit a warranty for the integrity of film and permanence of color of the high performance organic coatings for the following:

1. Color fade not to exceed 5 delta E units (Hunter) as calculated in accordance with ASTM D 2244 on exposed surfaces cleaned with clean water and a soft cloth.
2. Degree of chalking not to exceed rating No. 8 when measured in accordance with ASTM D 4214 on exposed unwashed surfaces.
3. Will not crack, check or peel.
4. Warranty Period: 20 years from date of Substantial Completion.

C. Thermosetting Acrylic Enamel Coatings: Submit a warranty for the integrity of film against cracking, chipping, flaking, peeling and blistering of the thermosetting acrylic enamel coatings.

1. Warranty Period: 5 years from date of Substantial Completion.

1.12 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of all-glass system Installer. Include quarterly preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper all-glass system operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Substitution Criteria: Aluminum glazed curtain wall manufactured by the manufacturers listed below (or others) will be considered if they fully meet the

aesthetic and Performance Requirements of this section and are accepted by the Commissioner. Subject to compliance and requirements, and approval by sample or mockup, provide products by one or a combination of the following, or approved equal:

B. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include:

1. Permastelisa.
2. Pioneer.
3. Sota Wall.
4. Enclos.
5. Gartner.
6. Benson.
7. Schuco USA.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221; 6063-T5 extruded aluminum for non-structural components or 6063-T6 extruded aluminum for structural members; temper and alloy as recommended by manufacturer.
2. Sheet and Plate: ASTM B 209; 6065-T5 temper and alloy as recommended by manufacturer.
   a. Formed flashing and closures: Minimum 0.062 inch thick aluminum, in finish as selected.
   b. Extruded sill members: Minimum 0.062 inch thick aluminum, in finish as selected.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308.
5. Welding Rods and Bare Electrodes: AWS A5.10.

B. Stainless Steel bars and sheet shall be of 300 series according to ASTM A 240.

1. External use: Type 316, passivation according to ASTM A 967
2. Internal use: Type 304, passivation according to ASTM A 967
3. Minimum thickness is: 0.062 inch for frames; 0.031 inch for trim covers; 0.012 inch for concealed flashing; 0.015 inch for exposed flashing; 0.125 inch for stone anchors; 0.125 inch for wall panels.

C. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A 36
2. Cold-Rolled Sheet and Strip: ASTM A 1008.
3. Select surface preparation methods according to recommendations in SSPCSPCOM and prepare surfaces according to applicable SSPC standard.
4. Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment.

5. Galvanized Steel: hot-dip galvanized coating per ASTM A 153.

D. Hot-Rolled Sheet and Strip: ASTM A 1011.

E. Tension Rods:

1. Rods shall be either carbon steel or stainless steel, as required. End elements shall be clevis type or threaded and attach per the methods details on the drawings.

F. Anchors and Fasteners:

1. Material: Non-magnetic stainless-steel:
   a. For areas outboard and through air seal – ASTM A 276, UNS S31600.
   b. For areas Interior to air seal – ASTM A 276, UNS S30400.
2. Anchor and Fastener Metal Alloy Tapes, Designations and Standards: Alloys as selected by fabricator to prevent corrosion resistance with components fastened. Do not use self-drilling, self-tapping type fasteners.
3. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devises.
4. 3-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
5. Touch up galvanized surfaces with galvanic paint.

G. Fire Safing and Smoke Seal: Refer to Section 07 84 43 "Joint Firestopping."

1. Spandrel back panes working in conjugation with the perimeter firesafing: 18 gauge steel sheet for a minimum of 1 hour rating for the total assembly per UL rating.

H. Low Friction Materials

1. Wherever materials are subject by design to relative movement, provide suitable low friction materials:
   a. Teflon strip, 0.03 inch thick; and Teflon tape, 0.005 inch thick.
   b. High-impact polystyrene or Nylatron equal to Eel-Slip pads as manufactured by Scan-Pac.
2. Low friction materials shall be impervious to moisture.

I. Sealing, Glass and Glazing Materials

1. Concealed Sealing Materials: Silicone, compatible with and adherent to each material it will be in contact with, as recommended by the manufacturer to fulfill performance requirements.
2. Exposed Sealing Materials: Silicone, refer to Section 07 92 00 "Joint Sealants."
3. Glass and Glazing Materials: Refer to Section 08 80 00 "Glazing."

J. Thermal Isolators: Provide rigid polyamide type isolators of profile and hardness as recommended by the Aluminum Glazed Curtain wall fabricator, and fabricated to a cross sectional profile to interlock with aluminum extrusions for thermal isolation of exterior window frame snap caps to interior window framing.

K. Insulation: Refer to Section 07 21 00 "Building Thermal Insulation".

L. Louvers: Refer to Section 08 91 30 "Stainless Steel Louvers."

M. Concealed Flashing: Manufacturer's standard, corrosion-resistant, non-staining, non-bleeding flashing compatible with adjacent materials Dead-soft, 0.018-inch thick stainless steel, ASTM A 240 of type recommended in writing by manufacturer. Refer to Section 07 62 00 “Sheet Metal Flashing and Trim”.

N. Exposed Flashing and Closures: Manufacturer's standard aluminum components not less than 0.060 inch thick. See Section 07 62 00 Sheet Metal Flashing and Trim.

O. Framing Gaskets: Manufacturer's standard, otherwise silicone gaskets.

P. Framing Sealants: As recommended in writing by manufacturer or specified in Section 07 92 00 Joint Sealants.

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 15.6 lb/cu ft or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

Q. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by de-scaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fit joints with ends coped or mitered.
3. Physically and thermally isolate glazing from framing members.
4. Accommodate thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior, unless defined otherwise on the architectural drawings.
6. To greatest extent possible conceal from view fasteners, anchors, and connection devices.
7. Curve curtain wall surfaces by faceting the units.

D. Fabricate components that, when assembled, have the following characteristics:

1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within Aluminum Glazed Curtain wall to exterior.

2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of Aluminum Glazed Curtain wall and secondary seal weeped and vented to exterior.

E. Aluminum Glazed Curtain Wall System

1. Provide adequate metal thicknesses, methods of construction, and reinforcement to meet conditions, with the requirements of the Commissioner's details and specifications as a minimum.
2. Accurately follow the method of construction, reinforcement anchorage, details of finish, jointing, etc., shown on the reviewed shop drawings.
3. Fabricate and assemble in accordance with the Aluminum Glazed Curtain Wall manufacturer's standard procedures and general industry practices.
4. Perform fitting and assembly/glazing in the shop under controlled conditions.
5. Shop glaze unitized aluminum curtain wall system in strict accordance with reviewed shop drawings using specified seals and gaskets to provide a weather tight installation and to meet the performance criteria specified in this Section.
6. Build units square, true accurate to size, free from distortion, waves, twists, buckles or other defects detrimental to appearance and performance.
7. Do not, under any circumstances, interrupt or compromise the thermal break system by using drill through pressure plate screws.
8. Fabricate metal components of sharp and well defined profiles and of gauges and thicknesses not less than those indicated and/or needed.
9. Fabricate modules one story high, or as otherwise dictated by interfacing conditions.
10. Fit and assemble in the shop, units too large for handling or shipping to check accuracy, disassembled and marked for shipping and field assembly.
11. Provide minimum 1/2" bite for factory-sealed glazing units.
12. Fit intersecting members to flush hairline, weather-tight joints and mechanically interlock together, except where specified or detailed otherwise.
13. Seal vertical and horizontal members to maintain integrity of air seals. Ensure internal joints are completely sealed to maintain continuity of the air barrier.
14. Fabricate horizontal members to form individually pressure equalized and sealed gutter members.
15. Provide vent holes to allow for drainage and pressure equalized and sealed gutter members.
16. Manufacturer's identifications, such a labels and name plates visible on the finished work are not permitted.
17. Unless otherwise accepted by the Commissioner, provide concealed fastenings throughout.
18. Make allowance for deflection of structure to ensure that structural loads are not transmitted to framing or glazing.
19. Provide vertical expansion and construction joints designed with baffled overlaps with a compressed resilient air seal laid in between the mullion ends.
20. Fabricate unitized curtain wall framing to receive doors and hardware. Provide adapters as required.

F. Spandrel Panels

1. Fabricate spandrel panel complete with backing and reinforcing as detailed or as required by the specification, and in accordance with the reviewed shop drawings.

2. Fit insulation into the back up panels and secure in place by being impaled into welded pins and retained by integral discs. The retaining discs must be black when used in combination with black coated fiberglass.
3. Ventilate space between spandrel back side of spandrel facing material and face of insulation to prevent fracture of glass due to excessive heat build-up.
4. Fabricate spandrel panel to function under stress and not induce buckling, bulging, oil canning, deformation or displacement in visible members.
5. Back pans to be fully sealed to the framing of curtain wall to act as vapor barrier.

G. Metal panels

1. Metals panels, fascia, copings, sills and other sheet or plate fabricated items shall be flat and free of bow or "oil canning" or "read thru" of stiffeners, welds. Exposed metal faces shall be of such flatness that the maximum uniform bow in 2 feet shall not exceed 1/32 inch and the maximum overall variation in plane between high and low point within a panel shall not exceed 1/16 inch.

H. Factory-Assembled Frame Units:

1. Rigidly secure non-movement joints.
2. Seal joints watertight unless otherwise indicated.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.4 GLAZING

A. Glazing: Comply with Section 08 80 00 "Glazing."

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Four sided glazed aluminum framed doors see Door Schedule.

B. Entrance Door Hardware:

1. Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer. For exposed parts, match metal and finish of patch and rail fittings.

C. Opening-Force Requirements:

1. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.

2.6 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

B. Add on Gasket: Silicone gasket Shore A 65 +/-5.

C. Sealants: As recommended in writing by manufacturer or specified in Section 07 92 00 Joint Sealants.

2.7 PERIMETER SEALANT AND EXPANSION JOINTS

A. Provide expansion joints specified herein as backing materials to joint sealants.

B. Apply sealant to joint between metal to metal components and metal frames to adjacent building materials around full perimeter.

C. Use skilled mechanics thoroughly trained and competent in the use of sealing materials and of pressure operated equipment. Apply sealant with gun having proper nozzle size.

D. Clean debris from curtain wall during erection and provide temporary closure to prevent accumulation of debris.

2.8 ALUMINUM FINISHES

A. As shown for the respective units and matching the reviewed samples. Remove scratches, abrasions, dents, and other defects prior to finishing operations. Perform this work in addition to finish treatment specified. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations unless otherwise specified. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Exposed to view under any conditions, including exposed cut ends and panel edges, shall receive factory applied coating to comply with AAMA 2605 both outside and inside. Aluminum surfaces in potentially wetted gutter areas, subject to wetting or water run-off or used as a structural silicone adhesion substrate shall receive either finish described hereinabove or alternative protective coating or finish as may be approved by the Commissioner

C. Finish shall be applied by an applicator licensed by the coating manufacturer and applied in strict conformance with the coating manufacturer’s specifications for cleaning, priming, finish coat applications and quality control.

D. High Performance Organic Finish: Manufacturer’s standard 2-coat, thermal cured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear top coat containing not less than 70 percent polyvinylidene fluoride resin by weight. Prepare, pretreat

and apply coating to exposed metal surfaces to comply with AAMA 2605 and coating and resin manufacturer's written instructions.

1. Painted aluminum finish shall be factory oven cured, 2-coat to comply with AAMA 2605. Color to be selected by the Commissioner.
2. Color shall match approved samples. Samples shall show extremes of color range.
3. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
4. Pretreat metal surfaces in accordance with AAMA 2605 and procedures recommended by formulator.
5. Finishes: AAMA 2605.

2.9 ALUMINUM FINISHES FOR ENTRANCE DOOR SYSTEMS

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finishes: AAMA 2605.

2.10 ALUMINUM FINISH AT STRUCTURAL SILICONE

A. Mill finish is not acceptable at structural silicone bonding surfaces.

B. Aluminum surface to which structural silicone will be adhered shall have a finish that demonstrates by test the ability to satisfy specified requirements. Subject to testing, acceptable finishes are:

1. AAMA 2605.
2. Architectural Class I anodizing conforming to AAMA 611.
3. Alodine conversion coating.

2.11 STEEL FINISHES

A. Refer to Section 09 91 00 Painting.

2.12 COATINGS FOR CONCEALED METAL SURFACES

A. General: The following protective coatings shall be applied to surfaces of metals which are to be concealed in the construction:

1. Coating for Carbon Steel: Hot dip galvanized, complying with ASTM A 123.
2. Coating for Aluminum, and Carbon Steel: Where aluminum or carbon steel surfaces are to be in contact with each other or in contact with dissimilar materials such as masonry or concrete, and where hot dip galvanizing of carbon

steel is incompatible with component parts because of galvanic action or component fabrication tolerances provide one of the following:

a. Bituminous Paint: Cold-applied, non-sagging, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos. Apply in two coats for an overall minimum dry film thickness of 25 mils.
b. Zinc Rich Primer: Organic zinc-rich primer, complying with SSPC-Paint 20.

2.13 SOURCE QUALITY CONTROL

A. Structural-Sealant Glazing: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, material qualification procedures, sealant testing, and fabrication reviews and checks.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Before beginning installation of Aluminum Glazed Curtain wall work examine building structural frame and existing building cladding indicated to support Aluminum Glazed Curtain wall work. Notify Commissioner in writing, of any dimensions, or conditions, found which will prevent proper execution of Aluminum Glazed Curtain wall work.

C. Field Measurements: Verify dimensions of supporting structure by field measurements before fabrication so curtain wall work will be accurately designed, fabricated and fitted to structure. Indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Provide lines and benchmarks as a basis for measurements.

D. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 PREPARATION

A. Coordinate Aluminum Glazed Curtain wall work with work of other Sections especially location of embeds, and provide items to be placed during installation of other work at proper time to avoid delays in work

B. Place such items, including concealed overhead framing, accurately in relation to final location of Aluminum Glazed Curtain wall components.

3.3 ERECTION TOLERANCES

A. Aluminum Glazed Curtain wall systems shall be fabricated and erected to accommodate dimensional tolerances of structural frame and surrounding cladding while providing installed tolerances:

B. Variation from theoretical calculated position as located in plan or elevation in relation to established floors lines, column lines and other fixed elements of the structure, including variations from plumb, level, straight and member size: +/- 1/4 inch max in any 20'-0" run, column-to-column bay, or floor-to-floor height.

C. Alignment: Where surfaces abut in line, and meet at corners, limit offset from true alignment to 1/32 inch

D. Variation from angle, or plumb, shown: +/- 1/8 inch max in any 10'-0" run or story height, non-cumulative.

E. Variation from slope, or level, shown: +/- 1/8 inch max in any 20'-0" run or column-to-column bay, non-cumulative.

3.4 INSTALLATION

A. Anchor work to structure and surrounding cladding in accordance with accepted shop drawings.

B. Install work using skilled mechanics, specially trained, experienced in this type of work, and who are full time employees of the installer.

C. Prevent vibration harmonics or thermal movement from being transmitted to building, loosening, weakening and/or fracturing connections between units and the structure or between the units themselves.

D. Include anchors, weather stripping, flashing, and calking as necessary to provide a complete installation. Erect members that are not warped, bowed, deformed, or otherwise damaged.

E. Provide necessary reinforcing to sections, and provide necessary anchor plates for securing materials.

F. Provide structural anchors with three way adjustment. Weld anchors into place. Use mechanical fasteners for attachment of unitized curtain wall to anchors.

G. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.

H. Anchor frames without distortion or stress from expansion and contraction of the metal.

I. Anchor component parts to transmit wind loads and other stresses to the anchorage system. Install anchors to transmit uniformly distributed loads through the structure at each floor.

J. Erect and secure work plumb, square, level, straight and securely attached to adjacent construction surrounding openings provided, and at proper elevations and in alignment with adjacent work.

K. Provide necessary expansion joints in members as required at allow aluminum sections to expand and contract without damaging the glass or glazing assemblies.

L. Apply a heavy brush coat of alkaline resistant bituminous material or alkaline resistant bituminous paint to aluminum framing clips, anchors, or loose parts in contact with concrete, mortar, plaster, or dissimilar metals.

M. Provide aluminum flashing necessary to complete the installation. Install flashing at the head of aluminum curtain wall and elsewhere as required to provide a weather tight installation. Fabricate break shapes prior to application of finish.

N. Straighten components so that glazing and expansion rabbets will be square, flat, plumb and true. Draw up fixed supporting connections to safe tension to avoid future shifting of glass-clad wall components. Adjust sliding connections to permit necessary relative motion between elements.

O. Do not bridge the thermal break between the interior and exterior sections of the frames with a metal which will destroy the thermal separation provided.

P. Assess each component for appearance and color and consider any variations when arranging components for assembly. Abrupt variations in appearance and color will not be permitted.

Q. Provide mechanical fastening (safety screws) to caps to prevent separation of and sliding on pressure plates.

R. Ensure that drainage holes in pressure plates are not blocked during field assembly of curtain wall system.

S. Install spandrel panel same as glazing, to provide a complete weather tight installation.

T. Fit joints to produce hairline joints free from burrs and distortion.

U. Cutting and trimming components during erection is prohibited.

3.5 FIELD QUALITY CONTROL

A. After completion of curtain wall installation, test the curtain wall from the exterior for water leaks in accordance with AAMA 501.2 "Field Check of Metal Curtain Walls for Water Leakage". Test exterior glazing system and perimeter joints at abutting construction. A minimum of two tests areas, designated by the Commissioner for each system, shall be tested.

B. Repair leaks and other defects. Retest as directed by the Commissioner. Repair or replace other work damaged by such leaks.

3.6 CLEANING AND PROTECTION

A. Clean metal surfaces promptly after installation, exercising care to avoid damage to factory finished exposed surfaces.

B. Wash glass on both faces not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer. Remove excess glazing and sealant compounds, dirt, and other substances.

C. Immediately remove any deleterious material from surfaces of metal and glass.

D. Remove non-permanent labels, and clean surfaces.

E. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

F. Adjust doors for smooth operation.

G. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

H. Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

I. Touch-up Painting: Cleaning and touch-up painting of any field welds and abraded areas of shop paint or stainless parts shall be completed to blend with the adjacent surfaces of the product. Such touch-up work shall be done in accordance with manufacturer's instructions.

J. Institute protective measures required throughout the construction period to ensure that glazed window work will be without damage or deterioration, at time of acceptance.

K. Schedule training with Commissioner with at least seven days advance notice.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of ALUMINUM GLAZED CURTAIN WALLS shall not be measure for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of ALUMINUM GLAZED CURTAIN WALLS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000

END OF SECTION

SECTION 08 71 00
FINISH DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Finish door hardware for swing doors.

B. Related Sections:

1. Hollow metal doors and frames: Section 08 11 13.
2. Stainless steel doors and frames: Section 08 11 19.
3. Aluminum glazed curtain walls: Section 08 44 13.
4. Structural Glass curtain walls: Section 08 44 26.
5. Automatic door operators: Section 08 71 13.
6. Painting: Section 09 91 00.
7. Electronic Safety and Security: Division 28

1.3 ACTION SUBMITTALS

A. Product Data.

B. Samples:

1. Samples for Verification: Submit minimum 2-by-4-inch plate samples of each type of finish required, except primed finish.
2. Lockset Lever and Rose: 1 lockset with rose, if any, of each design and finish scheduled in the reviewed hardware schedule. Samples will be returned at the completion of the Work.

C. Hardware Schedule:

1. Provide hardware schedule containing a complete listing of finish hardware items required for the project, whether or not specifically named in the Specifications or indicated on the Drawings. The review of the schedule is not to be construed to relieve the Contractor of responsibility for errors or omissions in the schedule, nor of the responsibility to completely equip the project with finish hardware.
2. Include in the schedule each door location, hand of door, complete list of each hardware set item per set, finish, manufacturer of each item and keying

information. Use same reference numbers and letters for doors and sets as those on the Contract Documents.

D. Keying Schedule: Submit separate detailed keying schedule for approval indicating clearly how the Commissioner's final instructions on keying of locks have been fulfilled.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Installation and maintenance instructions and catalog cut sheets for items scheduled.

B. Template Notification: Written notification that required templates and a copy of the final reviewed hardware schedule have been sent to the hollow metal door and frame and aluminum door and frame, manufacturers for use in fabrication.

C. Electronic Hardware Systems:

1. Provide complete wiring diagrams for each opening requiring electronic hardware except openings where only magnetic hold-open devices are specified. Provide a copy with each hardware schedule submitted.
2. Provide complete operational (narratives) descriptions of electronic components listed by opening/hardware set in the hardware schedule submittals. Operational descriptions are to detail how each electrical component functions within the opening incorporating conditions of ingress and egress and fire alarm activation or loss of power. Provide a copy with each hardware schedule submitted.

D. Warranties: Copies of warranty for each item requiring a warranty.

E. Operation and Maintenance Manuals: Upon completion, furnish 2 complete maintenance manuals to the Commissioner. Include the following items:

1. Approved hardware schedule, catalog cuts and keying schedule.
2. Hardware installation and adjustment instructions.
3. Manufacturer's written warranty information.
4. Wiring diagrams and operational descriptions for electronic openings.

1.5 QUALITY ASSURANCE

A. Supplier Qualifications:

1. The hardware supplier is to be an industry recognized company who has maintained and has been furnishing hardware in the project's vicinity for a period of not less than 2 years.
2. The supplier of the finish hardware is to be a firm with not less than 5 years of consecutive experience in supplying finish hardware of the quantity and quantity specified for projects similar in size and complexity.
3. The supplier of the finish hardware is to be a firm technically qualified and experienced in supplying building structures with finish hardware.

4. The supplier is to employ an experienced certified Architectural Hardware Consultant (AHC) who is to be available, at reasonable times during the course of the hardware submittals, supply and installation, for consultation about the project hardware requirements to the Commissioner and Contractor.
5. Refinements such as butt knuckle, clearance, strike lip lengths and adjustments, beveling of lock faces, handing of doors and centering of backsets will be expected and is to be indicated in the submitted hardware schedule.

B. Supplier Responsibilities: The supplier is responsible for thoroughly detailing the entire project to assure that the items specified will properly function in the indicated locations. Should the items specified not work properly, it is the responsibility of the supplier to furnish suitable items of comparable quality as approved by the Commissioner to those being furnished throughout the project.

C. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

E. Hardware Sets: The hardware sets represent the design intent and direction of the Commissioner. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items are to be brought to the attention of the Commissioner with corrections made prior to the end of the bidding process. Omitted items not included in a hardware sets are to be scheduled with the appropriate additional hardware required for proper application and functionality.

F. Underwriters' Laboratory Requirements:

1. Furnish hardware in accordance with NFPA Standard No. 80 and 101 for openings specified, shown or scheduled to receive fire-rated UL labels. In case of conflict between type of hardware specified and type required for fire protection, furnish type required by NFPA and UL.
2. Furnish hardware of type approved by UL for usage with the types and sizes of fire doors and frames required. Unless otherwise shown on the Drawings or specified, arrange fire doors to remain in the normally closed position by furnishing each unit with an automatic closing device. Furnish active latch bolts of UL approved throw.
3. Provide exit hardware for fire-rated openings bearing UL markings.
4. Project requires door assemblies and components that are compliant with positive pressure fire door testing and S-label requirements. Specifications must be cross-referenced and coordinated with flush wood door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.

G. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

H. Regulatory Requirements: Comply with provisions of the following:

1. Accessibility Standard: Where indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.
2. NFPA 101: Comply with the following for means of egress doors:
   a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks are not to require the use of a key, tool, or special knowledge for operation.
   b. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
   c. Thresholds: Not more than 1/2 inch high.

I. Reference Standards:

1. ANSI/BHMA A156.

1.6 COORDINATION

A. Coordinate layout and installation of recessed pivots and or closers with floor construction and finishes. Cast anchoring inserts into concrete.

B. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Keying Meeting: Conduct meeting with the Commissioner or Commissioner's representative prior to submitting the Key schedule for Commissioner's review. Incorporate keying meeting decisions into final keying schedule including, but not limited to, the following:
1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Final key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

D. Electrical System Roughing-in & Installation:

1. Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system and building control system, if any.
2. Prior to installation of electronic hardware, arrange conference between supplier, installers and related trades to review materials, procedures and coordinating related work.

1.7 DELIVERY, STORAGE AND HANDLING

A. Handle finish hardware in such a manner as to prevent damage. Store in a clean, dry, secure place.

B. Package each set of hardware items together in sets, identified with set numbers in accordance with the final reviewed hardware schedule.

1. Package each item of hardware separately and labeled separately.
2. Include in each package appropriate fastening installation instructions and templates.
3. Deliver a complete schedule with shipped hardware.

C. Should marking of any item become separated from the item, return the item to the supplier for marking.

D. Immediately remove from the job site damaged or otherwise unsuitable items when so ascertained and replace with an identical item.

1.8 WARRANTY

A. Provide Hardware Manufacturer's standard written form in which the hardware item manufacturer agrees to repair or replace door hardware components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including excessive deflection, cracking, or breakage.
   b. Faulty operation of operators and door hardware.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
2. Warranty Period: 3 years from date of Substantial Completion, except as follows:
   a. Electromagnetic and Delayed-Egress Locks: 5 years from date of Substantial Completion.
   b. Mortise Locksets: 5 years from date of Substantial Completion.
   c. Cylindrical Locksets (Grade 1): 5 years from date of Substantial Completion.
   d. Exit Devices: 3 years from date of Substantial Completion.
   e. Manual Closers: 25 years from date of Substantial Completion.
   f. Concealed Floor Closers (Heavy Duty): 10 years from date of Substantial Completion.
   g. Concealed Floor Closers (Shallow Depth): 2 years from date of Substantial Completion.
   h. Overhead Concealed Closers: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS & FINISHES

A. Materials and equipment are contained in the Hardware Schedule.

B. Unless otherwise specified, provide various items of hardware with color and finish matching the finish specified for locksets and latchsets.

C. Provide finishes of the same designation, that come from two or more sources, which match when the items are viewed at arms length and approximately 2 feet apart.

D. Provide hue of color of each finish matching whether or not the base metal is cast, forged or stamped, or when plating is applied over steel, brass or bronze.

E. Provide manufacturer's standard painted finish over bonderized and prime coated metal surfaces where required; the lacquer or enamel matching the finish of the locksets and latchsets unless otherwise specified.

F. Hardware Finishes:

1. Provide finishes as indicated in the herein hardware sets. Provide other hardware with matching finish unless noted otherwise.
2. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products
3. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

2.2 TEMPLATES

A. Fabricate locks, hinges, closers and other hardware, to be mounted on hollow metal doors and frames to templates; furnish with machine screws. Furnish templates to hollow metal door and frame manufacturers and other manufacturers requiring such templates.

2.3 FASTENINGS

A. Furnish hardware with tamper resistant screws and other fastenings suitable to assure permanent anchorage as shown in the hardware sets. Where exposed, provide fastenings of countersunk oval head type, (except use flat head for hinges), and matching finish of hardware being attached. Provide concealed fastenings. Exposed through and sex bolts are not acceptable. Do not attach hardware with self-tapping or sheet metal screws. Fasten floor type stops and holders to the floor with machine screws into expansion shields.

2.4 ACCEPTABLE MANUFACTURERS

A. Proprietary names used to designate hardware in the schedule are not intended to imply that products of the manufacturer are required to the exclusion of equivalent products of other herein named or listed manufacturers. The Commissioner is to be informed in writing in accordance with Section 01 60 00 "Product Requirements" for approval of hardware items and manufacturers not specified on the project prior to submitting the hardware schedule.

2.5 ELECTRONIC HARDWARE

A. For each item of electrified hardware specified, provide standard "Molex" type plug connectors to accommodate up to 12 wires. Provide Plug connectors that plug directly into through-door wiring harnesses, frame wiring harnesses, electric locking devices and power supplies.

2.6 HARDWARE ITEMS

A. General: Subject to compliance with requirements, provide hardware as scheduled on drawings, or comparable products approved by Commissioner.

B. Hanging Devices:

1. Butt Hinges:
   a. Complying with ANSI/BHMA A156.1 Grade 1.
   b. Provide 1 hinge for every 30 inches of door height.
   c. Provide non-removable pins on lockable reverse bevel doors.
   d. Provide butt hinges as manufactured by one of the following:
      1) McKinney (MC)
      2) Stanley (ST)
      3) Hager (HA)
      4) Ives (IV)
      5) Approved equal
2. Pivots:
   a. Complying with ANSI/BHMA 156.4 Grade 1.
   b. Provide pivots as manufactured by one of the following:
      1) Rixson (RX)
      2) Dorma (DO)
      3) Ives (IV)
      4) Approved equal
3. Continuous Hinges:
   a. Provide heavy duty continuous hinges at exterior aluminum & hollow metal doors.
   b. Provide heavy duty continuous hinges at high-use interior doors where shown.
   c. Provide continuous hinges manufactured by one of the following:
      1) Pemko (PE)
      2) Markar (MR)
      3) Ives (IV)
      4) Approved equal

C. Flush Bolts And Accessories:

1. Provide manual and automatic flush bolts, dust-proof strikes and related accessories as indicated in the hardware schedule sets.
2. Complying with ANSI/BHMA A156.16, Grade 1.
3. Provide items as manufactured by one of the following:
   a. Trimco (TR)
   b. Rockwood (RO)
   c. Ives (IV)
   d. Approved equal

D. Cylinders And Keying:

1. Cylinders:
   a. Provide manufacturer's standard cylinders and keys.
   b. Complying with ANSI/BHMA A156.5, Grade 1.
   c. Provide cylinders as manufactured by the following:
      1) Best Access Systems.
2. Keying:
   a. Complying with ANSI/BHMA A156.28.
   b. Provide locks and cylinders with construction cores. Provide locks and cylinders to be master-keyed or grandmaster-keyed into owner's Best key system as directed by the Owner. Provide factory keyed locks and cylinders. Furnish the following key amounts:
      1) 3 change keys per lock
      2) 3 grand master keys
      3) 6 master keys per master level
      4) 15 construction/temporary keys
   c. Send master keys and key blanks directly from the factory to the Owner in sealed boxes. Submit signed receipt indicating such quantities received and person receiving.
3. Key Cabinet:
   a. Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Provide key control cabinet with expansion capacity of 150 percent of the number of locks required for the project.
   b. Provide key cabinet as manufactured by one of the following:
      1) Telkee
      2) MMF
      3) Lund

E. Locking Devices:

1. Mortise Locksets:
   a. Complying with ANSI/BHMA 156.13 Series 1000, Grade 1 Certified.
   b. Provide mortise locksets as manufactured by one of the following:
      1) Yale (YA) 8800 Series x MOR lever/rose design
      2) Sargent (SA) 8200 Series x LNB lever/rose design
      3) Corbin Russwin (CR) ML2000 Series x CSA lever/rose design
      4) Schlage (SC) L9000 Series x 07A lever/rose design
      5) Approved Equal

F. Conventional Exit Devices:

1. Complying with ANSI/BHMA A156.3 Grade 1 Certified.
2. Provide exit devices listed by Underwriters Laboratories and bearing the UL label for life safety in full compliance with NFPA 80 and NFPA 101.
3. Provide lever trim available in finishes and designs to match that of the specified locksets.
4. Provide conventional exit devices as manufactured by one of the following:
   a. Yale (YA) 7100 Series
   b. Corbin Russwin (CR) ED5000 Series
   c. Von Duprin (VO) 98 Series
   d. Sargent (SA) 80 Series
   e. Approved Equal

G. Door Closers - Surface Mounted Door Closers – Heavy Duty:

1. Complying with ANSI/BHMA 156.4, Grade 1 Certified.
2. Do not install closers on exterior or corridor side of doors where possible.
3. Provide surface mounted door closers as manufactured by one of the following:
   a. Norton (NO) 7500 Series
   b. Sargent (SA) 350 Series
   c. LCN (LC) 4041 Series
   d. Corbin Russwin (CR) DC6000 Series
   e. Approved Equal

H. Door Closers - Concealed Door Closers – Heavy Duty:

1. Provide concealed door closers as manufactured by the following:
   a. Dorma (DO) RTS 88
   b. Approved equal

I. Door Trim and Protective Plates:

1. Complying with ANSI/BHMA A156.6.
2. Provide kick, mop and armor plates fabricated from .050 gauge stainless steel with beveled edges. Provide heights and widths indicated in the hardware sets.
3. Push plates, pull plates, door pulls and other miscellaneous door trim to be furnished as specified.
4. Provide items as manufactured by one of the following:
   a. Trimco (TR)
   b. Ives (IV)
   c. Rockwood (RO)
   d. Approved equal

J. Wall Mounted Door Stops:

1. Complying with ANSI/BHMA A156.16, Grade 1.
2. Provide wall stops for doors unless otherwise indicated.
3. Provide wall stops as manufactured by one of the following:
   a. Trimco (TR)

b. Ives (IV)
c. Rockwood (RO)
d. Approved equal

K. Overhead Stops and Holders:
1. Complying with ANSI/BHMA A156.8, Grade 1
2. Provide overhead holders as manufactured by one of the following:
a. Sargent (SA)
b. ABH (AB)
c. Rixson (RX)
d. Approved equal

L. Weather-Stripping, Gasketing and Thresholds:

1. Provide items as indicated in the hardware sets.
2. Complying with the following:
a. Weather-Stripping & Gasketing: ANSI/BHMA A156.22.
b. Thresholds: ANSI/BHMA A156.21.
3. Provide threshold units comply with the Americans with Disabilities Act (ADA.)
4. Provide items as manufactured by one of the following:
a. Pemko (PE)
b. Reese (RS)
c. Zero (ZE)
d. National Guard (NG)
e. Approved equal

M. Silencers: Furnish rubber door silencers at hollow metal and/or wood frames; 2 per pair and 3 per single door frame.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine and verify conditions of hardware installations. Installation of finish hardware and related items constitute acceptance of the existing conditions.

3.2 PRE-INSTALLATION ORIENTATION

A. After delivery of hardware and prior to its installation, meet with the installer and manufacturers. Compare approved samples with actual hardware delivered to assure acceptability. Review catalogs, brochures, installation instructions and the final hardware schedule. Rehearse installation procedures and workmanship, with special techniques of installation.

3.3 INSTALLATION

A. Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

B. Install finish hardware plumb, level and true to line. Install each hardware item in compliance with the manufacturer's printed instructions and recommendations.

C. Install finish hardware using supplied templates for each item. Cut and fit substrate to avoid substrate damage and weakening. Cover cut-outs with hardware item. Mortise work in correct locations and size, without gouging, splintering or causing irregularities in the finished work.

D. Where cutting and fitting is required on substrates to be painted or stained, install, fit and adjust hardware prior to finishing work. Remove finish hardware and place in original packaging. Reinstall hardware after finishing.

E. Attach thresholds to concrete surfaces using drilled-in lead expansion shields and countersunk flat-head bronze or stainless steel screws. Set thresholds in a continuous bed of polyurethane sealant.

3.4 MOUNTING HEIGHTS OF HARDWARE

A. Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.

B. Where standards or specified heights conflict, consult the Commissioner for interpretation prior to mounting hardware.

3.5 FIELD QUALITY CONTROL

A. The Commissioner and hardware supplier will do a final inspection prior to building completion to ensure that hardware was correctly installed and is in proper working order.

B. Prior to the installation of hardware, manufacturer's representatives for locksets, closers, and exit devices is to arrange and hold a jobsite meeting to instruct the hardware installer's personnel on the proper installation of their respective products. Send a letter of compliance to the Commissioner indicating when this meeting is to be held and who will be in attendance.

3.6 CLEANING, TRAINING AND FINAL ADJUSTMENT

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

B. Immediately prior to acceptance of the building by the Commissioner, lubricate hardware with graphite or special oil, test and adjust moving parts. Clean hardware to remove dust and stains.

C. Instruct Commissioner's designated personnel in adjustment and maintenance of hardware and finishes during hardware adjustment. Furnish special tools to the Commissioner's Representative as required to adjust and maintain hardware.

D. Where door hardware is installed more than one month prior to Final Completion or partial occupancy of a space or area, return to the installation during the week prior to Final Completion or partial occupancy and make final check and adjustment of hardware items in such space or area. Clean operating items as necessary to restore to proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment and air movement so that items operate properly.

3.7 PROTECTION

A. Protect exposed hardware installed on doors during the construction phase. Install hardware at the latest possible timeframe to avoid damage from construction activities. Replace damaged hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the Commissioner. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the Commissioner with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Manufacturer’s Abbreviations:

1. MK - McKinney
2. MR - Markar
3. DO - dormakaba Arch Hdw
4. SU - Securitron
5. RF - Rixson

6. OT - OTHER
7. RO - Rockwood
8. SA - Sargent
9. AD - Adams Rite
10. GS - ASSA ABLOY Glass Solutions
11. BE - dormakaba Best
12. NO - Norton
13. PE - Pemko
14. NG - National Guard

Hardware Sets

Set: AC1.0

1	Continuous Hinge	FM300 CTP Torx	630	MR
1	Electric Power Transfer	EL-CEPT Torx		SU
1	Fail Secure Lock w/REX	LC RX 36 8271 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Surface Closer	R 7500 (Reg. Arm) Torx	689	NO
1	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Wall Stop	400 TORX	626	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
1	Sweep	315CN Torx	AL	PE
1	Card Reader	By Security Contractor		OT
1	Wiring Diagram	By Security Contractor		SA
1	ElectroLynx Harness	QC-Cxxx (transfer to lock/exit trim)		MK
1	ElectroLynx Harness	QC-C1500P transfer to power)		MK
1	Door Position Switch	DPS-M-BK		SU
1	Power Supply	AQD Series		SU

Notes: Electrically operated opening: Door(s) normally closed latched and locked. Free egress at all times. Entry by mechanical key or by presenting valid card key to card reader which will temporarily unlock outside lever handle. Upon loss of power door is locked- FAIL SECURE.

Set: AC1.1

1	Continuous Hinge	FM300 CTP Torx	630	MR
1	Electric Power Transfer	EL-CEPT Torx		SU
1	Fail Secure Lock w/REX	LC RX 36 8271 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Surf Overhead Stop	9-X36 Torx	630	RF
1	Surface Closer	PRO 7500 Torx (par arm)	689	NO
1	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
1	Sweep	315SSN Torx	SS	PE

1	Card Reader	By Security Contractor		OT
1	Wiring Diagram	By Security Contractor		SA
1	ElectroLynx Harness	QC-Cxxx (transfer to lock/exit trim)		MK
1	ElectroLynx Harness	QC-C1500P transfer to power)		MK
1	Door Position Switch	DPS-M-BK		SU
1	Power Supply	AQD Series		SU
1	Latch Protector	320-RKW Torx	630	RO

Notes: Electrically operated opening: Door(s) normally closed latched and locked. Free egress at all times. Entry by mechanical key or by presenting valid card key to card reader which will temporarily unlock outside lever handle. Upon loss of power door is locked- FAIL SECURE.

Set: AC1.2

1	Continuous Hinge	FM300 Torx	630	MR
1	Continuous Hinge	FM300 CTP Torx	630	MR
1	Electric Power Transfer	EL-CEPT Torx		SU
1	Automatic Flushbolt Set	2842 TORX	630	RO
1	Coordinator	2600 Series TORX	600	RO
4	Mounting Bracket	2601 Series TORX	600	RO
1	Fail Secure Lock w/REX	LC RX 36 8271 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Dust Proof Strike	570 TORX	626	RO
2	Surf Overhead Stop	9-X36 Torx	630	RF
2	Surface Closer	PRO 7500 Torx (par arm)	689	NO
2	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
2	Sweep	315SSN Torx	SS	PE
1	Meeting Stile Seal (2-pc's)	305SSE Torx	SS	PE
1	Card Reader	By Security Contractor		OT
1	Wiring Diagram	By Security Contractor		SA
1	ElectroLynx Harness	QC-Cxxx (transfer to lock/exit trim)		MK
1	ElectroLynx Harness	QC-C1500P transfer to power)		MK
2	Door Position Switch	DPS-M-BK		SU
1	Power Supply	AQD Series		SU
1	Latch Protector	320-RKW Torx	630	RO

Notes: Electrically operated opening: Door(s) normally closed latched and locked. Free egress at all times. Entry by mechanical key or by presenting valid card key to card reader which will temporarily unlock outside lever handle. Upon loss of power door is locked- FAIL SECURE.

Set: AC2.0

1	Continuous Hinge	FM300 CTP Torx	630	MR
1	Electric Power Transfer	EL-CEPT Torx		SU
1	Elect. Exit Device w/Rex (Mortise, NL)	12 LC 19 36 55 76 8976 ETB	630	SA

1	Surface Closer	PR7500 Torx (par arm)	689	NO
1	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Wall Stop	400 TORX	626	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
1	Sweep	315CN Torx	AL	PE
1	Card Reader	By Security Contractor		OT
1	Wiring Diagram	By Security Contractor		SA
1	ElectroLynx Harness	QC-C006 (transfer to exit)		MK
1	ElectroLynx Adaptor	52-2946		SA
1	ElectroLynx Harness	QC-Cxxx (transfer to lock/exit trim)		MK
1	ElectroLynx Harness	QC-C1500P transfer to power)		MK
1	Door Position Switch	DPS-M-BK		SU
1	Power Supply	AQD Series		SU

Notes: Electrically operated opening: Door(s) normally closed latched and locked. Free egress at all times. Entry by mechanical key or by presenting valid card key to card reader which will temporarily unlock outside lever handle. Upon loss of power door is locked- FAIL SECURE.

Set: E1.0

1	Concealed Closer	RTS88 90 NHO	689	DO
1	Center Pivot	By door Vendor		OT
2	Glass Door Exit Device (NL)	PDU8000-3 Black	630	GS
2	Best Mortise Cylinder	1E-74	626	BE
1	Exit Device Strike (Sgl. Door)	MSK-SGL	630	GS
1	Electric Strike (Sgl. Door)	ESK-SGL	630	GS
1	Automatic Opener	6330	689	NO
1	Threshold	2005AV Torx	AL	PE
2	Sweep	315SSN Torx	SS	PE
1	Wiring Diagram	By Security Contractor		SA
2	Door Position Switch	DPS-M-BK		SU
2	Door Switch	505		NO
1	Power Supply	AQD Series		SU
1	Balance of hardware	by door vendor		OT

Notes: Electrically controlled opening: Door normally closed and latched. Egress allowed at all times. Manual entry by key or auto entry by actuators on either side of opening which will temporarily disengage keeper on electric strike allowing the active door to open. Upon loss of power strike is locked (FAIL SECURE)

Notes; Glass door vendor to provide pivot(s), closer arm(s), cover plates(s) mounting bracket(s), clip(s), top & bottom rails and weatherstripping as required for a complete installation.

Set: 1.0

1	Continuous Hinge	FM300 Torx	630	MR

1	Storeroom Lock	LC 36 8204 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Surf Overhead Stop	9-X36 Torx	630	RF
1	Surface Closer	PRO 7500 Torx (par arm)	689	NO
1	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
1	Sweep	315SSN Torx	SS	PE
1	Drip Cap	16SS Torx	SS	NG
1	Door Position Switch	DPS-M-BK		SU
1	Latch Protector	320-RKW Torx	630	RO

Set: 1.1

2	Continuous Hinge	FM300 Torx	630	MR
1	Manual Flushbolt Set	555 TORX	626	RO
1	Storeroom Lock	LC 36 8204 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Dust Proof Strike	570 TORX	626	RO
2	Surf Overhead Stop	9-X36 Torx	630	RF
1	Surface Closer	PRO 7500 Torx (par arm)	689	NO
2	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
2	Sweep	315SSN Torx	SS	PE
1	Meeting Stile Seal (2-pc's)	305SSE Torx	SS	PE
1	Drip Cap	16SS Torx	SS	NG
2	Door Position Switch	DPS-M-BK		SU
1	Latch Protector	320-RKW Torx	630	RO

Set: 1.2

2	Continuous Hinge	FM300 Torx	630	MR
1	Self-Latching Flushbolt Set	2845 TORX	630	RO
1	Coordinator	2600 Series TORX	600	RO
2	Mounting Bracket	2601 Series TORX	600	RO
1	Storeroom Lock	LC 36 8204 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Dust Proof Strike	570 TORX	626	RO
2	Surface Closer	PR7500 Torx (par arm)	689	NO
2	Kick Plate	K1050 8" high CSK TORX	630	RO
2	Wall Stop	400 TORX	626	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
2	Sweep	315CN Torx	AL	PE
1	Meeting Stile Seal (2-pc's)	303ASTST Torx	AL	PE
2	Door Position Switch	DPS-M-BK		SU

Set: 1.3

1	Continuous Hinge	FM300 Torx	630	MR
1	Storeroom Lock	LC 36 8204 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Surface Closer	PR7500 Torx (par arm)	689	NO
1	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Wall Stop	400 TORX	626	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
1	Sweep	315CN Torx	AL	PE
1	Door Position Switch	DPS-M-BK		SU

Set: 1.4

1	Continuous Hinge	FM300 Torx	630	MR
1	Storeroom Lock w/knurling	LC 36 76 8204 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Surf Overhead Stop	9-X36 Torx	630	RF
1	Surface Closer	PRO 7500 Torx (par arm)	689	NO
1	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
1	Sweep	315SSN Torx	SS	PE
1	Drip Cap	16SS Torx	SS	NG
1	Door Position Switch	DPS-M-BK		SU
1	Latch Protector	320-RKW Torx	630	RO

Set: 1.5

1	Continuous Hinge	FM300 Torx	630	MR
1	Storeroom Lock w/knurling	LC 36 76 8204 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Wall Stop	400 TORX	626	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
1	Sweep	315SSN Torx	SS	PE
1	Drip Cap	16SS Torx	SS	NG
1	Door Position Switch	DPS-M-BK		SU
1	Latch Protector	320-RKW Torx	630	RO

Set: 1.6

1	Continuous Hinge	FM300 Torx	630	MR
1	Storeroom Lock w/knurling	LC 36 76 8204 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Surface Closer	R 7500 (Reg. Arm) Torx	689	NO
1	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Wall Stop	400 TORX	626	RO
1	Threshold	2005AV Torx	AL	PE

1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
1	Sweep	315CN Torx	AL	PE
1	Drip Cap	346C Torx	AL	PE
1	Door Position Switch	DPS-M-BK		SU

Set: 2.0

1	Continuous Hinge	FM300 Torx	630	MR
1	Dormitory Lock w/Ind.	LC 36 50 8225 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Surface Closer	R 7500 (Reg. Arm) Torx	689	NO
1	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Mop Plate	K1050 4" high CSK TORX	630	RO
1	Wall Stop	400 TORX	626	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
1	Sweep	315CN Torx	AL	PE
1	Door Position Switch	DPS-M-BK		SU

Set: 3.0

1	Center Pivot Set	H117-3/4	626	RF
2	Best Mortise Cylinder	1E-74	626	BE
2	Dust Proof Strike	570 TORX	626	RO
1	Balance of hardware	by door vendor		OT

Notes: Door vendor to provide bottom rail deadlock
Locate a dust proof strike in open & closed positions

Set: 4.0

2	Continuous Hinge	FM300 Torx	630	MR
1	Manual Flushbolt Set	555 TORX	626	RO
1	Exit Device w/knurling (Mortise, NL)	12 LC 19 36 76 8904 ETB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Dust Proof Strike	570 TORX	626	RO
2	Surf Overhead Stop	9-X36 Torx	630	RF
1	Surface Closer	PRO 7500 Torx (par arm)	689	NO
2	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
2	Sweep	315SSN Torx	SS	PE
1	Meeting Stile Seal (2-pc's)	305SSE Torx	SS	PE
1	Drip Cap	16SS Torx	SS	NG
1	Door Position Switch	DPS-M-BK		SU
1	Latch Protector	320-RKW Torx	630	RO

Set: 4.1

2	Concealed Closer	RTS88 90 NHO	689	DO
2	Glass Door Exit Device (NL)	PDU8000-3 Black	630	GS
2	Best Mortise Cylinder	1E-74	626	BE
1	Exit Device Strike (Dbl. Door)	MSK-DBL	630	GS
1	Threshold	2005AV Torx	AL	PE
2	Sweep	315SSN Torx	SS	PE
2	Door Position Switch	DPS-M-BK		SU
1	Balance of hardware	by door vendor		OT

Notes: Notes; Glass door vendor to provide closer arm(s), pivot(s), cover plates(s) mounting bracket(s), clip(s), top & bottom rails or patch fittings as required for a complete installation.

Weather-stripping by door vendor

Set: 4.2

2	Continuous Hinge	FM300 Torx	630	MR
2	Exit Device (CVR-LBR, NL)	LC NB 19 36 MD8406 ETB	630	SA
2	Best Mortise Cylinder	1E-74	626	BE
2	Surface Closer w/ Stop arm	CPS7500 Torx	689	NO
2	Drop Plate (PA)	7788 Torx	689	NO

Set: 4.3

1	Continuous Hinge	FM300 Torx	630	MR
1	Exit Device (Rim, passage)	19 36 8515 ETB	630	SA
1	Surface Closer w/ Stop arm	CPS7500 Torx	689	NO
1	Drop Plate (PA)	7788 Torx	689	NO

Set: 4.4

1	Concealed Closer	RTS88 90 NHO	689	DO
1	Glass Exit Device (exit only)	PDU8000 Black	630	GS
1	Exit Device Strike (Sgl. Door)	MSK-SGL	630	GS
1	Threshold	2005AV Torx	AL	PE
1	Drip Cap	16SS Torx	SS	NG
1	Door Position Switch	DPS-M-BK		SU
1	Balance of hardware	by door vendor		OT

Notes: Notes; Glass door vendor to provide closer arm(s), pivot(s), cover plates(s) mounting bracket(s), clip(s), top & bottom rails or patch fittings as required for a complete installation.

Weather-stripping by door vendor

Set: 4.5

1	Continuous Hinge	FM300 Torx	630	MR

1	Exit Device (Rim, NL)	LC 19 36 8504 ETB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Surface Closer w/ Stop arm	CPS7500 Torx	689	NO
1	Drop Plate (PA)	7788 Torx	689	NO

Set: 5.0

1	Continuous Hinge	FM300 Torx	630	MR
1	Classroom Lock	LC 36 8237 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Surface Closer	PR7500 Torx (par arm)	689	NO
1	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Wall Stop	400 TORX	626	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
1	Sweep	315SSN Torx	SS	PE
1	Door Position Switch	DPS-M-BK		SU
1	Latch Protector	320-RKW Torx	630	RO

Set: 6.0

1	Continuous Hinge	FM300 Torx	630	MR
1	Office Lock	LC 36 8205 LNB	630	SA
1	Best Mortise Cylinder	1E-74	626	BE
1	Surface Closer w/ Stop arm	CPS7500 Torx	689	NO
1	Kick Plate	K1050 8" high CSK TORX	630	RO
1	Threshold	2005AV Torx	AL	PE
1	Head Gasketing	2891AS Torx	AL	PE
1	Jamb Gasketing Set	290AS Torx	AL	PE
1	Sweep	315SSN Torx	SS	PE
1	Door Position Switch	DPS-M-BK		SU

Set: 7.0

1	Best Cylinder	1E-74 type as req'd.	606	BE
1	Balance of hardware	by door vendor		OT

Set: 8.0

1	Concealed Closer	RTS88 90 NHO	689	DO
1	Best Rim Cylinder	12E-62	626	BE
1	Locking Pull	LP3301FHD ADA	630	GS
1	Dust Proof Strike	570 TORX	626	RO
1	Wall Stop	400 TORX	626	RO
1	Threshold	2005AV Torx	AL	PE
1	Sweep	315SSN Torx	SS	PE
1	Door Position Switch	DPS-M-BK		SU
1	Balance of hardware	by door vendor		OT

Notes: Notes; Glass door vendor to provide closer arm(s), pivot(s), cover plates(s) mounting bracket(s), clip(s), top & bottom rails or patch fittings as required for a complete

installation.

Weather-stripping by door vendor

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of FINISH DOOR HARDWARE shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of FINISH DOOR HARDWARE shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 08 71 13
AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Automatic low energy door operators surface mounted type, including entrance door finish hardware, push-button controls, safety devices and accessories required to provide the specified operations.

B. Related Sections:

1. Hollow steel doors and frames: Section 08 11 13.
2. Stainless steel doors and frames: Section 08 11 19.
3. Aluminum glazed curtain walls: Section 08 44 13.
4. Structural Glass Curtain Walls: Section 08 44 26.
5. Finish door hardware: Section 08 71 00.
6. Applicable Division 26 electrical sections.
7. Applicable Division 28 electronic safety and security sections.

1.3 ACTION SUBMITTALS

A. Manufacturer's Product Data: Material and equipment description, catalog cut sheets for each finish hardware item.

B. Shop Drawings: Show elevations of doors, sections and details, mounting of operators, controls, signs and wiring diagrams.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Installation and operating instructions for each finish hardware item.

B. Installer Qualifications: Written evidence of installer’s experience.

C. Warranty: Signed copies of specified warranty.

1.5 QUALITY ASSURANCE

A. Comply with laws, rules and regulations of governmental authorities having jurisdiction over this part of the work, including American Disabilities Act (ADA) current edition.

B. Comply with the applicable portions of the National Association of Architectural Metal Manufacturers (NAAMM).

1. Metal Finishes Manual.

C. Provide automatic door equipment Underwriters Laboratory Inc. (UL) listed.

1. UL Standard: Provide power door operators that comply with UL 325 and UL 1998.

D. Comply with the provision of ANSI/BHMA A156.19.

E. Installer Qualifications:

1. Provide automatic door control equipment installed by a firm that also maintains such equipment.
2. Before starting work, the Installer is to furnish evidence to the Commissioner that it has furnished and installed equipment of the same general type as specified and that such equipment has been in successful operation for at least 5 years.

F. Manufacturer Qualifications: Engage a firm experienced in manufacturing operators similar to those indicated for this Project and with a record of successful in-service performance.

1.6 WARRANTY

A. Provide manufacturer's written warranty stating that the complete automatic door operator installation will be free of faults and defects in accordance with the General Conditions, except the warranty period is to be for 3 years instead of 1 year.

B. Provide warranty signed by the Contractor, Subcontractor and Automatic Door Operator Manufacturer.

C. The above warranties are in addition to, and not a limitation of, other rights the Commissioner may under the Contract Documents.

1.7 MAINTENANCE SERVICE

A. The Automatic Door Operator Installer is to furnish maintenance on equipment described herein for a period of 12 months commencing on date of Substantial Completion, subject to 24-hour emergency callbacks.

B. Include in maintenance; systematic examination, adjustment and lubrication of electrical and mechanical parts whenever required and using only genuine, standard parts produced by the manufacturer of the equipment installed. Provide maintenance work performed by competent personnel under the supervision and in direct employ of the Automatic Door Operator installer.

C. Include cost of this maintenance the contract price. The Commissioner reserves the right to exclude the cost of this maintenance from the contract price or pay for it separately on a monthly basis as the work is performed.

1. Engage a certified inspector to perform safety inspection after each adjustment or repair, and at end of maintenance period. Furnish completed inspection reports to Commissioner.
2. Perform maintenance, including emergency callback service, during normal working hours.
3. Include 24-hour-per-day, seven-day-per-week emergency callback service.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Subject to compliance with the requirements, provide one of the following:

1. “Series 4100LE” (Horton Automatics, Corpus Christi, TX. 78405).
2. "Series 9540, Senior Swing" (LCN Closer, Princeton, IL, 61356).
3. "Series ED700" (Dorma Automatics, Lake Bluff, IL 60044).
4. « Series 6300 » (Norton Door Controls, Monroe, SC)

2.2 FABRICATION

A. Unit Description: Provide door operator consisting of a self-contained electro-mechanical unit for mounting above door head bar with electric latch retraction exit device or electric strike on active leaf and concealed manual overhead closer mounted in the operator for the inactive door leaf. Equip motor with automatic reset thermal overload protection. Power requirement to be 115 volt, 1-phase, 60 Hz, 15 amp for double doors.

B. Surface Mounted Overhead Application: Provide self-contained, electro-mechanical door operator unit mounted in a nominal 4-1/2 inch x 5-3/4 inch aluminum header box. Surface mount header box between door jambs above door frame header. Provide drive from the operator to the door through the normal pivot point of the door. Provide overhead arm of forged steel construction for increased durability.

C. Operating Components:

1. Motor, Gear Box, Microprocessor Box:
   a. Provide D.C. permanent magnet motor with shielded ball bearings and direct drive. Provide motor which will stop when door is in the open position and also when door is in the hold-open mode to conserve energy.

b. Provide door operator in completely self-contained cast aluminum housing, fully assembled and sealed. Provide operator with precision machine gears and precision machined bearing seats and shielded bearings, for silent operation, located in cast aluminum housing and filled with lubricant for extreme weather conditions to operate between minus 30 deg F and 160 deg F.
c. Mount motor/gear box operators on vibration isolators to provide for quiet operation.
d. Provide microprocessor control located in the bottom of the gear box operator to allow for easy access to the adjustable back check and latching position cams without the need to remove the door or the operator to make adjustments.

2. Control Box:
a. Provide control box with an energy conservation feature consisting of an automatic wind and stack pressure controller, a power close and power hold feature. Provide this feature to be available at the flip of a switch on the control box. Provide controller that will increase the closing force on the door from 9 lbs. to 15 lbs. if the door is held open by wind for more than 5 seconds and then continue to hold the door closed under power until the door is reactivated.
b. Provide a three position rocker (toggle) "Off-On-Hold Open" switch so the unit can be turned "Off" at night for locking of door, "On" in the morning after the doors are unlocked and to the "Hold-Open" position during the day so the doors can be continuously held open for making deliveries or other purposes.
c. Provide control box of the snap-in type with full accessibility to the following adjustments: opening speed, back check speed, closing speed and time delay. Provide opening speed and time delay adjustments within safe limits. Provide hold open voltage fixed, factory pre-set for proper hold open voltage. Provide fuses and overload protection which is readily accessible at the bottom of the control box without removing control box or door.
d. Provide control box with a soft start acceleration drive and torque limiting drive that will limit the door opening force. Provide control box with a D.C. current to the motor derived by solid state phase control from a 115V AC power source.

3. Provide hydraulic concealed overhead closer to control the inactive door leaf, requiring no electrical power to operate.
4. Provide power transfer from frame to doors by means of electric transfer device if electrified exit hardware is specified.

D. Controls:

1. Push Plates: Provide push plates for door activating and holding, on the exterior and on interior side of the building.
a. Jamb or wall mounted wall switch with 1-3/4 inch wide x 4-1/2 inch high stainless steel press plate engraved with the handicapped logo and lettering “PUSH TO OPEN.”
b. Wall mounted switch with 1-3/4 inch wide x 4-1/2 inch high stainless steel press plate engraved with the handicapped logo and lettering “PUSH TO OPEN”.
2. Provide electric relays to control electronic door strikes and exit devices.

3. Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.
4. Finish: Finish exposed metal surfaces to match color and finish of door and frames.

E. Signage: As required by cited ANSI/BHMA standard for type of door and its operation.

2.3 SYSTEM OPERATION

A. Power Mode:

1. From Building Interior:
   a. The push button on interior of the building is actuated and the door opens slowly-to back check (80 degrees in 3 to 6 seconds) and to the fully open position in 4 to 7 seconds. The door is then to remain open for a period of 5 to 30 seconds as determined by the setting of the variable time delay on the control box. After the time delay, the door closes by the spring in the door operator from 90 degrees to 10 degrees in 3 to 6 seconds from 10 degrees to fully closed in 1-1/2 to 2 seconds.
2. From Building Exterior:
   a. The push button on exterior of the building is actuated and the exit device latchbolt is electrically retracting the on the active leaf and the door opens slowly-to back check (80 degrees in 3 to 6 seconds and to the fully open position in 4 to 7 seconds. The door will then remain open for a period of 5 to 30 seconds as determined by the setting of the variable time delay on the control box. After the time delay, the door closes by the spring in the door operator from 90 degrees to 10 degrees in 3 to 6 seconds from 10 degrees to fully closed in 1-1/2 to 2 seconds.
3. The force required to prevent a door from opening or closing is not exceed at 15 lbf applied 1 inch from the latch edge of the door at any point in the opening or closing cycle.
4. In the event of a power failure, doors are to open with a manual pressure not to exceed a 25 lbf at a point 1 inch from the latch edge of the door.

B. Manual Mode - Inactive Leafs:

1. In the manual mode, pedestrian traffic walks up to door (inside) and push either touchbar on the exit device unlocking the exit device and manually opens the door and is then closed by the spring in the door operator.
2. During normal operating hours the exit devices will be dogged down to provide manual push or pull operation both doors.
3. Do not provide Push-N-Go operation for manual operation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive the automatic door operators and controls. Verify dimensions of in-place and subsequent construction. Coordinate work of other sections required for installation of door equipment. Installation of the door equipment shall constitute acceptance of the related construction.

3.2 INSTALLATION

A. Install automatic door operators in accordance with manufacturer's written instructions and cited ANSI/BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.

B. Controls: Install activation and safety devices in accordance with manufacturer's written instructions and cited ANSI/BHMA standard for operator type and direction of pedestrian travel. Connect activation- and safety-device wiring as indicated on Drawings.

C. Access-Control System: Connect operators to access-control system as specified in Division 28 Sections.

D. Electrical Wiring:

1. Verify and coordinate the electrical characteristics of the power operator and controls prior to submittal of Shop Drawings and installation.
2. Install door operator and controls including wiring between such, as required for the proper operation of the door operators as specified for the types of electrical power available in the building.
3. Provide power wiring and conduit from building sources to the door operator.

E. Signage: Apply on both sides of each door as required by cited ANSI/BHMA standard for type of door operator and direction of pedestrian travel.

3.3 ADJUSTING

A. Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable ANSI/BHMA standards.

1. Adjust operators on exterior doors for weathertight closure.

B. After completing installation of exposed, factory-finished automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.

C. Readjust automatic door operators after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

3.4 DEMONSTRATION

A. Engage a certified inspector to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators. Provide name and telephone number to the Owner of 24 hour maintenance/repair service for automatic doors operators.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of AUTOMATIC DOOR OPERATORS shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of AUTOMATIC DOOR OPERATORS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Glass and glazing.

B. Engineered exterior wall systems:

1. EWS-03A - Point supported glass curtain wall.
2. EWS-03B - Sloping point supported glass curtain wall with integrated gutter.
3. EWS-04 - Point supported glass curtain wall with angled glazing. Butt glazed vertical weatherseal.
4. EWS-05 - Sloping point supported glass canopy.
5. EWS-06 - Butt glazed curtain wall.
6. EWS-07A - Butt glazed curtain wall.
7. EWS-07B - Sloping curtain wall with integrated gutter.

C. Engineered exterior wall work, including:

1. Floor-loaded tempered glass vision lites and mullion fins.
2. Splice plates at mullion fins joints.
3. Point support spider fittings connected to mullion fins to support vision lites.
4. Structural silicone sealants at butt glazed joints.
5. Top and bottom connections to building structure.
6. Structural support framing.
7. Required glazing accessories, trim, anchors, supports, and accessories for a complete fabricated and installed system.
8. Monolithic and insulating glass units.
9. Sealants in perimeter joints at abutting construction and all joints required to be sealed within the curtain wall system assembly.
10. Visual mockup as indicated. Provide for mockup trip and inspection
11. Field measurements and verification of all openings and all conditions of the installation.
12. Field water testing of the installed curtain wall system including perimeter sealant joints.

D. Related Sections:

1. Rough carpentry: Section 06 10 00.
2. Building thermal insulation Section 07 21 00.

3. Joint Sealants: Section 07 92 00.
4. Aluminum curtain walls: Section 08 44 13.
5. Structural glass curtain walls: Section 08 44 26.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design:

1. Design exterior glazing and wall systems including comprehensive engineering analysis by a qualified Engineer, using performance requirements, design criteria and industry standards indicated herein.
2. The glass manufacturer is responsible for the analysis and engineering of glass and glazing, as well as the fabrication and installation of the glass and glazing.

B. General: Provide glazing systems capable of withstanding normal thermal movement, and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

C. Manufacturer's Engineering Analysis: For glass for exterior openings, the glass manufacturer is to perform wind load and thermal stress analyses and is to demonstrate compliance of glass with performance requirements.

D. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
   a. Design Loads: As indicated on Drawings.
   b. Impact Loads for Interior Installations: Per applicable code or herein referenced industry standard.
   c. Window/Curtain Wall (Guardrails) Infill: Design glass in windows and curtain wall as a guardrail in glass areas below 42 inches above the finish floor. Design glass in these areas to resist a horizontal impact load of 200 pounds applied to any 1 square foot of infill area, at any point, in any direction on the glass infill.
2. Design metal framed skylight laminated glass to the Design Loads: As indicated on Drawings.
3. Maximum Lateral Deflection: For the following types of glass supported on four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
   a. For monolithic glass lites heat treated to resist wind loads.
   b. For insulating glass.
   c. For laminated glass lites.

E. Point Supported Glass:

1. Provide glass which demonstrates that the stresses induced in the glass by the fittings are compatible with the strength of the glass and the specified performance criteria, especially at the holes.
2. Provide finite element calculations to show compliance.
3. Pre-stressing of the glass around holes, to a level which is compatible with the design and use of the fittings, is not permissible.

F. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss and a temperature change (range) of 120 deg F ambient; 180 deg F, material surfaces.

1.4 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings:

1. Plans, elevations and large scale details of the exterior wall systems.
2. Indicate on Details: Metal materials, gages, finishes, methods of fabrication, welds, fasteners, fittings, accessories, supports, framing and anchors. Show support structure, adjacent construction and methods of attachment of canopy frame.
3. Provide shop drawings with seal and signature of qualified Engineer. Provide signature by the same engineer who prepares and signs the design calculations.
4. Include mockup Shop Drawings, showing details.

C. Samples for Initial Selection:

1. Sets of laminated glass interlayer color and pattern selection samples.
2. Sets of spandrel glass, standard color selection samples.
3. Sets of color samples of glazing sealant for each type of sealant used.

D. Samples for Verification:

1. 12 inch x 12 inch samples of each type glass.
2. 6 inch lengths of glazing tape.
3. Color samples of glazing sealant selected.
4. Laminated glass interlayer color and pattern selected.
5. 12 inch x 12 inch samples of spandrel glass colors selected.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer’s Literature: Materials description and installation instructions for glazing materials.

B. Design Calculations: Provide design calculations showing conformance with the specified performance requirements prepared and certified by the glass manufacturer.

1. Point Supported Glass: Finite element calculations, including stresses at holes.

C. Wind Load and Thermal Stress Analyses: Copies of manufacturer's wind load and thermal stress analyses.

D. Compatibility and Adhesion Test Report: Submit copies of statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results relative to material performance, including recommendations for primers and substrate preparation needed to obtain adhesion.

E. Warranties: Signed copies of insulating glass unit, coated glass, and laminated glass warranties.

1.6 CLOSEOUT SUBMITTALS

A. Provide extra material equal to 5 percent, or a minimum of 1 whichever is greater, of furnished glazing products for bridge roof, north tower roof, and platform canopy glass of each type and size.

1.7 QUALITY ASSURANCE

A. Comply with the following:

1. GANA Publications: GANA's - Glazing Manual.
2. Glazing Material: FS DD-G-451Dand ASTM C 1036.
3. Glass Coating: ASTM C 1376 Standard Specification for Pyrolitic and Vacuum Deposition Coatings on Glass.
4. Safety Glazing: ASTM C 1048, ASTM C 1172, ANSI Z97.1, U.S. Consumer Product Safety Commission Standard 16 CFR 1201 CI and CII, and GANA'S - Glazing Manual and Laminated Glass Design Guide.
5. Sloped Glazing: AAMA GDSG-1, Glass Design for Sloped Glazing and AAMA TIR-A7, Sloped Glazing Guidelines.
6. Structural Sealant Glazing: Comply with ASTM C 1401 for design and installation.

B. Unless otherwise shown or governed by other referenced standards specified, conform with details and procedures of GANA Glazing Manual, (National Glass Association).

C. Engineer Qualifications: Structural Engineer licensed in the State of Illinois and experienced in providing engineering services of the kind indicated that have resulted in the successful installations, similar in material, design, and extent to that indicated for this Project.

D. Installer Qualifications: An experienced installer, as evidenced by a minimum of 5 consecutive years experience, and who has completed glazing similar in material, design, and extent to that indicated for project and whose work has resulted in construction with a record of successful in-service performance.

E. Source Limitations:

1. Tinted Interlayer Glass: Obtain laminated glass with tinted interlayer from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.
2. Coated Glass: Obtain coated glass from one manufacturer for each type of coating and each type and class of float glass indicated.
3. Insulating Glass: Obtain insulating glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.
4. Laminated Glass: Obtain laminated glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.
5. Tempered Glass: Obtain tempered glass units from one manufacturer using the same type of glass and tempering process for units.

F. In the event of a conflict between specified standards or references the more stringent or greater is to take precedent and be the one utilized for the design and installation.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver glazing materials to project site in manufacturer's unopened containers, fully identified with trade name, color, size, hardness, type, class and grade. Store each item in accordance with manufacturer's instructions. Immediately remove from the job site damaged or otherwise unsuitable material, when so ascertained.

1.9 MOCKUP INSTALLATION

A. Refer to Section 01 40 00 - Quality Requirements.

1.10 WARRANTY

A. Coated Glass: Provide a written 12 year warranty from date of manufacture for coated glass. Warranty covers deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer’s published instructions.

B. Laminated Glass: Provide a written 12 year warranty from date of manufacture for laminated glass. Warranty covers deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer’s published instructions.

C. Exterior Wall System: Faults and defects include but are not limited to, the following:

1. Structural failures including, but not limited to, glass breakage
2. Noise or vibration caused by thermal movement.
3. Adhesive or cohesive sealant failures.
4. Failure of system to meet Performance Requirements.

D. The above warranties are in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
3. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified subject to approval by the Commissioner.

2.2 MATERIALS

A. Clear Float Glass: Complying with ASTM C 1036, Type I, Class 1, Quality q3, thickness as shown or specified, tempered in doors and adjacent lights where shown on Drawings or required by codes.

B. Ultra Clear (Low Iron) Float Glass: Complying with ASTM C 1036, Type I, Class 1, Quality q3, thickness as shown or specified, tempered in doors and adjacent lights where shown on Drawings or required by codes, with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87, provide one of the following:

1. "Krystal Klear" (AGC Industries Inc.).
2. "Ultrawhite" (Guardian).
3. "Starphire" (Vitro Glass).
4. "Optiwhite" (Pilkington).

C. Tinted Float Glass: Complying with ASTM C 1036, Type 1, Class 2 3, Quality q3, thickness as shown or specified, tempered in doors and adjacent lights where shown on Drawings or required by codes, heat strengthened where required by conditions of the installation, one of the following:

1. Green:
   a. "Evergreen" (Pilkington LOF).
   b. "Solex" (Vitro).

c. "Versalux Green" (Zeledyne).

D. Clear Low-Emissivity (Low E) Glass: Complying with ASTM C 1376, thickness as shown or specified, tempered in doors and adjacent lights and heat strengthened where shown on Drawings or required by codes, one of the following:

1. "Solarban 60" (VITRO).
2. "Ti-AC" (AGC).
3. "Sunguard" (Guardian).
4. "VE-2M" (Viracon).

E. Clear Laminated Low Iron Glass: Complying with ASTM C 1172, two layers of tempered or heat strengthened low iron glass laminated with 0.0350 inch thick extra clear polyvinyl butyral (PVB) interlayer, thickness as determined by the glass manufacturer to comply with the specified performance requirements, where shown on Drawings, provide interlayer by one of the following:

1. "Trosifol Ultraclear" (Kuraray America, Inc.).
2. "Custom Decorative Laminated Glass" (McGrory Glass, Inc.).
3. "" (Eastman Chemical Company).

F. SGP Interlayer Clear Laminated Low Iron Glass: Complying with ASTM C 1172, two layers of tempered or heat strengthened low iron glass laminated with ionoplast interlayer, thickness as determined by the glass manufacturer to comply with the specified performance requirements, where shown on Drawings, provide interlayer by one of the following:

1. "SentryGlas Plus" (Kuraray America, Inc.).

G. SGP Interlayer Color Laminated Low Iron Glass: Complying with ASTM C 1172, two layers of tempered or heat strengthened low iron glass laminated with ionoplast interlayer, "SentryGlas Plus" (Kuraray America, Inc.) and tinted polyethylene terephthalate film, "Custom Decorative Laminated Glass" (McGrory Glass, Inc.), thickness as determined by the glass manufacturer to comply with the specified performance requirements, where shown on Drawings.

1. Color and Pattern: As selected by Architect from manufacturer's full range.

H. Recessed Extruded Aluminum Glazing Channels: Aluminum extrusions complying with ASTM B 221, 6063-T5 alloy and temper G.S. 10A-T5, with clear anodized finish with manufacturer's standard continuous roll-in glazing gaskets retained in extrusion races, as manufactured by C.R. Laurence Company or other as approved by Commissioner.

I. Glazing Tape: Polyisobutylene/Butyl, complying with ASTM C 1281:

1. "Butyl Rubber Tape" (Dap, Inc.).
2. "G-66 or BB-50" (Pecora Corporation).
3. "Tremco 400 Tape" (Tremco).

J. Anti-Graffiti film: "Graffiti Free" (Madico, Inc.).

K. Setting Blocks: Neoprene blocks, 70 to 90 Type A durometer hardness.

L. Spacers: Neoprene blocks, 40 to 50 Type A durometer hardness, 3 inches long, self-adhesive on one face only.

2.3 POINT SUPPORTED SPIDER GLASS FITTINGS

A. Provide specially designed and fabricated fittings for point support in holes for glass panels. Provide fittings with a tolerance capability, which will cope with the full range of movements and following:

1. Thermal movements occurring as a result of differential coefficients of thermal expansion within the range specified. The components used within the system are to noiselessly withstand thermal movements without any buckling, distortion, cracking, failure of joint seals or undue stress on the glass or fixing assemblies.
2. Deflection of edge beams due to loading applied after the erection of the cladding to the magnitude specified.
3. Maximum side sway of the structure due to wind load occurring to the magnitude specified or seismic or dynamic movement to the degree specified.
4. Deflection due to self-weight of the glass system.
5. Upward and downward (Inward and Outward) movements due to the design wind loads specified.

B. Provide fittings with countersunk discs, flush countersunk bolts and articulated swivel bolts will be machine finished; socket head bolt will be with hexagonal shank, stainless steel UNS S31600.

C. Bushings: Provide bushings of UV-resistant nylon.

D. Gaskets: Provide gaskets of fully vulcanized fiber, neoprene or pre-cured silicone which accommodates rotational loads at the glass plane, with flexible disc/pads, countersunk discs, flush countersunk bolts and articulated swivel bolts fabricated from solid machined UNS S31600 stainless steel as typical products of the specified system manufacturers. Conform with ASTM International C1115

E. Acceptable Manufacturers:

1. SADEV USA Inc., Keokuk, IA. 52632
2. Novum Structures LLC, Menomonee Falls, WI 53051
3. Pilkington North America, Inc., Toledo, OH 43687
4. C.R. Laurence Company of North America, Los Angeles, CA 90058.

2.4 HEAT TREATED TEMPERED AND HEAT STRENGTHENED GLASS

A. Provide tempered and heat strengthened glass horizontally heat-treated in accordance with EN 14179-1. Fabricate tempered and heat strengthened glass units so that roll distortion lines are in accordance with ASTM International C1651

B. Provide heat treated glass complying with ASTM C 1048 for the following:

1. Kind HS: Heat strengthened.
2. Kind FT: Fully tempered.

C. Heat Soak Test fully tempered glass in accordance with EN 14179-1.

2.5 FABRICATION - POINT SUPPORTED GLASS

A. Glass Tolerances:

1. Provide squareness of panels tolerance within 3.0 mm of specified dimensions.
2. Provide edge lengths within 1.5 mm of specified dimensions.
3. Provide holes within 1.0 mm of specified locations. Bow shall be better than 0.1 percent.

B. Glass Holes:

1. Depending on fitting type, provide drilled holes be countersunk or straight through. Provide fittings of the type shown in the Drawings.
2. When glass is suspended, do not countersink fitting holes.
3. Clean edges of holes to be free of loose or ground materials.
4. Provide insulated glass units with holes fully sealed and warranted to perform under applied loads and conditions by the glass manufacturer.

2.6 GLAZING SEALANTS

A. Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Commissioner from manufacturer's full range.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920, ASTM C 1184 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Single-Component Neutral and Basic-Curing Silicone Glazing Sealants:
   a. Products:
      1) "790" (Dow Corporation).
      2) "SilPruf LM SCS2700" (GE Silicones).
      3) "SilPruf SCS2000" (GE Silicones).

4) "Omniseal" (BASF).
b. Type and Grade: S (single component) and NS (nonsag).
c. Class: 100/50.
d. Use Related to Exposure: NT (nontraffic).
e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
1) Use O Glazing Substrates: Coated glass.

2. Neutral-Curing Silicone Glazing Sealants:
a. Products:
1) "791" (Dow Corporation).
2) "795" (Dow Corporation).
3) "SilPruf NB SCS9000" (GE Silicones).
4) "UltraPruf II SCS2900" (GE Silicones).
b. Type and Grade: S (single component) and NS (nonsag).
c. Class: 50.
d. Use Related to Exposure: NT (nontraffic).
e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
1) Use O Glazing Substrates: Coated glass.

3. Class 25 Neutral-Curing Silicone Glazing Sealant:
a. Products:
1) "799" (Dow Corporation).
2) "UltraGlaze SSG4000" (GE Silicones).
3) "Proglaze SSG" (Tremco Incorporated).
b. Type and Grade: S (single component) and NS (nonsag).
c. Class: 25.
d. Use Related to Exposure: NT (nontraffic).
e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
1) Use O Glazing Substrates: Coated glass.

2.7 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.8 GLAZING SCHEDULE

A. Glazing Types are indicated on Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine surfaces to receive the parts of the work specified herein. Verify dimensions of in-place and subsequent construction. Application or installation of materials constitutes acceptance of the related construction.

3.2 INSTALLATION - GENERAL

A. Employ only experienced glazers who have had previous experience with the materials and systems being applied. Use tools and equipment recommended by the glass manufacturer.

B. Measure openings and cut glass accurately to fit each opening with minimum edge clearances and bite on glass as specified by GANA. If glass is to be cut to size at project site deliver each piece to project at least 2 inches larger (in both dimensions) than required, so as to facilitate the cutting of clean cut edges without necessity of seaming or nipping. Do not seam, nip or abrade tempered glass at the job site.

C. Maintain a minimum temperature of 40 deg F during glazing unless the manufacturer of the glazing materials specifically agrees to application of his materials at lower temperatures. If job progress or other conditions require glazing work when temperatures are below 40 deg F (or below minimum temperature recommended by the manufacturer), consult the manufacturer and establish the minimum provisions required to ensure satisfactory work. Record in writing to the manufacturer, with copy to the Commissioner, the conditions under which such glazing work proceeds and the provisions made to ensure satisfactory work.

D. Clean glazing stops and rabbets to receive glazing materials of obstructions and deleterious substances which might impair the work. Remove protective coatings which might fail in adhesion or interfere with bond of sealants. Comply with manufacturer's instructions for final wiping of surfaces immediately before application of primer and glazing sealants or tapes.

E. Prime surfaces to receive glazing sealants in accordance with manufacturer's recommendations, using recommended primers. Test materials and surfaces for adhesion of sealants.

F. Inspect each piece of glass immediately before installation. Do not install pieces which have significant impact damage at edges, scratches or abrasion of faces or any other evidence or damage.

G. Locate setting blocks at the quarter points of sill but no closer than 6 inches to corners of glass. Use blocks of proper size to support the glass in accordance with manufacturer's recommendations.

H. Provide spacers for glass to separate glass from stops, except where continuous gaskets or tape are required. Locate spacers 36 inches o.c. maximum inside and

out, with a minimum of 2 spacers per edge of glass. Provide thickness equal to sealant thickness shown. Provide width as required for minimum of 3/8 inch bite on glass at edges.

I. Set glass in a manner which produces greatest possible degree of uniformity in appearance. Face glass, which has dissimilar faces, with matching faces in the same direction. Set glass with bow (if any) to exterior.

J. Install tempered and heat strengthened glass units with the roll distortion parallel to the bottom or sill glazing pocket in accordance with the glass manufacturer's recommendations for the type of glass installation.

K. Do not use glazing materials from different sources in the same joint system unless the manufacturer of each material has stated in writing that his material is fully compatible with the other material.

L. Patch Fitting Installation:

1. Verify that support framing and solid substrate are installed prior to installation of fittings and glass.
2. Install patch fittings and glass in accordance with the manufacturer’s printed installation instructions and the final reviewed shop drawings.

M. Where shown on the Drawings or where required by window manufacturer apply a cap and toe beads of sealant at the exterior perimeter of the glass assuring a bond to both frame, and glass, completely fill the void between glass and frame.

N. Use masking tape or other suitable protection to limit coverage of glazing materials to the surfaces intended for sealants.

O. Glazing Tape:

1. Butt or lap ends of sealant tape in accordance with the manufacturer's recommendations.
2. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
3. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
4. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
5. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
6. Do not remove release paper from tape until just before each glazing unit is installed.

P. Clean excess sealant from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.

3.3 GASKET GLAZING (DRY)

A. Install glass units in curtain walls, windows, doors, sidelites, interior glazing channels and metal framed skylights using curtain wall, glazing channel, window door or skylight manufacturer's standard extruded glazing gaskets and strips installed in accordance with manufacturer's printed installation instructions.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.4 STRUCTURAL SILICONE GLAZING

A. Clean, prime and mask at structural silicone joints during the same work day on which the silicone is applied.

B. Temporarily clamp glass during cure of structural silicone. After sufficient cure, remove clamps and fill any gaps in silicone.

C. Mask glass and aluminum during application of structural silicone. Remove masking immediately after tooling sealant.

D. Seal exterior flush joints at structural silicone conditions with silicone sealant specified herein.

E. Do not apply structural silicone to edges of insulating glass units, or to edges of laminated glass units. Do not adhere to, or place against, the edge of a laminated glass unit interlayer, sealants used as weather seals.

3.5 INSTALLATION – POINT SUPPORT GLASS FITTING SYSTEM

A. Install glass panels and point support fittings in accordance with the final reviewed shop drawings and the manufacturer’s printed installation instructions.

B. Verify that support framing is within tolerances of point support spider fittings prior to glass panels installation.

C. Install point system designed to accommodate the tolerances of the surrounding conditions and the supporting structure. Do not exceed the tolerances and clearances shown on the final reviewed shop drawings. Maintained parts of the system, when completed, within the following tolerances:

1. Maximum offset from true alignment between any two identical members abutting end to end in line to be 1/32 inch.
2. Maximum variation from plane or location shown on the final reviewed shop drawings, not greater than 1/8 inch per 12 foot length or 1/2 inch in any total length.

D. Bolt Torque: Torque bolts to torques specified on shop drawings using a calibrated tool. Lock torque bolts into position to prevent back-off. Reset calibrations regularly to ensure an accurate torque.

E. Provide spacers to separate the glass from attachment plates.

F. Seal plate-to-plate joints of glass with silicone sealant. Provide joint dimensions that are compatible with sealant properties and live load movement of the structure.

G. Clean glazing connectors receiving glazing materials of deleterious substances that might impair the work. Remove protective coatings and deleterious substances that might fail in adhesion or interfere with bond of sealants. Comply with the manufacturer's instructions for final wiping of surfaces immediately before the application of primer and glazing sealants. Wipe metal surfaces with an appropriate cleaning agent.

H. Inspect each unit of glass immediately before installation. Do not install glass with significant impact damage at edges, scratches, abrasion of faces or any other evidence of damage.

I. Sealants: Prime surfaces are to receive glazing sealants where required, in accordance with the sealant manufacturer's recommendations, using recommended primers.

J. Perimeter Channels: Locate setting blocks in sill channel, if required by conditions of the installation at the quarter points of the sill, but no closer than 6 inches to corners of the glass. Use blocks of proper sizes to support the glass in accordance with the manufacturer's recommendations.

K. Set the glass in a manner that produces the greatest possible degree of uniformity in appearance. Face glass, which has a dissimilar face with matching faces in the same direction.

L. Use masking tape or other suitable protection to limit the coverage of glazing materials on the surfaces intended for sealants.

M. Tool the exposed surfaces of glazing materials.

N. Clean excess sealant from the glass and support members immediately after the application, using solvents or cleaners recommended by the manufacturers.

O. Cure sealants in accordance with the manufacturer's instructions to attain maximum durability and adhesion to glass.

3.6 TESTING OF EXTERIOR WALL SYSTEMS

A. Testing Agency: Engage a qualified independent testing and inspecting agency to witness field tests and inspections and to prepare test reports.

B. Field Quality-Control Testing: A minimum of two tests areas, designated by the Commissioner for each system, shall be tested according to AAMA 501.2.

C. Repair leaks and other defects. Retest as directed by the Commissioner. Repair or replace other work damaged by such leaks.

3.7 PROTECTION AND CLEANING

A. Protect glass from breakage immediately upon installation. Use streamers or ribbons suitably attached to framing and held free of glass. Do not apply warning markings directly to the glass.

B. Remove and replace glass which is broken, cracked, chipped or damaged in any way and from any source, including weather, vandalism and accidents during the construction period.

C. Maintain glass in a reasonably clean condition during construction so that it will not become stained and will not contribute to the deterioration of glazing materials.

D. Wash and polish glass on both faces just prior to final acceptance. Comply with instructions and recommendations of glass manufacturer and glazing materials manufacturer for cleaning in each case.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of GLAZING shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of GLAZING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 08 87 00
GLAZING SURFACE FILMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Glazing surface films, including installation materials.

B. Related Sections:

1. Glazing: Section 08 80 00.

1.3 REFERENCE STANDARDS

A. ASTM International (ASTM):

1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E 903 - Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
3. ASTM D 3330 - Standard Test Methods for Peel-Adhesion at 180 Degree Angle.

1.4 ACTION SUBMITTALS

A. Product Data: For each film product indicated.

B. Samples for Color Selection: Manufacturer's standard sample sets showing the full range of colors available for each type of product indicated.

C. Samples for Verification: 12-inch square samples of each type of glazing film specified, in color specified.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Special warranty specified in this Section.

B. Maintenance Data and Replacement Instructions: For each type of film overlay to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by film manufacturer as having the necessary experience, staff, and training to install manufacturer's products according to specified requirements.

B. Source Limitations: Obtain each type of film overlay through one source from a single manufacturer to provide products of consistent quality in appearance and physical properties.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

B. Store and protect glazing films according to manufacturer's written instructions and as needed to prevent damage, condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with film installation when ambient and substrate temperature conditions are outside limits permitted by manufacturer and when glass substrates are wet from frost, condensation, or other causes.

1.9 WARRANTY

A. Surface Film Manufacturer is to warrant in writing the specified glazing surface film to be free from faults and defects including fading, delamination, peeling, cracking, or blistering in accordance with the General Conditions, except the warranty is to be for 5 years instead of 1 year.

B. Provide warranty covering both labor and material to replace glazing surface film which becomes defective in any of the categories listed above.

C. Provide copies of warranty signed by the Glazing Surface Film Manufacturer and submit to the Commissioner.

D. This warranty is in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents.

1.10 MOCKUP INSTALLATION

A. Apply glazing film to not less than 9 square feet of glass, in locations as directed by Commissioner to verify selections made under sample selections and to demonstrate aesthetic effects and qualities of materials and execution.

1. Obtain approval of field samples before continuing with remainder of installation.
2. Maintain field samples during remainder of installation in an undisturbed condition as a standard for judging the completed Work.
3. Approved field samples may become part of the completed Work.

PART 2 - PRODUCTS

2.1 GLAZING SURFACE FILMS

A. Film Overlay: Single-layered applied glazing film products, 2 mils minimum thickness, applied to interior glass surfaces, consisting of the following (from outboard surface to inboard surface), as applicable to each type of film indicated:

1. Removable release liner.
2. Pressure sensitive adhesive.
3. Clear, dyed, etched or printed pattern layer of polyester film.
4. Scratch resistant coating.

B. Product and Colors: Provide product and colors as manufactured by one of the following:

1. 3M Fasara.
2. Decorative Films, LLC.
3. LLumar iLLusions.
4. As indicated on the Drawings.

2.2 GLAZING FILM ACCESSORIES

A. General: Provide products complying with requirements of glazing film manufacturer for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Adhesive: Pressure Sensitive acrylic adhesive system.

C. Cleaners, Primers, and Sealers: Types recommended by glazing film manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass and surrounding adjacent surfaces for conditions affecting installation.

1. Report conditions that may adversely affect installation. In report, include description of any glass that is broken, chipped, cracked, abraded, or damaged in any way.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Immediately before beginning installation of films, clean glass surfaces of substances that could impair glazing film's bond, including mold, mildew, oil, grease, dirt and other foreign materials.

C. Blade the inside surface of window glass with industrial razors to ensure removal of foreign contaminants.

D. Protect window frames and surrounding surfaces and materials from damage during installation.

3.3 INSTALLATION

A. General: Comply with glazing film manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements are indicated.

B. Install film continuously, but not necessarily in one continuous length. Install with no gaps or overlaps.

C. If seamed, install with no gaps or overlaps. Install seams vertical and plumb. No horizontal seams allowed.

D. Do not remove release liner from film until just before each piece of film is cut and ready for installation.

E. Install film with mounting solution and custom cut to the glass with neat, square comers and edges to within 1/8 inch of the window frame.

F. Remove air bubbles, wrinkles, blisters, and other defects.

G. After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, banding, thin spots, blisters or pinholes.

1. If installed film does not meet this criteria, remove and replace with new film.

3.4 CLEANING

A. Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.

B. After application of film, wash film using cleaning methods recommended by glazing film manufacturer. Do not use abrasive-type cleaning agents or bristle brushes.

C. Replace films that cannot be cleaned.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of GLAZING SURFACE FILMS shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of GLAZING SURFACE FILMS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 08 91 30
LOUVERS - STAINLESS STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Louvers, including the following:

1. Horizontal, Nondrainable-Blade Louvers.
2. Insulated blank-off panels
3. Bird screens and insect screens

B. Related Sections:

1. Cast-in-place concrete: Section 03 30 00.
2. Sealants for perimeter abutting construction: Section 07 92 00.
3. Aluminum curtain wall: Section 08 44 13.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified structural engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the indicated wind loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Design Loads are indicated in the Structural Drawings.

C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

D. Anchors and Connections:

1. Anchors, connections and assemblies connecting the louvers and associated fabrications to the supporting construction are shown on the Drawings as suggested locations for the louver manufacturer/installer's information. The louver manufacturer/ installer is responsible for the structural design and placement of the connections and anchors, including connecting hardware, accessories and reinforcing necessary for fabrication, and installation of the louvers and associated fabrications.
2. The louver manufacturer is to notify the Commissioner in writing prior to the submittal of shop drawings of any changes in the proposed locations of connections and anchors.

E. The Commissioner's review of shop drawings is not to be construed as removing responsibility from the louver manufacturer/installer for structural failures related to design, fabrication, installation, and fabrication services.

1.5 ACTION SUBMITTALS

A. Shop Drawings:

1. Indicate sections of typical members, dimensioned elevations, anchors, and fasteners and their spacing and full details of accessories required.
2. Provide shop drawings with seal and signature of structural Engineer currently registered in the State of Illinois. Provide the same engineer who prepares and signs the design calculations.

B. Samples:

1. 6 inch x 12 inch sample of stainless steel with finish specified / selected by the Commissioner.

1.6 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions for louvers.

B. Design Calculations: Copies of structural design calculations with seal and signature of structural Engineer currently registered in the State of Illinois. Calculations will not be reviewed by the Commissioner but are for information purposes only.

C. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and

witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

D. Warranty: Signed copies of the following:

1. Louver units.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

C. Governing criteria for louver air performance and water penetration is to be in accordance with AMCA 500 (Air Movement and Control Association, Inc.)

D. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.8 DELIVERY, HANDLING AND STORAGE

A. Deliver louver components to the project site clearly marked for proper identification.

B. Store louver components in accordance with manufacturer's instructions, above ground, in dunnage and protected from weather, construction activities and other causes of damage or loss.

C. Handle materials at the project site in such a manner as to prevent damage. Immediately remove from the project site damaged or otherwise unsuitable material when so ascertained.

1.9 PROJECT/SITE CONDITIONS

A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

1.10 WARRANTY

A. Louvers:

1. Provide manufacturer's written warranty, stating that the louvers will be free of faults and defects for a period of 2 years in accordance with the General Conditions, except the warranty period is to be 2 years instead of 1 year.
2. Provide warranty signed by the Louver Manufacturer and Installing Contractor and submit) copies to the Commissioner.

B. The above warranties are in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless-Steel Sheet: ASTM A240/A240M, UNS S30400, No. 4 finish, with grain running parallel to length of blades and frame members.

B. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
2. For fastening stainless steel, use 300 series stainless-steel fasteners.

C. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION - GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Interior flange unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacing indicated, but not more than recommended by manufacturer to comply with performance requirements.

1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.

G. Access Doors: Provide access doors in louvers where shown on the Drawings, matching louver blade size and configuration, complete with concealed frame and operating hardware, including means for locking.

H. Provide subsills made of same material as louvers for recessed louvers.

I. Join frame members to each other and to fixed louver blades with as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening except where insect screening is indicated.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce stainless-steel screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Stainless-Steel Louvers:

1. Bird Screening: Stainless-Steel, 1/2 inch square mesh, 0.047-inch wire.
2. Insect Screening: Stainless-Steel, 18-by-18 mesh, 0.009-inch wire.

2.4 BLANK-OFF PANELS

A. Insulated, Blank-Off Panels: Laminated panels consisting of insulating core surfaced on back and front with metal sheets and attached to back of louver.

1. Thickness: 2 inches unless noted otherwise on the drawings.
2. Metal Facing Sheets: Stainless-Steel sheet, not less than 0.031 inch nominal thickness.
3. Insulating Core: Rigid extruded-polystyrene foam.
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard, not less than 0.080 inch nominal thickness channel frames, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
6. Panel Finish: Same finish applied to louvers, both sides.
7. Attach blank-off panels with clips.

2.5 STAINLESS-STEEL SHEET FINISHES

A. Comply with ASTM A480/A480M. Remove or blend tool and die marks and stretch lines into finish.

B. Polished finish: Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

D. Repair sheet finish by grinding and polishing irregularities, weld spatter, scratches, and forming marks to match surrounding finish.

2.6 LOUVERS SCHEDULE

A. Horizontal , Nondrainable-Blade Louver, LV-1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide “FSJ-402”, Greenheck Fan Corporation or comparable product by one of the following:

    a. Airolite Company, LLC (The).
    b. Construction Specialties, Inc.
    c. Greenheck Fan Corporation.
    d. Ruskin Company; Johnson Controls, Inc.
3. Louver Depth: 4 inches.
4. Blade Profile: Plain blade without center baffle.
5. Frame and Blade Material and Nominal Thickness: Stainless-steel sheet, not less than 0.050 inch.
6. Louver Performance Ratings:

a. Free Area: Not less than 7.5 sq. ft. for 48-inch- wide by 48-inch high louver.
b. Point of Beginning Water Penetration: Not less 700 fpm.
c. Air Performance: Not more than 0.10-inch wg static pressure drop at 700 fpm free-area velocity.

7. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 –Joint Sealants for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed surfaces of louvers that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Commissioner, remove damaged units and replace with new units.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of LOUVERS - STAINLESS STEEL shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of LOUVERS - STAINLESS STEEL shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Gypsum board shaft wall assemblies for the following applications:

1. Shaft wall enclosures.
2. Horizontal enclosures.

B. Related Sections:

1. Waterproofing: Section 07 13 54.
2. Fire-Resistive Joint Systems: Section 07 84 43.
3. Gypsum board: Section 09 29 00.

1.2 DESIGN REQUIREMENTS

A. Design Requirements: Design, engineer, fabricate, and install work in compliance with specified standards, performance requirements, material selections and requirements of this and related sections.

B. Include engineering analysis by a qualified Engineer, using structural performance requirements and design criteria indicated herein.

C. Determine the size, gauge, and spacing when not shown on the Drawings of members, connections and anchorage to building structure and construction using the Performance Requirements.

1.3 PERFORMANCE REQUIREMENTS

A. Fire Resistance Ratings: For fire-resistance-rated assemblies, provide materials and construction which are identical to those of assemblies whose fire resistance rating has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

B. Structural Performance Characteristics: Provide gypsum board shaft wall systems designed to withstand the following lateral design loadings (air pressures), applied transiently and cyclically, for maximum heights of partitions required, within the following deflection limits, verified by pretesting for deflection characteristics.

1. Shafts: Lateral loading of 5 psf.
2. Other Loads: Design loads are those shown on the Drawings.
3. Wall Deflection Limit:
    a. Gypsum Board Shaft Wall Assemblies: L/240 of partition height.

b. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.

4. Anchorage to Structural Concrete Frame: Provide power driven galvanized fasteners of type suitable for application indicated, fabricated from corrosion resistant materials, with capability to sustain, without failure, a load (shear and bearing) equal to 10 times design load without exceeding allowable stress of fastener or framing members, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
5. Anchorage to steel or imbeds: Welded connections per AWS requirements.
6. Provide bolted or welded connections of cold-formed framing members.
7. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

1.4 ACTION SUBMITTALS

A. Product Data: Submit a list of proposed products and materials to be provided for complete assemblies, along with manufacturer's product data, specifications, typical installation details and other data for each material listed to prove compliance with the specified requirements.

B. Submit shop drawings and manufacturer's literature indicating framing sizes and gages support framing system for horizontal enclosures.

1.5 INFORMATIONAL SUBMITTALS

A. Design Data: Submit complete metal framing manufacturer's load and deflection tables properly annotated to indicate the framing sizes and gages to be used and showing compliance with the specified performance requirements.

B. Design Calculations: Submit calculations prepared by a qualified Engineer, showing compliance with the specified performance criteria. Calculations will not be reviewed by the Architect but are for informational purposes only. Test reports are not an acceptable substitute for design calculations.

1. Attachment and anchorage to the building structure.
2. Load-bearing stud wall member sizes (if shown on Drawings or required by conditions).

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures for installing gypsum board shaft wall assemblies including, but not limited to, the following:

1. Fasteners proposed for anchoring nonstructural steel framing to building structure.
2. Wiring devices in shaft wall assemblies.
3. Doors and other items penetrating shaft wall assemblies.
4. Waterproofing on shaft wall assemblies.
5. Items supported by shaft wall-assembly framing.
6. Mechanical work enclosed within shaft wall assemblies.

B. Engineer Qualifications: Structural Engineer licensed in the State of Illinois and experienced in providing engineering services of the kind indicated that have resulted in the successful installations, similar in material, design, and extent to that indicated for this Project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

C. Stack panels flat on leveled supports off floor or slab to prevent sagging.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide manufacturers by one of the following:

1. CertainTeed Corporation
2. Georgia-Pacific Gypsum LLC.
3. Continental Building Products, LLC.
4. National Gypsum Company.
5. USG Corporation.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES, GENERAL

A. Provide materials and components complying with requirements of fire resistance rated assemblies indicated.

1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
2. Provide auxiliary materials complying with gypsum board shaft wall assembly manufacturer's written recommendations.

2.3 PANEL PRODUCTS

A. Recycled Content: Provide gypsum panel products with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 5 percent by weight.

B. Gypsum Shaftliner Board:

1. Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with ASTM D 3273 mold-resistance score of 10 as rated according to ASTM D 3274, 1 inch thick, and with double beveled long edges.
   a. Provide one of the following:
      1) "Sheetrock Liner Panels – Mold Tough" (USG).
      2) "Glas Type X Shaftliner" (CertainTeed).
      3) "Fire-Shield Shaftliner XP" (National).
      4) "Mold Defense Firecheck Shaftliner" (Continental).
      5) "eXP Shaftliner" (National).

C. Gypsum Board: Fire-rated and moisture resistant, as specified in Section 09 29 00 - Gypsum Board.

2.4 LOAD-BEARING STEEL FRAMING

A. Framing Members: Comply with ASTM C 754 for conditions indicated.

B. Steel Sheet Components: Light gage screw type, C-H and E studs Comply with ASTM C 645 requirements for metal, and AISI "Specification for the Design of Cold Formed Steel Structural Members", unless otherwise indicated.

1. Protective Coating: ASTM A 653, G60 hot-dip galvanized, unless otherwise indicated.

C. Steel for Cold-Formed Metal Framing - Studs and Tracks: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: 33, 37, 40, 50, Class 1; as required by structural performance.

D. Framing Accessories:Fabricate steel framing accessories of same material and finish used for framing members, with a minimum yield strength of 33,000 psi.
2. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   a. Supplementary framing.
   b. Bracing, bridging, and solid blocking.
   c. Web stiffeners.
   d. Anchor clips.
   e. End clips.
   f. Foundation clips.
   g. Gusset plates.
   h. Stud kickers, knee braces, and girts.
   i. Joist hangers and end closures.
   j. Hole-reinforcing plates.
   k. Backer plates.

E. Provide studs and runners by one of the following:

1. MarinoWARE.
2. SCAFCO Corporation.
3. Clarkwestern Dietrich Building Systems LLC.
4. Telling Industries.
5. MBA Metal Framing.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Section 09 29 00 - Gypsum Board that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.

C. Gypsum Board Joint Treatment Materials: As specified in Section 09 29 00 - Gypsum Board.

D. Laminating Adhesive: Adhesive or joint compound recommended by manufacturer for directly adhering gypsum face layer panels and gypsum base face layer panels to backing layer panels in multilayer construction.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40CFR59, Subpart D (EPA Method 24).

E. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

F. Track Fasteners: Power driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
2. Power Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

G. Sealant: As specified in Section 07 92 00 - Joint Sealants.

2.6 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire resistance rated assembly indicated.

1. Depth: As indicated on Drawings.
2. Minimum Base Metal Thickness: As indicated on Drawings.

B. Runner Tracks: Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, but at least 2 inches long and in depth matching studs.

1. Minimum Base Metal Thickness: Not less than indicated for studs.

C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire resistance rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs. Provide one of the following:

1. "Slotted Top Track" by Metal Lite, Inc.
2. "SLP-Trk" by Clark Dietrich Metal Framing, Inc. for fire-rated partitions.
3. “Fire Trak System”, Fire Trak Corp.

D. Jamb Struts: Manufacturer's standard J-profile strut with long-leg length of 3 inches, in depth matching studs, and not less than 0.0329 inch thick.

E. Room Side Finish: As indicated on Drawings.

F. Shaft Side Finish: As indicated by fire resistance rated assembly designations.

2.7 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire resistance rated assemblies indicated, manufacturer's written installation instructions, and the following:

1. ASTM C 754 for installing steel framing except comply with framing spacing indicated.
2. Section 09 29 00 - Gypsum Board, for applying and finishing panels.

B. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

C. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge architectural or building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

H. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft wall assembly framing.

I. At penetrations in shaft wall, maintain fire resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

J. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

K. Firestop Tracks: Install to maintain continuity of fire resistance rated assembly indicated.

L. Control Joints: Install control joints according to ASTM C 840, while maintaining fire resistance rating of gypsum board shaft wall assemblies, and in specific locations as reviewed by the Architect.

M. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air pressure differential between shaft and external spaces; maintain an airtight and smoke tight seal; and comply with ASTM C 919 requirements or with manufacturer's written instructions, whichever are more stringent.

3.3 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at 24 inches o. c. unless otherwise indicated on Drawings.

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks.

1. Stud Spacing: 16 inches unless otherwise indicated on Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically unless otherwise indicated on Drawings. Fasten at each stud intersection.

J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

L. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: 16 inches unless otherwise indicated on Drawings.

D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.

E. Where necessary install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

I. Horizontal (Ceiling) Installation:

1. Determine the support steel framing sizes and suspension wire spacing for ceiling installations based on the Manufacturer's published limiting span tables for a maximum spacing of 24 inches, a uniform load of 20 pounds per square foot and a maximum allowable deflection of L/240.
2. Install studs perpendicular to support framing in J runners and attach studs to support framing with Type S screws spaced twenty-four inches on center.
3. Install liner panels and stud framing.
4. Install. Gypsum board to meet required ratings

3.5 ERECTION TOLERANCES

A. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.6 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Non-structural metal framing, including the following:

1. Non-load bearing interior light gauge steel studs and furring.
2. Ceiling and soffit suspension systems for interior gypsum board assemblies.
3. Backing plates not provided by other trades for support of items attached to metal framing system.
4. Supplementary parts and components, such as clips, fasteners, supplementary framing, and other miscellaneous accessories required for a complete installation.

B. Related Sections:

1. Cold-formed steel framing: Section 05 40 00.
2. Rough carpentry: Section 06 10 00.
3. Building thermal insulation: Section 07 21 00.
4. Penetration firestopping: Section 07 84 13.
5. Gypsum board: Section 09 29 00.

1.3 SYSTEM DESCRIPTION

A. Delegated Design Requirements:

1. Drawings of metal support system assemblies are diagrammatic and show design intent of finished profiles, shapes and forms; relationships between elements; location, identification, dimension and size of components, assemblies and accessories; and details and diagrams of connections.
2. Unless otherwise indicated on the Drawings, engineer, fabricate, assemble, and install metal support systems to meet or exceed the criteria indicated; to conform to the profiles indicated; to satisfy applicable governing codes and regulations; and to provide structurally sound assemblies.
3. If required by authorities having jurisdiction, prepare and submit reviewed shop drawings, specifications, load and deflection tables and any other supporting data required by authorities having jurisdiction for their review and approval, and pay fees incurred, prior to beginning installation.

B. Performance Requirements: Unless otherwise indicated on the Drawings, engineer assemblies to withstand the loads prescribed by the authorities having jurisdiction, within the specified deflection limits.
   1. Lateral loading: 5 psf for interior partitions; as prescribed for exterior walls.
   2. Limit metal framing systems deflection under load to the following:
      a. L/240 where supporting gypsum board only.
      b. L/360 where supporting tile.

1.4 ACTION SUBMITTALS

A. Product Data: Include a list of proposed products and materials to be provided for complete assemblies, along with manufacturer's product data, specifications, typical installation details and other data for each material listed to prove compliance with the specified requirements.

B. Shop Drawings: large scale, dimensioned shop drawings for Contractor-engineered assemblies.

   1. Show framing member size, thicknesses, number, type, location, and spacing.
   2. Indicate component details, framing layout, framed openings, anchorage to structure, bracing, type and location of fasteners and welds, and accessories required for related work.
   3. Show metal thicknesses, spacing of members and span dimensions.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer's Design Data: When not indicated on the Drawings submit complete load and deflection tables properly annotated for the indicated framing sizes, spacing, span limits and thicknesses to be used.

B. Certificates:

   1. Mill certificates and galvanizing certificates: Signed by framing member/accessory manufacturer certifying compliance with material requirements.
   2. Welder certificates: Submit certificates verifying welders to be employed in this work have satisfactorily passed AWS qualification tests. If re-certification of welders is required, retesting will be Contractor's responsibility.

C. Manufacturer's Installation Instructions: Submit manufacturer-prepared instructions concerning the proper preparation and installation framing members and framing accessories.

1.6 QUALITY ASSURANCE

A. Installer's Qualifications: Firm and individuals with a minimum of 3 consecutive years experience in the installation of specified products on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.

B. Qualifications for Welding Work: Use qualified welders experienced in welding lightgage steel, and comply with AWS D1.1 and D1.3.

C. Regulatory Requirements: Where fire-resistive construction is indicated, provide materials, accessories, and application procedures listed by UL, or tested according to ASTM E 119 for the type of construction shown, and approved by the authorities having jurisdiction.

1.7 HANDLING

A. Delivery: Protect materials from excessive moisture in shipment, storage, and handling.

B. Storage: Store off ground, either in a dry, ventilated, enclosed space or protected with suitable waterproof coverings.

C. Handling: Protect metal framing units from rusting and damage.

1.8 SEQUENCING

A. Coordinate placement of concealed internal wall reinforcement, such as backing plates, for items to be attached to metal support systems.

B. Coordinate installation of ceiling and soffit suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorage to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

C. Furnish concrete inserts, and other devices indicated, to other trades for installation well in advance of time needed for coordination with other construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide metal framing members from one of the following:

1. MarinoWARE.
2. SCAFCO Corporation.
3. Clarkwestern Dietrich Building Systems LLC.
4. Telling Industries.
5. MBA Metal Framing.

2.2 STUDS, RUNNERS AND FURRING

A. Framing Members - General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

2. Protective Coating: ASTM A 653, G40.

B. Smooth Steel Studs: ASTM C 645, punched web complying with the following:

1. Protective coating: ASTM A 653, G40 galvanized coating.
2. Bracing: Where the wall finish does not adequately brace both flanges of studs, provide bracing or reduce allowable stresses for computing stud heights in compliance with requirements of the authorities having jurisdiction.
3. Uncoated Metal Thickness: Minimum 0.018 inch, refer to the Drawings.

C. Dimpled Steel Studs and Runners:

1. Protective coating: ASTM A 653, G40 galvanized coating.
2. Bracing: Where the wall finish does not adequately brace both flanges of studs, provide bracing or reduce allowable stresses for computing stud heights in compliance with requirements of the authorities having jurisdiction.
3. Uncoated Metal Thickness: Minimum 0.015 inch.

D. Top and Bottom Tracks: As recommended by the manufacturer of each stud type and of the same thicknesses as the studs in same wall or partition, unless otherwise indicated on the Drawings. Provide unpunched, screwable tracks with 1-1/4-inch flanges.

E. Slip-Type Head Joints: To accommodate slab deflection where studs extend to the underside of beams, floor or roof slabs, secure at top with a deep leg, minimum 0.063 inch slip connection.

F. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs by one of the following:

1. "Slotted Top Track" by Metal Lite, Inc.
2. "SLP-TRK" by Clark Dietrich, Inc. for fire-rated partitions.
3. "Fire Track System", Fire Track Corp.
4. Or other Code-compliant assemblies acceptable to the Commissioner.

G. Furring Channels: Minimum 0.018 inch thick, galvanized, hat-shaped.

H. Horizontal stiffener, runner channels and bridging: Complying with ASTM A 1003, minimum 0.053 inch metal thick, channels fabricated of cold-rolled steel with flanges not less than 7/16-inch wide. Minimum weights as follows:

Channel Size	Flange Width	Pounds/1000 linear foot
3/4-inch	7/16-inch	300
1-1/2-inch	7/16-inch	475
2-inch	19/32-inch	590

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, minimum 0.062 inch diameter wire, or double strand of minimum 0.048 inch diameter wire.

B. Wire: ASTM A 641, Class 1 zinc coating, soft temper:

1. Hanger Wire: Minimum 0.12 inch diameter, unless otherwise indicated.
2. Diagonal Bracing Wire: 0.08 inch diameter, unless otherwise indicated.
3. Tie wire: 0.05 inch diameter, single-strand annealed steel or 0.04 inch diameter, galvanized, double-strand annealed steel.

C. Metal Channels Supporting Suspended Ceilings (Carrying Channels): Provide metal channels complying with ASTM C 641, galvanized in compliance with ASTM A 924, G60 coating designation, for framing, furring and stiffening, as follows:

Size	Type	Pounds per 1,000 linear feet
3/4 inch	Cold-rolled	300
1 inch	Hot-rolled	410
1-1/2 inches	Hot-rolled	475
2 inches	Cold-rolled	590

D. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum ½ inch wide flanges, 3/4 inch deep.
2. Steel Studs and Runners: ASTM C 645.
   a. Minimum Base-Metal Thickness: minimum 0.033 inch.
   b. Depth: As indicated on Drawings.
3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
   a. Minimum Base-Metal Thickness: Minimum 0.033 inch thickness>.
4. Resilient Furring Channels: 1/2inch deep members designed to reduce sound transmission.
   a. Configuration: Asymmetrical.

E. Direct Hung Suspension System (Alternate Method):

1. Cross Tees: 1-1/2 inch high double web .020 inch thick electro-galvanized steel with 15/16 inch wide capped flange face.
2. Wall Track: 1-1/2 inch to 1-5/8 inch inside dimensions .020 inch thick electro-galvanized steel with 15/16 inch to 1 inch wide top and bottom flange faces.
3. Acceptable Products:
   a. "Drywall Suspension System" (USG Corp.).
   b. "System 640" (Rockwool International).
   c. "Drywall Grid System" (Armstrong World Industries, Inc.).

F. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times

that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

2.4 FASTENERS AND ACCESSORIES

A. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates; length and thickness required by Code, or recommended by the metal framing manufacturer when not prescribed by Code.

B. Shot pins: 0.140-inch diameter low velocity powder-actuated drive pins equivalent to Ramset/Red Head No. 1508, or other as approved by Commissioner, with 7/8-inch minimum penetration into concrete.

C. Anchor bolts: ASTM A 307, non-headed type.

D. Expansion shields: FS FF-S-325, except do not use lead, fiber and plastic shields.

E. Welding electrodes: ASTM A 233, as recommended by AWS for the conditions of use and the metals to be welded.

F. For low walls: stud reinforcement "Floor Anchor" (Pinquist Tool & Die Co., Inc.), at every stud.

G. Isolation Strip at Exterior Walls - Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction and supports.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 WALL INSTALLATION

A. General:

1. Erect metal framing systems in compliance with their manufacturer's recommendations, the reference standards, the Drawings and these Specifications.
2. Use minimum 0.039 inch thick studs at the following locations:
   a. Each side of door openings.
   b. Where studs support backing plates, plumbing fixtures and wall-supported cabinets.
3. Do not attach metal framing to ducts, conduits or pipes. Do not allow metal framing and suspension wires to contact pipes.
4. Cut framing components squarely for a tight fit against abutting members. Erect framing plumb and level to provide solid backing for finish materials. Install steel studs in a wall/partition so that their flanges point in the same direction.
5. Do not exceed a 1/8-inch in 10-foot deviation (non-cumulative) from true lines and levels, nor 1/4-inch from true position. Perform necessary remedial work on framing to achieve specified tolerances.

B. Wall/Partition Framing:

1. Layout partitions and permanently mark on slabs.
2. Align and securely anchor ceiling and floor tracks to building construction. Space anchors within 6 inches of ends of each track segment and at 24 inches o.c. maximum. Do not drive fasteners closer than 2 inches to slab or curb edge.
3. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
5. Frame openings in stud walls. Provide double studs, closer spacing, and additional reinforcement as detailed or required at doorframes, interior windows and recesses for equipment.
6. Frame both sides of control joints in gypsum board surfaces with separate studs and a discontinuous runner; do not bridge the joint with system components or accessories.
7. Assemble corners using a minimum of 3 studs.
8. Install studs in single length, without joints, extending from floor to underside of floor or roof structure above, except where indicated on the Drawings to stop at or above suspended ceilings. Splicing studs is not permitted without the Commissioner's approval.
9. Where studs stop at or above suspended ceilings, unless otherwise indicated, brace every fourth stud (maximum) with opposite stud bracing at 45 deg angles securely anchored to the floor or roof above.
10. Attaching studs to runner: Attach studs to tracks by friction fit for single stud gypsum board partitions.

11. Attach the following studs to runner tracks with screws or with a crimping tool in compliance with the stud manufacturer's instructions, except where indicated to be welded.
    a. Studs with gypsum board on only one side.
    b. Studs on each side of doors.
    c. Studs supporting wall hung plumbing fixtures.
    d. Studs supporting wall hung urinal screens, toilet compartments, cabinets and equipment.
    e. Attach corner studs, partition intersections, studs on each side of doorjambs, and other openings in walls/partitions as specified above.
12. Unless otherwise indicated, provide horizontal stiffeners consisting of 3/4-inch channels spaced at not more than 54 inches o.c. maximum in partitions/walls supporting wall supported cabinets. Attach stiffeners to each stud.
    a. Provide an additional 3/4-inch channel 6 inches above door head and extend 2 stud spaces beyond jamb studs.
    b. Install channels in longest possible lengths, lap 12 inches and wire-tie at joints. Do not tie channels on opposite sides of staggered and double stud partitions together.
13. Double studs (face to face to form a tube) at locations adjacent to doors and openings. Extend studs at door openings to slab or deck above and anchor securely to bottom track (as specified in subparagraph 12.b. above) and to top slab or deck with clip angles.
    a. Locate additional studs not more than 2 inches from door and window frames, abutting partitions, partition corners, and other construction.
    b. Install a section of track over door and window frames with a clip angle at each end and attach securely to the adjacent vertical studs.
    c. Install cut-to-length studs at the location of vertical joints and at standard spacing over the doorframe header extending to the ceiling track.
14. Install studs 2 inches away from abutting concrete, steel columns or other structural elements. Extend the horizontal stiffeners and attach it to the structural element.
15. Provide additional framing, as required, for attachment of electrical boxes, fire extinguisher cabinets and similar items located in stud walls.

C. Furring:

1. Provide furring attached to concrete and metal framing to conceal utilities, furred soffits, and other furring as indicated.
2. Furring to receive gypsum board shall be screw-on channels directly attached to backing material, or applied over runner channels as applicable.
3. Furring to receive plaster shall be 3/4-inch cold-rolled channels wire tied to 1-1/2-inch runner channels.
4. Space furring as indicated for studs.

D. Install extra stud, furring members and angle runners at terminations of gypsum board work, and at openings and where required for support of other work occurring in the gypsum board work.

1. Install sheet metal strapping, studs, hat-shaped channels or stud runners in walls where shown on the Drawings or as required by the conditions of the installation, minimum same thickness as stud framing, for the support and

attachment of other work. Attach to stud framing with not less than three screws per stud.

3.4 INSTALLING CEILING & SOFFIT SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Do not attach wires to, or bend around, interfering material such as ductwork, pipes and conduits
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Space main runners not over 4 feet O.C. in any dimension so that hanger wires do not support more than 12 square foot of ceiling.

G. Hang suspended framing independent of walls, columns, pipes, ducts, and conduits, and their insulation.

H. Space runner channels not more than 6 inches from parallel walls or beams.

1. Align runner channels accurately relative to indicated ceiling height and saddle-tie with hanger wires.
2. Lap channels 12 inches at splices and tie at each end of lap.

I. Attach furring channels to runner channels at right angles to carrying channels with clips or with 0.05 inch diameter tie wire with triple wrap and triple twist.

1. Space at not over 12 inches O.C. for lath/plaster assemblies, and 16 inches O.C. for gypsum board.
2. Locate approximately 2 inches from parallel walls.
3. Lap channels 12 inches at splices and wire-tie at each end of lap.
4. Assemble and install metal grillage so that it is rigid, square, and free of movement, and level within the tolerances specified.
5. At control joints, provide discontinuous lap in main runners occurring over joints.
   a. Do not bridge joints with cross furring where joints run perpendicular to furring.
   b. Where joints run parallel to furring, provide furring to support each side of joint.

J. Provide recesses and openings where indicated for lighting fixtures, registers, access panels and other items to be installed in ceilings. Provide additional furring channels where required by opening condition.

K. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLATION OF DIRECT HUNG CEILING SYSTEM (ALTERNATE METHOD)

A. Install direct hung ceiling (interior) system in accordance with the manufacturer's printed instructions and as specified herein. Comply with ANSI A97.2 and as further specified. Furnish and install hanger devices in coordination with other work.

B. Interconnect main furring runners with furring tees at 24 inches o.c. Install furring tees on all sides around recessed lighting fixtures and other openings in ceiling.

C. Install additional hangers around light fixtures as required to support additional weights of light fixtures. Verify weights of light fixtures prior to installation of suspension system and hangers. Wrap hanger wires tightly at least three full turns.

3.6 WELDING

A. Perform welding in compliance with AWS recommendations with welders qualified to weld lightgage metal. Provide stitch plates where studs are burned-through.

B. Backing Plates:

1. Backing plates may be omitted if anchorage for wall-hung items is directly into steel studs of 0.052 inch thick or heavier, or items are furnished with equal mounting devices.
2. Wall-mounted and wall-hung items that require backing plates include, without limitation, the following:
   a. Grab bars.
   b. Toilet compartments and screens.
   c. Toilet room accessories.
   d. Wall and base cabinets.
   e. Plumbing fixtures.
   f. Ladders.
   g. Wall mounted door stops.
3. Unless otherwise indicated, plates not provided with fixtures and equipment shall be long enough to span, as a minimum, across 3 studs and may be one of the following:
   a. 0.063 inch thick minimum steel plate by 4 inches wide.
   b. 0.063 inch thick unpunched wide flange stud by 4 inches wide.
4. Notch studs so that backing plate will be flush with exterior face of stud.
5. Weld plates continuously along contact surfaces at each stud crossing, or secure with 2 countersunk machine screws at each stud.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of NON-STRUCTURAL METAL FRAMING shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of NON-STRUCTURAL METAL FRAMING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Gypsum board, including the following:

1. Interior gypsum board.
2. Tile backer board.
3. Gypsum sheathing board.
4. Installation accessories and finishing materials.

B. Related Sections:

1. Cold formed metal framing: Section 05 40 00.
2. Rough carpentry: Section 06 10 00.
3. Building thermal insulation: Section 07 21 00.
4. Penetration firestopping systems: Section 07 84 13.
5. Joint firestopping: Section 07 84 43.
6. Joint sealants: Section 07 92 00.
7. Non-load bearing metal framing: Section 09 22 16.
8. Painting: Section 09 91 00.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples:

1. 12 inch long samples of corner bead, end bead, reglets, moldings and control joint trim.
2. Sample of electrical box pad.

1.4 QUALITY ASSURANCE

A. Provide gypsum board construction complying with laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the Work.

B. Provide primary materials from a single manufacturer unless otherwise approved, in writing by the Commissioner, to insure total unit responsibility.

C. Gypsum Board:

1. Provide installation of gypsum board materials and systems construction complying with ASTM C 840, the manufacturer's current printed instructions and specifications and Gypsum Association, Standard GA 216 - Recommended Specifications for the Application and Finishing of Gypsum Wall Board, and Standard GA 600 - Fire Resistance Design Manual, current editions, except as herein modified and as approved by the manufacturer.
2. In the event of a conflict between these specifications and the referenced standards, the more stringent or greater is to be utilized for the installation.

D. Fire Resistive Construction:

1. For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
2. Where gypsum board systems are indicated to have fire resistance ratings, including those required to comply with governing regulations, provide materials and installations identical with applicable assemblies which have been tested and listed by recognized authorities, including UL.
3. Deflection and Firestop Track: Provide top runner in fire resistance rated assemblies indicated as labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Sound Transmission Characteristics: Provide materials and construction identical to those tested in the assembly indicated in accordance with ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1. Provide assemblies designed and pretested to achieve the minimum ratings as indicated on the Drawings.

1.5 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other damage. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and environmentally conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.7 TESTS

A. The Commissioner may have periodic sound tests made, at his option, as the work progresses. Contractor is required to make necessary modifications of partitions that are found to be substandard (not meeting approximate sound attenuation levels established by tests listed in manufacturer's data sheets) for that particular partition construction. Provide partitions which meet or exceed the STC ratings shown on the Drawings for each partition type. Provide partitions which meet or exceed the STC ratings of the gypsum board manufacturer for each partition type.

B. Costs of testing of partitions when found to be substandard, are to be paid for by the Contractor, including cost of retesting of modified partitions. Cost of testing partitions found to meet required sound attenuation levels will be paid for by the Commissioner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE GYPSUM BOARD MANUFACTURERS

A. Georgia-Pacific Corp.; Portland, OR 97204.

B. Continental Building Products Inc., Herndon, VA 20170.

C. National Gypsum Company, Charlotte, NC 28211.

D. United States Gypsum Co.; Chicago, IL 60680.

E. Certainteed Corporation, Valley Forge, PA 19482.

2.2 GENERAL - PANELS

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 GYPSUM PANELS

A. Gypsum Board: Complying with ASTM C 1396, regular, Type X or Type C, tapered with beveled or radial edge for finished joints, thickness as shown on the Drawings.

B. Abuse and Mold Resistant Gypsum Board: Complying with ASTM C 1396 and ASTM C 1629, Level 1, Level 2, Level 3 for soft and hard body impact resistance, high traffic area, impact and abrasion resistant, moisture and mold resistant, and fire resistant gypsum board panels with tapered edges for finished joints.

1. Thickness: As indicated on Drawings.
2. Mold Resistance: ASTM D 3273, score of not less than 10.
3. Products: Subject to compliance with the specified requirements provide one of the following:
   a. "Aqua Tough Interior Panels" (USG).
   b. "Hi-Impact XP" (National Gypsum).
   c. "Protecta HIR 300 Type X" (Continental Building Products).
   d. "Air Renew Extreme Abuse Resistant" (Certain Teed).
   e. "Tough Rock Mold-guard" (Georgia-Pacific).

C. Mold Resistant Gypsum Board: Non-combustible moisture and mold resistant core encased in moisture and mold resistant paper or fiberglass faces or with paperless faces, complying with ASTM C 1396, tapered with beveled or radial edge for finished joints, thickness as shown on the Drawings.

1. Thickness: As indicated on Drawings.
2. Mold Resistance: ASTM D 3273, score of not less than 10.
3. Products: Subject to compliance with the specified requirements provide one of the following:
   a. "Sheetrock Mold Tough" (USG).
   b. "Gold Bond XP" (National Gypsum).
   c. "Mold Defense" (Continental Building Products).
   d. "ProRoc with M2 Tech" (CertainTeed).
   e. "DensArmor Plus" (Georgia-Pacific).

D. Gypsum Ceiling Board: Complying with ASTM C 1396, tapered with beveled or radial edge for finished joints, 1/2 inch thickness, regular and Type X (fire-rated).

E. Exterior Gypsum Soffit Board: Complying with ASTM C 1396, tapered edge for finished joints, thickness as shown on the Drawings, regular and Type X (fire-rated).

F. Gypsum Sheathing Board: Unless noted on the Drawings, or specified otherwise, provide one of the following at the Contractor's option:

1. Paper Faced Gypsum Sheathing: Provide gypsum sheathing board complying with ASTM C 1396 for Type X fire resistant, water resistant, Form (plain back), square edges and ends, 1/2 inch thick, provide one of the following:
   a. "Exterior Sheathing or Firecheck Type X" (Continental Building Products).
   b. "Gold Bond Jumbo or Fire Shield Gypsum Sheathing" (National).
   c. "USG Gypsum Sheathing or Fire Code Type X" (USG).
2. Glass-Mat Faced Gypsum Exterior Sheathing Board: Complying with ASTM C 1177 and ASTM D 3273, regular, 1/2 inch thick, (Type X, 5/8 inch thick where required to be fire-rated), provide one of the following:

a. "Dens-Glass Gold Exterior Sheathing and Dens-Glass Gold Exterior Fireguard Sheathing" (Georgia-Pacific).
b. "Glasroc Sheathing" (Certainteed).
c. "EXP Sheathing and EXP Fire-Shield Sheathing" (National Gypsum).

3. Paperless (No Facing) Gypsum Sheathing Board: Sheathing Board: Complying with ASTM C 1177, ASTM C 1396 and ASTM D 3273, regular, 1/2 inch thick, (Type X, 5/8 inch thick where required to be fire-rated), "Aqua Tough Fiberrock Exterior Sheathing" (USG) or other as approved by Commissioner.

2.4 TILE BACKER BOARD

A. Provide at shower walls, bath tub bulkheads, wet walls and other walls indicated on the Drawings. Unless noted on the Drawings, or specified otherwise, provide one of the following at the Contractor's option:

1. Cementitious Board: Fiberglass mesh reinforced portland cement aggregate water resistant mixture formed boards, 1/2 inch thick, complying with ASTM C 1325 and ANSI A118.9, one of the following:
   a. "Durock" (USG, Chicago, IL 60680).
   b. "Wonder-Board" (Custom Building Products, Seal Beach, CA 90740).
   c. "Util-A-Crete" (Fin Pan, Inc., Hamilton, OH 45012).
   d. "Perma Base" (National Gypsum).
2. Glass Mat Faced Water Resistant Gypsum Tile Backer Board Complying with ASTM C 1178 and ASTM D 3273, regular, 1/2 inch thick, (Type X, 5/8 inch thick where required to be fire-rated, provide one of the following:
   a. "Dens-Shield Tile Backer" (Georgia-Pacific).
   b. "GlasRoc DiamondBack Tile Backer" (Certainteed).
   c. "e²XP® Tile Backer" (National Gypsum).

2.5 TRIM ACCESSORIES

A. Interior Trim: Comply with ASTM C 1047.

1. Material: Paper faced galvanized steel sheet or rigid PVC.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. Control (expansion) joint.
   d. Tear-Away Bead: L-Shaped, exposed long flange receives joint compound.

B. Foam Gaskets: Closed cell vinyl foam adhesive backed strips that allow fastener penetration without foam displacement, thickness as indicated on the Drawings, in width to suit metal stud size indicated on the Drawings.

C. Control Joints: Roll formed zinc or extruded vinyl as standard with the board manufacturer.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying type, all-purpose compound.
   a. Use setting type compound for installing paper faced metal trim accessories.
3. Fill Coat: For second coat, use drying type, all-purpose compound.
4. Finish Coat: For third, coat, use drying type, all-purpose compound.

D. Sheathing Joint and Penetration Treatment Materials:

1. Sealant for Paper Surfaced and Glass Mat Gypsum Sheathing Board: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing, and recommended by tape and sheathing manufacturer for use with fiberglass sheathing tape and for covering exposed fasteners.
2. Sheathing Tape for Glass Mat and Paper Faced Gypsum Sheathing Board: Self-adhering fiberglass tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturer for use with silicone emulsion sealant in sealing joints and penetrations in glass mat gypsum and paper faced sheathing board and with a history of successful in-service use.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

C. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Screws:

1. Metal Studs: Type S and S-12 bugle head and pan head, sized to suit thickness, zinc plated for exterior use, complying with ASTM C 1002 and ASTM C 954.
2. Wood Studs: Type W, 1-1/4 inch long or Type S bugle head and pan head, sized to suit thickness, zinc plated for exterior use, complying with ASTM C 1002 and ASTM C 954.

3. Gypsum: Type G, sized to suit thickness, zinc plated for exterior use, complying with ASTM C 1002 and ASTM C 954.
4. Gypsum Sheathing: Provide size, type, material and finish as recommended by gypsum sheathing manufacturer for substrates indicated.
5. Provide fasteners with a hot-dip zinc coating complying with ASTM A 153.
6. Fastening to Metal Studs: Use 1-1/2 inches long, galvanized screws.

E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire Resistance Rated Assemblies: Comply with mineral fiber requirements of assembly.

F. Acoustical Sealant: As specified in Section 07 92 00 – Joint Sealants

G. Electrical Box Pads: Moldable Polybutene pads, minimum 1/8 inch thick, , provide on the following:

1. "Lowery's Electrical Box Pads" (Harry A. Lowery & Associates, Inc., Sun Valley, CA 91352).
2. "3M Putty Pads" (3M Fire Protection Products, St. Paul, MN 55144).
3. "Series SSP" (Specified Technologies Inc., Sommerville, NJ 08876).

H. Spot Grout: Joint treatment compound as recommended by the manufacturer for spot grouting hollow metal door and window frame anchors, complying with ASTM C 475.

I. Surfacer: "Sheetrock Brand Tuff-Hide" (USG).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. When the outside temperature is below 55 deg F, provide heat and maintain in areas where the work is to be performed. Provide heat continuously and uniformly at 55 deg F from one week prior to start of installation until gypsum board application and joint treatment is completed. Do not start installation until windows

are glazed and doors installed or openings temporarily closed. Provide ventilation to remove excess moisture during joint treatment.

B. Coordination with Sprayed Fire Resistive Materials: After sprayed fire resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire resistive material thickness below that which is required to obtain fire resistance

3.3 INSTALLATION - GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or backing is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4 to 3/8 inch wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, including floors. Provide 1/4 to 1/2 inch wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Spot-Grouting: At hollow metal door and window frames spot-grout each jamb anchor, filling the inside face of the jamb at each anchor.

J. STC Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound flanking paths around or through assemblies, including sealing partitions above acoustical ceilings. Separate by 24 inches horizontally outlet boxes and other penetrations on opposite sides of the partition in separate stud cavities and treat with outlet box pads.

K. Install sound attenuation blankets, where shown on the Drawings, pressure fit between studs. Fill voids. Openings and gaps, butt joints of blankets and support and secure in accordance with manufacturer's recommendation when not self-supporting.

3.4 APPLYING INTERIOR GYPSUM BOARD

A. Single Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire resistance rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire resistance rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire resistance rated assembly. Stagger joints on opposite sides of partitions.
2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install controls joints in accordance with the following:

1. Install control joints according to ASTM C 840.
2. In specific locations as drawn for visual effect.

3. Where a partition, wall, or ceiling traverses a construction joint (expansion, seismic, or building control element) in the base building structure.
4. Where a wall or partition runs in an uninterrupted straight plane exceeding 30 lineal feet.
5. Interior Ceilings with Perimeter Relief: Install control joints so that linear dimensions between control joints does not exceed 50 ft and total area between control joints does not exceed 2,500 sq. ft. Install a control joint or intermediate blocking where ceiling framing members change direction.
6. Interior Ceilings without Perimeter Relief: Install control joints so that linear dimensions between control joints does not exceed 30 ft and total area between control joints does not exceed 900 sq. ft. install a control joint or intermediate blocking where ceiling framing members change direction.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. Tear-Away Bead: Use at exposed panel edges.

D. Apply gypsum board screws with an electric driver. Drive screws not less than 3/8 inch from edges or ends of panels to provide a uniform dimple not over 1/32 inch deep.

3.6 INSTALLATION OF TILE BACKER BOARD

A. Install tile backer board on walls to receive ceramic and/or stone tile; on plumbing fixture wet walls, in toilet areas, shower areas, baths, showers and bath tub surrounds and other wet area walls shown on the Drawings. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

B. Support ends of boards over framing. Fasten boards to studs with 1-1/4 inch long screws spaced 16 inches o.c. and at perimeter 8 inches o.c. not less than 3/8 inch nor more than 5/8 inch for board edges.

C. Prefill joints with latex-portland cement mortar, then embed backer board manufacturer’s or manufacturer approved tape and level the joints.

D. Install water resistant gypsum board of the same thickness above tile backer board on walls with ceramic tile wainscot and full height on other walls in toilet rooms and wet areas.

3.7 INSTALLATION OF EXTERIOR GYPSUM SHEATHING

A. Comply with GA-253 and with manufacturer's written instructions.

B. General: Fasten exterior gypsum sheathing to stud framing for exterior walls. Space fasteners as recommended by gypsum sheathing manufacturer. Keep

perimeter fasteners 3/8 inch from edges and ends of board units. Fit boards tightly against each other and around openings.

C. Install sheathing vertically with long edges parallel to and centered over studs. Provide solid framing wherever end joints do not bear against framing sills or plates. Fasten to each support in accordance with manufacturer's recommended spacing, but not more than the following:

1. Space fasteners not more than 4 inches o.c. around perimeter at edge and end supports.
2. Space 8 inches o.c. at intermediate supports.

D. Seal sheathing joints and penetrations in accordance with the sheathing manufacturer's written instructions.

3.8 INSTALLATION OF ELECTRICAL BOX PADS

A. Install acoustical electrical box pads over electrical and other type of device boxes in sound rated walls, including but necessarily limited to electrical junction boxes, electrical switch boxes, power outlet receptacle boxes, thermostat control boxes, telephone outlet boxes and television cable or antenna outlet boxes.

B. Install in accordance with the printed installation instructions of the manufacturer.

C. Brush or wipe dust and dirt from box surface. If surface is contaminated with oil or other material that would impair pad application, wipe with Xylene or Toloulene to remove.

D. Center pad on back of box and mold around conduit or cable entering box. Mold pad around sides covering openings.

3.9 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.

a. Apply surfacer to walls indicated to have Level 4 finish on Abuse Resistant Type gypsum board.

4. Level 5: Finish ceiling (and wall) areas to Level 4 gypsum board finishing followed by an application of a thin skim coat of joint compound over the entire surface.
   a. Apply surfacer to walls indicated to have Level 5 finish on Abuse Resistant Type gypsum board.

3.10 CLEANING AND PROTECTION

A. Take precautions to minimize spattering of joint treatment compounds and other materials on other work. Remove joint treatment compounds promptly from doors, frames, glass and other finishes and surfaces that could be stained or marred by these materials. Clean floors of gypsum board materials and treatment compounds upon completion of the gypsum board work. At completion of work, remove unused materials, scraps, containers and equipment. Remove dust accumulated during finishing operations, leave areas broom clean, ready for painting, wall covering, ceramic tile or other finishes.

B. Provide temporary protection of finish surfaces in areas of high traffic and susceptible to damage from work of others. Maintain protection throughout the construction period so that the work will be without damage or deterioration at the time of Substantial Completion. Repair or replace any damaged work. Remove temporary protection at completion of work or when required for completion of other work.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.11 SCHEDULE OF LOCATIONS

A. Install gypsum board in the following locations:

1. Gypsum Board: Vertical and horizontal surfaces, unless otherwise indicated.
2. Gypsum Board Type X & C: Where required for fire resistance rated assembly.
3. Gypsum Board Type X: Interior face of cold formed metal framing exterior walls.
4. Abuse Resistant Gypsum Board: Where indicated on the Drawings.
5. Mold Resistant Gypsum Board: Food preparation areas, showers and shower rooms, and wet areas, unless otherwise indicated on the Drawings.
6. Gypsum Ceiling Board: Ceilings unless noted otherwise.
7. Exterior Gypsum Soffit Board: Exterior soffits.
8. Gypsum Sheathing Board: Where indicated on the Drawings.
9. Tile Backer Board: Substrate for tile.
10. Water Resistant Gypsum Board: Toilet, bath, and wet area walls, not covered by tile.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of GYPSUM BOARD shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of GYPSUM BOARD shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 09 30 10

TACTILE TILE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 DESCRIPTION

A. This section specifies furnishing and installing surface applied detectable tactile warning surface tiles where indicated, using an exterior grade tile with UV protection.

1.03 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's literature describing products, installation procedures, fasteners, adhesive and routine maintenance.

B. Samples for Verification Purposes:

1. 3 fasteners.
2. 3 full size samples of tactile tiles showing full range of color and pattern variations.

C. Shop Drawings are required for products specified showing fabrication details, composite structure, fastener locations, plans of tile placement including joints, and material to be used as well as outlining installation materials and procedure.

1.04 INFORMATIONAL SUBMITTALS

A. Material Test Reports: Submit test reports from qualified independent testing laboratory indicating that materials proposed for use are in compliance with requirements and meet the properties indicated.

B. Maintenance Instructions: Submit copies of manufacturer's specified maintenance practices for each type of tactile tile and accessory required.

C. Warranty: Provide a copy of the warranty for review and approval.

1.05 QUALITY ASSURANCE

A. Provide tactile tiles and accessories as produced by a single manufacturer, including mechanical fasteners.

B. Installers Qualifications: Engage an experienced Installer certified in writing by tactile manufacturer as qualified for installation, who has successfully completed tile installations similar in material, design, and extent to that indicated for Project. Manufacturer's supervisor shall be present during construction.

C. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", Illinois Accessibility Code, and ICC A117.1.

1.06 DELIVERY, STORAGE AND HANDLING

A. Tiles shall be suitably packaged or crated to prevent damage in shipment or handling.

B. Finished surfaces shall be protected by sturdy wrappings, and tile type shall be identified by part number.

C. Tiles shall be delivered to location at building site for storage prior to installation.

1.07 PROJECT CONDITIONS

A. Environmental Conditions and Protection: Maintain minimum temperature of 40 deg F in spaces to receive tactile tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store tactile tile material in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 40 deg F in areas where work is completed.

B. Dust from cutting, grinding or drilling shall be contained or removed by vacuum attached to equipment or by other means and shall not be allowed to spread into the atmosphere, among the workers, passengers or public, or to contaminate the area below or around the site.

C. The use of water for work, cleaning or dust control etc. shall also be contained and controlled and shall not be allowed to come in contact with the passengers or public. Provide barricades or screens to protect passengers or public.

D. Disposal of any liquids or other materials of possible contamination shall be made in accordance with federal state and local laws and ordinances.

E. Cleaning materials shall have code acceptable low VOC solvent content and low flammability if used on the site.

F. Coordinate phasing and flagging personnel operations as specified in the contract documents.

1.08 EXTRA STOCK

A. Deliver extra stock to CTA West Shops, 3901 W. Maypole Street, Chicago, IL 60624, "Attention" James Jenkins. Furnish new materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identification. Furnish not less than 10 percent of the supplied materials, for each type, color, pattern installed including fasteners. Furnish not less than 20 percent of concealed caps.

1.09 GUARANTEE

A. Tactile tiles shall be guaranteed in writing, signed by the Manufacturer and the Contractor, for a period of ten years from date of Final Acceptance. The guarantee includes defective materials and installation, loosening of fasteners or tiles, defective bonding of adhesives or sealants, breakage, cracked, chipped or broken tiles, marred or defaced surface, deformation, fading and chalking of finishes, cracked or open joints, and improper slope for drainage, or improper elevation of leading edge causing tripping.

PART 2 - PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. Basis of Design Product: "Armor-Tile" (Engineered Plastics Inc.) or comparable products, as approved by the Commissioner.

2.02 MATERIALS

A. Vitrified Polymer Composite Tile (VPC): Exterior grade tile with ultra-violet resistant additive shall be an epoxy polymer composition including aluminum oxide particles in truncated domes and shall meet or exceed the following test criteria:

1. Wheel Load Test: AASHTO-HS 20No Failure
2. Compressive Strength: ASTM D 695 shall be not less than 18,000 psi.
3. Flexural Strength of Tile: ASTM D 790 shall not be less than 24,000 psi.
4. Tensile Strength: ASTM D 638 shall be not less than 10,000 psi.
5. Impact Resistance: ASTM D 5420 not less than 450 in. lbf/in. A failure is noted if a hairline fracture is visible in the specimen.
6. Slip Resistance: ASTM C 1028, the combined wet/dry static coefficient of friction shall be not less than 0.80.
7. Water Absorption: ASTM D 570 shall not exceed 0.05 percent.
8. Abrasive Wear: ASTM C 501 ≥ 500 .
9. Abrasive Scrub Test: ASTM D 2486 ≤ 0.06 .

10. Salt Spray (300 hrs): ASTM B 117 No Failure.
11. Accelerated Aging Cycle Testing: ASTM D 1037 No Failure.
12. Chemical Resistance: ASTM D 543 No Failure.
13. Flame Spread: ASTM E 84 shall be less than 25.

B. VPC Tactile Tile Colors:

1. Blue (AT-B-2070); Process Blue, Pantone Matching System (PMS).
2. Yellow, refer to CT Drawings.

C. Tile Dimensions: Nominal 2'-0" x 4'-0" as indicated on Drawings with nosing.

2.03 AUXILIARY MATERIALS

A. Fasteners:

1. Concrete Platform: Stainless steel fasteners with plastic concrete anchors as recommended in writing by the manufacturer.
2. The fasteners are to be used in conjunction with the recommended adhesive.

B. VPC Dome Caps: Truncated dome caps shall be press fit and bonded into corresponding truncated domes in tiles.

C. Adhesive: Heavy duty elastomeric polyurethane adhesive system as recommended by the manufacturer.

D. Joint Sealant: Polyurethane as recommended by the manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with applicable requirements of the tile manufacturer's written installation instructions.

B. Clean surface of dirt, debris, and dust. Inspect surface and grind away or plane any obstructions or bumps. Clean saw cut of any obstructions or foreign matter without chipping or damaging the saw cut.

C. Adhere according to manufacturer’s written installation instructions. Set tiles in place; adjust and align. Drill holes and fasten stainless steel fasteners in pre-located holes in tiles. Do not install tiles over expansion joints or install tile with shiplap edge exposed. Fasteners in first row of domes at inside leading edge of tiles shall hold tile down to prevent the leading edge from buckling or causing a tripping hazard. Remove any tiles with such deformed edge and replace.

D. The leading edge of the tile shall be checked to ensure the tolerance provided is in accordance with the contract drawings. Adjust as required.

E. At construction joints between precast concrete panels provide adhesive under tile and between shiplap joints spanning construction joints.

F. Layout tiles and joints to fit at expansion joints in precast concrete slabs. Provide tiles with largest size units as possible at ends, but not less than a half unit. Tiles shall not cover expansion joints.

G. Provide for expansion as indicated in the manufacturer's instructions. Maintain expansion joints in platforms and any other reference marker or openings that may be required to be left exposed.

H. Provide fasteners as recommended by manufacturer for the substrate.

I. Provide sealant at joints as recommended by manufacturer.

3.02 CLEANING AND PROTECTION

A. Protect tiles against damage during construction period to comply with tactile tile manufacturer's specifications.

B. Protect tiles against damage following installation.

C. Clean tactile tiles not more than four days prior to date scheduled for inspection intended to establish date of Substantial Completion in each area of project. Clean tactile tile by method specified by tactile tile manufacturer.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of TACTILE TILE shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of TACTILE TILE shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 09 30 20
GLASS TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Glass tile mosaic on walls including, mortar grout, adhesives, crack isolation membrane, and installation accessories and materials.

1. Artist to provide three 8 1/2 inch by 11 inch samples separately.

B. Related Sections:

1. Cast-in-place concrete: Section 03 30 00.
2. Unit masonry: Section 04 42 00.
3. Joint Sealants: Section 07 92 00.
4. Gypsum board: Section 09 29 00.
5. Toilet accessories: Section 10 28 00.

1.1 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

1.2 ACTION SUBMITTALS

A. Shop Drawings: A high definition graphic file. Show locations of each type of tile and tile pattern. Show individual tiles. Show widths, details, and locations of joints in tile substrates and finished tile surfaces.

B. Samples:

1. Samples 1 of each type and finish of tile through range of color, with grouted joints.
2. Sample of each tile trim shape.
3. 6 inch x 6 inch samples of crack isolation membrane on suitable backing material.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer`s Literature: Materials description and recommended installation instructions for manufactured mortar, grout, latex additive, grout sealer, waterproofing, crack isolation membrane, and cementitious backer board.

B. Certification: Copies of waterproofing membrane manufacturer's certification that the crack isolation and/or waterproofing membrane materials are compatible with the setting materials to be used in the installation

1.4 QUALITY ASSURANCE

A. Provide material and installation complying with following:

1. Tile Council of North America Inc. (TCNA):
   a. Handbook for Ceramic, Glass, and Stone Tile Installation.
2. American National Standards Institute Specifications for:
   a. Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar, A108.1A.
   b. Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar, A108.5.
   c. Dry-Set Cement Mortar, A118.1.
   d. Modified Dry-Set Cement Mortar, A118.4.
   e. Standard Cement Grouts for Tile Installation, A118.6.
   f. Crack Isolation Membrane, A118.12.
   g. Recommended Standard Specifications for Ceramic Tile, A137.1.

B. Installer Qualifications: Engage an experienced installer with not less than 5 consecutive years of experience and who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of gauged porcelain tile/gauged porcelain tile panels.

C. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

D. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

E. Mockups: Construct a number of 24 inch by 24 inch mockups as designated by the artist.

F. Arrange for factory tour for Commissioner.

1.5 DELIVERY, STORAGE AND HANDLING

A. Accept delivery of material only in an undamaged condition; store above ground and in a dry place within the building. Maintain packaged material in original containers with seals unbroken and labels intact until time of use. Provide wrapped or bundled material bearing the name of the manufacturer and the product. Immediately remove from the job site damaged or otherwise unsuitable material, when so ascertained.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Preassembled Mosaic Sources:

1. Artaic, LLC; Boston, MA 02210.
2. Hakatai Enterprises, Inc., Ashland, OR 97520.

B. Tile Setting Materials:

1. Laticrete International, Inc., Bethany, CT 06525.
2. Mapei Corporation, Elk Grove Village, IL 60007.
3. Bostik, Inc., Wauwatosa, WI 53226.

2.2 MATERIALS

A. Wall Tile: Vitreous Glass tile, sizes, colors, patterns, are indicated in an artist provided 300 dpi file. Furnish trim shapes as required by conditions; angles, corners, bullnose, and other shapes required by installation conditions.

B. Glass Tile Mortar Basis of Design Product: "GlassMate" (Bostik) or comparable products, as approved by Architect of one of the Acceptable Manufacturers.

C. Wall Grout (Colored): Un-sanded, for joints less than 1/8 inch wide. Basis of Design Product: "Dimension RapidCure" (Bostik) or comparable products, as approved by Architect of one of the Acceptable Manufacturers.

D. Grout Joint Sealer: Clear penetrating siliconized product compatible with the grout and tile materials used and approved by the grout and tile manufacturer. Provide sealer which is non-yellowing and will not change the appearance in texture or coloring of the grout and tile after application.

E. Crack Isolation Membrane Basis of Design Product: "GoldPlus" (Bostik) or comparable products, as approved by Architect of one of the Acceptable Manufacturers.

F. Metal Edge Strip: As selected by the Commissioner.

2.3 PROPORTIONING MORTAR AND GROUT

A. General:

1. When factory premixed grout is used in the installation with latex liquid additives, provide both products produced by the same manufacturer to ensure compatibility.
2. When factory premixed dry-set mortar is used in the installation with latex liquid additives, provide both products produced by the same manufacturer to ensure compatibility.
3. Crack Isolation and Waterproofing Membrane: When used in the installation, provide a product produced by the same manufacturer as mortar to ensure compatibility.
4. The grout and mortar used in the installation may be from different manufacturers.
5. Mix mortar and grout in accordance with the manufacturer's printed instructions.

B. Mortar: Factory premix with water or latex additive added in accordance with the manufacturer's recommendations.

C. Grout: Factory premix with water or latex additive added in accordance with the manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

B. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone. If present remove in accordance with the tile setting bed material manufacturer's requirements.

1. Comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Commissioner.

C. Alkalinity and Adhesion Testing: Perform tests recommended by setting materials manufacturer. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Examine surfaces to receive the parts of the Work specified herein. Verify dimensions of in-place and subsequent construction. Verify that water resistant gypsum wallboard and tile backer board is installed and prepared in accordance with Gypsum Association standard GA 216. Application of materials constitutes acceptance of the substrate.

B. Do not start work until grounds, anchors, plugs, hangers, bucks, etc. have been installed and until adjoining work is satisfactorily protected.

C. Keep containers in which tile and other materials are packed dry until tiles and other materials are removed and every precaution taken to see that tiles are not stained before they are set in place. Maintain temperatures in rooms where tile is being set at a minimum of 40 deg F.

D. Clean and mechanically etch wall surfaces as required by conditions of the installation to maximize bond.

E. Layout tile in each area as shown on the Drawings in such a manner as to minimize the cutting of tile.

3.3 TILE INSTALLATION – GENERAL

A. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

B. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

C. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Glass Wall Tile: 0.023 inch.

3.4 INSTALLATION OF WALL TILE

A. Concrete Unit Masonry, TCNA Method W202, Gypsum Wallboard (Wet Areas), TCNA Method W243 and TCNA Method W244 Tile Baker Units, Dry-Set:

1. Tile on Tile Backer Board: Apply latex Portland-cement mortar, forcing it through the tape to completely fill and level the joints. Apply in several passes to accomplish level joints.
2. Spread dry-set mortar on substrate in a minimum 3/32 inch thickness. Spread mortar with flat side of trowel and comb with serrated or notched side of trowel.
3. Place tile base in position with a slight twisting motion using sufficient pressure to set tile firmly in mortar. Tap tile lightly to ensure maximum bond. Set tile before a skin forms on mortar.
4. Keep joints straight and uniform in width not exceeding 0.023 inch, align with floor joints. Wipe tile clean with a soft damp cloth. Avoid excess use of water.

3.5 GROUTING

A. After tile is firmly set, fill joints with appropriate Latex Dry-Set grout. Spread slurry of grout over the surfaces until joints are filled. On walls, after tile has set, remove string or rope spacers, if any, and force a maximum of grout into joints by trowel, squeegee, brush or finger application. Fill joints flush with surface of tile. Before grout sets, fill skips and gaps. Remove surface laitance and excess grout with dry polishing cloths. Provide faces of tile, clean and free from grout or other stains.

3.6 CLEANING AND SEALING

A. Upon completion of tile work in each area, including work specified under other Sections, clean tile surfaces with warm water and a high quality washing compound. Do not use acid or acid cleaners. Sponge and wash tile thoroughly, working diagonally across joints; polish with dry cloths.

B. Immediately prior to occupancy by the Commissioner, wash tile surfaces, again, and perform additional grouting that may be necessary.

C. After cleaning of tile and grout apply clear sealer to grout joints. Wipe tiles clean of sealer residue.

3.7 PROTECTION

A. Protect tiled areas until just prior to occupancy by the Commissioner.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of GLASS TILING shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of GLASS TILING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 09 65 13
RESILIENT WALL BASE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Resilient wall base, including installation materials.

B. Related Sections:

1. Unit masonry: Section 04 20 00.
2. Gypsum board: Section 09 29 00.

1.3 ACTION SUBMITTALS

A. Samples: Chain sets for color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description, installation and maintenance instructions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer, with not less than 5 consecutive years experience, to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.

2. Hand form internal corners, external corners, and end stops.
3. Scribe bases accurately to abutting surfaces.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Commissioner specifically approves such deviations in writing.

1.6 DELIVERY, STORAGE AND HANDLING

A. Receive materials in undamaged condition as packaged by the manufacturer with manufacturer's seals and labels intact.

B. Store materials at the job site within the building and in a dry place at least 24 hours before installing flooring materials. Maintain space temperature not be less than 70 deg F nor more than 90 deg F.

C. Immediately removed from the job site damaged or otherwise unsuitable material, when so ascertained.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Resilient Base:

1. Vinyl: Complying with ASTM F 1861, Type TV, Group 1 or 2, vinyl, .080 gage, coved in resilient flooring areas and straight in carpeted areas, set on type.
2. Rubber: Complying with ASTM F 1861, Type TS, Group 1 or 2, .080 gage, coved in resilient flooring areas and straight in carpeted areas, set-on type.
3. Lengths: Coils in manufacturer's standard length.
4. Base types, heights, colors, products and manufacturers are indicated on the Drawings.
5. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Armstrong World Industries, Inc.
   b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
   c. Johnsonite.
   d. Musson, R. C. Rubber Co.
   e. Roppe Corporation, USA.
   f. VPI, LLC; Floor Products Division.

B. Adhesive: Water and alkali resistant, complying with recommendations of resilient flooring manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. When solvent-based adhesives are used, ventilate spaces; use spark-proof fans if natural ventilation is inadequate. Prohibit smoking.

3.2 INSTALLATION

A. Mix and apply adhesive as recommended by the manufacturer. Cover surface evenly. Do not exceed the maximum working area of the material. Install base within time limits recommended. If adhesive films over or dries, remove the adhesive and recoat the area.

B. Firmly adhere resilient base to walls, columns, and permanent bases. Use longest lengths practical. Scribe bases accurately to abutting surfaces.
   1. Form internal and external corners and end stops with preformed units.
   2. Corners may be hand formed if method is approved by the Commissioner from the mockup.

      a. Form Outside Corners without producing discoloration (whitening) at bends.

      b. Miter or cope corners to minimize open joints.

C. Remove excessive adhesive in accordance with manufacturer's instructions.

3.3 CLEANING

A. Not less than 4 days after flooring installation, clean base. Wash thoroughly, with a cleaner recommended by the manufacturer, in accordance with manufacturer's printed instructions.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of RESILIENT WALL BASE shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of RESILIENT WALL BASE shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 09 67 10

DIELECTRIC FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies dielectric flooring as well as appurtenances thereto required under traction power equipment specifications.

B. Related Sections Include the following:

1. Cast-In-Place Concrete: Section 03 30 00.
2. Resinous Flooring: Section 09 67 23.
3. Transportation: Division 34.

1.03 REFERENCES

A. ACI 117 Standard Specifications for Tolerances for Concrete Construction and Materials.

B. ASTM D2440 Standard Test Method for Rubber Property - Durometer Hardness.

C. ASTM E1155 Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.

D. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs.

E. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

1.04 INFORMATIONAL SUBMITTALS

A. Manufacturer’s Data: each type specified.

B. Warranty: Provide a copy of the warranty, signed by the manufacturer and installer.

C. Compatibility Reports: Contractor to provide compatibility reports signed by manufacturer's representative stating that required moisture control, cement underlayment, and dielectric floor products are compatible.

D. Survey: Prior to installation of dielectric flooring, Contractor to submit a floor survey showing floor elevations and levelness at equipment locations.

E. Process Plan: Provide process plan indicating steps required for installation of dielectric flooring.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For dielectric flooring to include in maintenance manuals.

1.06 QUALITY ASSURANCE

A. The dielectric flooring shall be produced by a single manufacturer, including recommended primers (if any), base coat, top coat materials. See Drawings for location of dielectric flooring. The dielectric flooring installation shall be installed in depressed floor. The dielectric floor must be dead level flush with surrounding floor; no inclines are permitted.

B. Applicator: Certified or licensed by dielectric flooring materials manufacturer.

C. Compatibility Reports: Contractor to provide compatibility reports signed by manufacturer's representative stating that required moisture control, cement underlayment, and dielectric floor products are compatible.

1.07 SURVEYING AND LEVELING

A. Prior to installation of dielectric flooring, survey existing floor at equipment locations to determine existing flatness and levelness.

1. If flatness of floor area is less than 45 and Levelness is less than 35, then leveling is required prior to the installation of the dielectric coating.

B. Resurvey after installation of dielectric flooring to confirm flatness and levelness requirements have been met. Remediate any non-compliant areas. Electrical equipment shall not be installed until proof of flatness and levelness has been reviewed and approved.

1.08 HARDNESS TESTING

A. Allow dielectric flooring cure for a minimum of 7 days.

B. After 7 days, prior to installation of substation equipment, perform a hardness test to verify the floor has met a minimum of 100 percent of its designed strength. Hardness to be at 75 on the durometer scale.

1.09 TEST FOR DIELECTRIC FLOORING

A. Install the dielectric floor under dc switchgear and new rectifier cubicles, per manufacturer's instructions, to obtain an insulation resistance of at least 7.5 megohms.

B. Prior to installation of a dc switchgear line-up or a rectifier line-up, the dielectric floor shall be tested by means of 1000 volt dc megger. One lead of the megger shall be attached to a copper plate (4 inches by 4 inches by ½ inch), the other lead connected to the station ground bus (or cable). A salt solution made up of 1/3 salt and 2/3 water (by volume) shall be used as a conductive medium between the copper Plate and the dielectric floor. After completion of tests, the floor surface shall be thoroughly cleaned from salt residue.

C. One insulation resistance reading shall be taken for each 3 by 3 foot area of the dielectric floor. Each 3 by 3 foot area insulation resistance reading shall be equal to or greater than 7.5 megaohm.

D. Maintenance Instructions, Dielectric Flooring.

1. Submit copies of manufacturer's written instructions for recommended maintenance practices.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver dielectric flooring materials to the job sites in new unopened containers with intact factory applied labels.

B. Store liquid flooring materials in accordance with the manufacturer's instructions.

1.11 FIELD CONDITIONS

A. Maintain substrate temperature and room temperature before, during and after installation in accordance with dielectric flooring material manufacturer's instructions. Provide adequate ventilation during application and curing periods.

1. Application may proceed while air, material and substrate temperatures are between 60 F and 90 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
2. The relative humidity in the specific location of the application shall be less than 85 percent and the surface temperature shall be at least 5 deg F above the dew point.
3. Ensure that adequate ventilation is available for the work area.
4. Provide lighting equal to the final lighting level during the preparation and installation of the system.

1.12 WARRANTY

A. Material and installation shall be warrantied for 1 year after final acceptance from the Commissioner. Materials or installation requiring repairs within the warranty period shall be repaired or replaced.

PART 2 - PRODUCTS

2.01 DIELECTRIC FLOORING SYSTEM

A. Resin: manufacturer's standard.

B. Aggregate: manufacturer's standard clean, dry and containing no foreign matter.

C. Provide listed Basis of Design Products or comparable products, as approved by Commissioner.

1. Basis of Design: "Hallemite Product Line – HEF – Dielectric Amazite Insulating Flooring System" (RBC Industries), 3/8" Thickness.

2.02 MOISTURE CONTROL SYSTEM

A. One-Coat Moisture Control System for Concrete.

B. Provide listed Basis of Design Products or comparable products, as approved by Commissioner.

C. Basis of Design: "Ardex MC Rapid" (Ardex Engineered Cements).

2.03 FLOOR LEVELING

A. High Strength, Cement -based, polymer modified, trowel-grade underlayment for heavy loads

1. Compressive Strength - 7800 psi min.

B. Basis of Design: "Ardex Forti Finish" (Ardex Engineered Cements).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.

B. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

C. Prior to installation of dielectric flooring, verify concrete substrates are dry and moisture vapor emissions are within acceptable levels according to manufacturer's written instructions.

1. Perform relative humidity test using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 70 percent seventy percent relative humidity level measurement, or as required for selected manufacturer's product.

3.02 PREPARATION

A. Prepare concrete in accordance with dielectric flooring system manufacturer's written requirements.

B. Concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.

3.03 APPLICATION OF MOISTURE CONTROL SYSTEM

A. Follow dielectric flooring system manufacturer's recommendation for installation.

3.04 APPLICATION OF FLOOR LEVELING

A. Follow dielectric flooring system manufacturer's recommendations for installation

3.05 APPLICATION OF DIELECTRIC FLOORING

A. Apply dielectric flooring only after finishing operations, including painting, have been completed and heating system is available. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by manufacturer.

B. Apply material as recommended by dielectric flooring system manufacturer.

C. Apply dielectric flooring only after floor has been surveyed and floor flatness and levelness have been verified and approved at equipment locations.

D. Apply materials in the recommended quantities to produce a finished floor system thickness as indicated on drawings.

3.06 CLEANING AND PROTECTION

A. Remove any surface blemishes from the installed surfaces using neutral cleaners and procedures as recommended by the dielectric flooring manufacturer. Protect installed flooring from damage by use of heavy kraft paper or other covering.

B. After completion, close the finish floor to any kind of traffic for a minimum of 7 days or as recommended by the manufacturer, whichever is greater. Do not place equipment on dielectric floor until floor has reached is full hardness of 75 or as recommended by the manufacturer, whichever is greater.

C. Finishing: After completion of the project and just prior to the final inspection of the work, thoroughly clean floors and apply a final top coat, if required, over scuffed or worn areas in accordance with manufacturer's instructions.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of DIELECTRIC FLOORING shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of DIELECTRIC FLOORING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 09 67 23

RESINOUS FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes resinous flooring systems as shown on the drawings and in the schedules.

B. Related Requirements:

1. Concrete: Section 03 30 00.
2. Dielectric Flooring: Section 09 67 10.
3. Painting: Section 09 91 00.

1.03 SYSTEM DESCRIPTION

A. The work shall consist of preparation of the substrate, the furnishing and application of an epoxy based multi roller applied flooring system with aggregate and urethane topcoat. The system shall have the color and texture as specified with a nominal thickness of 1/8 inch. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

B. Cove base (if required) to be applied where noted on plans and per manufacturers standard details unless otherwise noted.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples:

1. Submit 6 inch sq sample colors for approval by the Commissioner.

1.05 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

B. Material Certificates: For each resinous flooring component, from manufacturer signed by manufacturer certifying that the resinous flooring complies with requirement specified herein.

C. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer or applicator who has specialized in installing resinous flooring, types similar to that required for this Project.

B. The Applicator shall have been approved by the flooring system manufacturer for surface preparation and application of the product specified.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 60-inch- square floor area selected by Commissioner.

a. Include 60-inch length of integral cove base with inside corner.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Commissioner specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping

1. Components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.
2. Provide a storage area for components. The area shall be maintained between 60 deg F and 90 deg F, dry, out of direct sunlight, and in accordance with the manufacturer's recommendations.

1.09 FIELD CONDITIONS

A. Site Requirements

1. Application may proceed while air, material and substrate temperatures are between 60 F and 90 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
2. The relative humidity in the specific location of the application shall be less than 85 percent and the surface temperature shall be at least 5 deg F above the dew point.
3. Ensure that adequate ventilation is available for the work area.
4. Provide lighting equal to the final lighting level during the preparation and installation of the system.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with requirements, acceptable manufacturers include, but are not limited to the following:

1. Dur-A-Flex, Inc.
2. Dex-O-Tex, Crossfields Products Corp.
3. Florock Polymer Flooring.
4. Stonhard, Inc.

2.02 Materials

A. Primer: 100 percent solids, epoxy-based, penetrating primer that exhibits chemical resistance, minimum 10 mils.

1. Basis of Design: "Floropoxy 4700 Epoxy Primer" (Florock).

B. Basecoat and Broadcast: impact-resistant, pigmented epoxy coating in thickness capable of accepting aggregate, followed by a broadcast of 40-100 mesh silica sand into the wet basecoat, minimum 12 mils.

1. Basis of Design: "Floropoxy 4805" (Florock) with 40-100 Silica Sand Broadcast.

C. Grout Coat: two-component, pigmented, 100 percent solids epoxy grout coat, minimum 20 mils.

1. Basis of Design: "Floropoxy 4805" (Florock).

D. Topcoat: pigmented, exceptionally wear resistant, high solids aliphatic urethane coating.

1. Basis of Design: "FloroWear 7100 High Traffic System" (Florock).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.

B. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.02 PREPARATION

A. General:

1. Prepare concrete in accordance with resinous flooring system manufacturer's written requirements.
2. Concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
3. Moisture Testing: Perform tests recommended by manufacturer and as follows.

    a. Perform relative humidity test using is situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.

    b. If the relative humidity exceeds 75% then Primer moisture mitigation system must be installed prior to resinous flooring installation. Slab-on grade substrates without a vapor barrier may also require the moisture mitigation system.

3.03 APPLICATION

A. General: Install resinous flooring system in accordance with resinous flooring system manufacturer's written requirements.

B. Floor Finish: Slip-resistant, firm and stable. The friction coefficient of the surface shall be no less than 0.8 wet or dry, when measured by static means using U.L. Friction Test Method/Card Data Method No. U.L 239.

3.04 CLEANING AND PROTECTION

A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.

B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

C. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

D. After completing application, clean spattered surfaces. Do not scratch or damage adjacent finished surfaces.

E. Protect work of other trades against damage. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Commissioner, and leave in an undamaged condition.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of RESINOUS FLOORING shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of RESINOUS FLOORING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 09 91 00
PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Painting, coatings and finishing, including the following:

1. Painting and finishing of exterior and interior exposed items and surfaces as specified herein and scheduled and noted on the Drawings.
2. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under other Sections, except as otherwise specified.
3. Paint as used herein means coating system materials, including primers, emulsions, enamels, sealers and fillers and other applied materials whether used as prime, intermediate or finish coats.
4. Paint exposed surfaces except where the natural finish of the material is obviously intended and specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.

B. Related Sections:

1. Cast-in-place concrete: Section 03 30 00.
2. Unit masonry: Section 04 20 00.
3. Structural steel: Section 05 10 30.
4. Metal fabrications: Section 05 50 00.
5. Mass Timber Panels: 06 15 43
6. Decorative metal: Section 05 70 00.
7. Sheet metal flashing and trim: Section 07 62 00.
8. Roof hatches: 07 72 33.
9. Finish door hardware: Section 08 71 00.
10. Gypsum board: Section 09 29 00.
11. Applicable Sections of Divisions 21, 22 23, and 26.

1.3 PAINTING NOT INCLUDED

A. General: The following categories of work are not included as part of the painter applied finish work or are included in other Sections of these Specifications, unless otherwise shown or specified.

1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under the various Sections for structural steel, metal fabrications, ornamental metal fabrications, hollow metal work and similar items.
2. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory finishing or installer finishing is specified for such items as (but not limited to) toilet enclosures, acoustic materials and casework.
3. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and inaccessible areas, furred areas, spaces and duct shafts.
4. Finished Metal Surfaces: Metal surfaces of anodized aluminum, aluminum paint finish system, stainless steel, chromium-plated, copper, bronze and similar finished materials will not required finish painting, except as otherwise indicated.
5. Operating Parts and Labels: Do not paint any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts, unless otherwise indicated. Do not paint over any code required labels, such as UL name or nomenclature plates.

1.4 ACTION SUBMITTALS

A. Samples: Commissioner's review will be for color and texture only. Compliance with other requirements is the exclusive responsibility of the Contractor. Provide a listing of the material and application for each coat of each finished sample, include color sample chips from manufacturer.

1. Initial Color Selection: Prior to beginning painting work, Contractor will be furnished sample color chips and copies of Color Schedule for surfaces to be painted. Colors will be selected by the Commissioner.
2. Draw-Downs: After initial colors have been selected provide actual paint draw-downs for each color and sheen specified, 12 inches by 12 inches.
3. On site Samples: On each actual wall surface, ceiling and other building components of each paint system. On at least 100 sq. ft. of surface as directed, provide full coat finish samples of required sheen, color and texture. Simulate finished lighting conditions for review of in-place work.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer’s Literature: Materials description, installation and maintenance instructions for each type of paint.

B. Paint Schedule: Submit copies of the paint schedule indicating each type of surface to be painted, paint product and generic description of paint product and each type of primer for each type of surface material.

1.6 QUALITY ASSURANCE

A. Provide materials used on this part of the Work as hereinafter specified. No claims as to the suitability of any materials specified, or the applicator's inability to produce first class finishes with these materials will be considered unless such claims are made in writing prior to the start of the painting work.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label.

B. Provide labels on each container with the following information:

1. Name of title of material.
2. Manufacturer's stock number.
3. Manufacturer's name.
4. Contents by volume, for major pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.

1.8 PROJECT/SITE CONDITIONS

A. Existing Conditions:

1. Starting of painting work will constitute the applicator's acceptance of the surfaces and conditions within any particular area.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces or conditions otherwise detrimental to the formation of a durable paint film.

B. Protection:

1. Protect work, whether to be painted or not, against damage by painting and finishing work. Correct damages by cleaning, repairing or replacing and repainting.
2. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings, after completion of painting operations.
3. During the progress of the work, remove from the project daily discarded paint materials, rubbish, cans and rags.
4. Upon completion of painting work, clean window glass and other paint spattered surface. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

1.9 WARRANTIES

A. Paint Finish:

1. Provide Fluoropolymer Coating manufacturer's written warranty stating that the paint finish used on exposed structural steel is be free from chipping, peeling, cracking, fading, chalking, or blistering in accordance with the General Conditions except the warranty period is to be for 15 years instead of 1year.

B. The above warranties are in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 COLORS AND FINISHES

A. Prior to beginning of work, sample color chips for surfaces to be painted will be furnished by the Commissioner. Match the colors of the chips and submit samples to the Commissioner as specified herein, before proceeding with the work.

B. Final acceptance of colors will be from samples applied on the job.

C. Proprietary names used to designate colors or materials are not intended to imply that products of the manufacturers are required to the exclusion of equivalent products of other named manufacturers, but the Commissioner is to be informed in writing of manufacturers and materials used on the job for various colors and finishes.

2.2 PAINT COORDINATION

A. Provide finish coats which are compatible with prime paints used. Review other Sections of these Specifications in which prime paints are to be provided to ensure compatibility of total coating system for various substrates. Upon request from other trades, furnish information on characteristics of specified finish materials, to ensure compatible prime coats as used. Provide barrier coats over incompatible primers or remove and reprime as required for specified finish coat.

2.3 PAINT MATERIALS

A. Provide the best quality grade of the various types of coatings as regularly manufactured by approved paint materials manufacturers. Materials not displaying the manufacturer's identification as a well known standard, best grade product will not be acceptable.

B. Provide undercoat paint compatible with and produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer and use only within recommended limits.

C. Provide paint manufactured by one of the following:

1. Behr Process Corporation, Santa Ana, CA 92704.
2. Benjamin Moore (Moore), Montvale, NJ 07645.
3. International, Akzo Nobel N.V., Chicago, IL.
4. PPG Paints, Pittsburgh, PA 15222.
5. Sherwin Williams (S-W), Cleveland, OH 44115.
6. Tnemec Company, Inc., Kansas City, MO 64141.
7. Carboline Company, St. Louis, MO 63144.
8. Modac Products Company, Inc., Broomall, PA 19008.
9. Sonneborn Building Products, Minneapolis, MN 55435.
10. Thoro Systems, Harris Specialty Chemicals, Inc., Jacksonville, FL 32256.
11. Master Coatings Technology, Eagan, MN 55121

D. Refer to the Paint Schedule at the end of this Section and building exterior, interior elevations and schedules on the Drawings.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. General:

1. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified for each particular substrate condition.
2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures and similar items in-place and not to be finish painted or provide surface applied protection prior to surface preparation and painting operations. Remove, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen skilled in the trades involved.
3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program the cleaning and painting so that contaminants from the cleaning process will not fall onto wet newly painted surfaces.

B. Cementitious Materials:

1. Prepare cementitious surfaces to be painted by removing efflorescence, chalk, dust, dirt, grease, oils and by roughening as required to remove glaze.
2. Determine the alkalinity and moisture content of the surface to be painted by performing appropriate tests. If the surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, correct this condition before application of paint. Do not paint over surfaces where the moisture content exceeds that permitted in manufacturer's printed directions.

C. Ferrous Metals:

1. Clean ferrous surfaces which are not galvanized or shop coated of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
2. Touch up shop applied prime coats wherever damaged or bare, where required by other Sections of these Specifications. Clean and touch up with the same type shop primer.

D. Galvanized Metal: Clean free of oil and other surface contaminants with a non-petroleum base solvent recommended by paint manufacturer.

3.2 SURFACE PREPARATION OF PREVIOUSLY COATED SURFACES

A. General:

1. Remove cracked and deteriorated sealants and calking.
2. Remove chalk deposits and loose, blistered, peeling, scaling, or crazed finish to bare base material or sound substrate by scraping and sanding.
3. Wash surfaces with solution of TSP to remove wax, oil, grease, and other foreign material; rinse, and allow to dry. Exercise caution that TSP solution does not soften existing coating.
4. Abrade glossy surfaces by sanding or wiping with liquid de-glosser.
5. Remove mildew as specified above.
6. Test compatibility of existing coatings by applying new coating to small, inconspicuous area. If new coatings lift or blister existing coatings, provide test results and recommendations from paint manufacturer to Commissioner.
7. Apply specified primer to surfaces scheduled to receive coatings.

B. Metal:

1. Remove rust from surfaces to bare metal in accordance with SP3 "Power Tool Cleaning".
2. Exercise care not to remove galvanizing.
3. Complete preparation as specified for new work.

3.3 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's written directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and, if necessary, strain the material before using.

3.4 PAINT APPLICATION

A. General:

1. Apply paint in accordance with the manufacturer's directions; use applicators and techniques best suited for the type of material being applied.
2. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance.
3. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment of furniture with prime coat only.
4. Paint interior surfaces of ducts, where visible through registers or grilles with a flat, non-specular black paint.
5. Finish exterior doors on tops, bottoms, and side edges same as exterior faces, unless otherwise indicated.
6. Sand lightly between each succeeding enamel or varnish coat.
7. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

B. Application Restrictions:

1. Do not apply water base paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 50 deg F, unless otherwise permitted by the paint manufacturer's printed instructions.
2. Do not apply solvent thinned paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 45 deg F, unless otherwise permitted by the paint manufacturer's printed instructions.
3. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds 85 percent; or to damp or wet surfaces, unless otherwise permitted by the paint manufacturer's printed instructions. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application of drying periods.

C. Minimum Coating Thickness: Provide the following minimum coating thicknesses unless herein noted otherwise:

1. Apply each material at not less than the manufacturer's recommended spreading rate.

D. Prime Coats:

1. Apply a prime coat to material which is required to be painted or finished and which has not been prime coated by others.
2. Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
3. Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks or other surface imperfections.

E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting,

holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

F. Completed Work: Match reviewed samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.5 PAINT SCHEDULE

A. Exterior:

1. Exposed Structural Steel (unless otherwise indicated):

   a. Prime Coat: Zinc-rich, as recommended in writing by topcoat manufacturer.

   b. Intermediate Coat: Epoxy, high-build:
      1) Tnemec: Series N69 Hi-Build Epoxoline II.
      2) PPG: Amercoat 385.
      3) S-W: Macropoxy 646-100 Fast Cure, B58 Series.
      4) Behr: US Coatings EpoxyGrip 2000 VOC; Distributed by Behr Process Corporation.
      5) International: Intercure 200HS.

   c. Topcoat: Polyurethane, two-component, pigmented:

      1) Tnemec: Series 1074 Endura-Shield.
      2) PPG: Amercoat 450H.
      3) S-W: Acrolon Ultra.
      4) Behr: US Coatings UreGrip 3000; Distributed by Behr Process Corporation.
      5) International: Interthane 990HS.

2. Exposed Structural Steel (PT-02):

   a. Prime Coat: Zinc-rich, as recommended in writing by topcoat manufacturer.

   b. Intermediate Coat: Polyurethane:

      1) Tnemec: Series 73.
      2) PPG: Coraflon ADS650 Urethane Mastic.
      3) S-W: Acrolon 218.

   c. Topcoat: 1 coat High-Solids Fluoropolymer Coating:

      1) Tnemec: Series 1071V Fluoronar.
      2) PPG: Coraflon ADS.
      3) S-W: Fluorokem HS.

3. Other Steel and Iron Substrates, Alkyd System:

a. Prime Coat: As recommended in writing by topcoat manufacturer.

b. Topcoat: Alkyd, exterior, semi-gloss.

1) Behr: Oil-Base Interior/Exterior Semi-Gloss Enamel, 3800 (<380 g/L).
2) Moore: Super Spec HP Alkyd Semi-Gloss Enamel P24.
3) PPG: Devguard 4306 Alkyd Semi-Gloss Enamel.
4) S-W: Metalatex DTM, B55 Series.

4. Galvanized-Metal Substrates, Latex System:

a. Prime Coat: As recommended in writing by topcoat manufacturer.

b. Topcoat: Latex, exterior, semi-gloss.

1) Behr: Direct To Metal Semi-Gloss, 3200 (<100 g/L).
2) Moore: Ultra Spec DTM Acrylic Semi-Gloss Enamel HP29.
3) PPG: 6-900XI Speedhide Exterior Semi-Gloss.
4) S-W: Pro Industrial Acrylic Semi-Gloss, B66-651 Series.
5) Tnemec: Series 1029 Enduratone.

5. Aluminum Substrates, Latex System:

a. Prime Coat: As recommended in writing by topcoat manufacturer.

b. Topcoat: Latex, exterior, semi-gloss.

1) Behr: Direct To Metal Semi-Gloss, 3200 (<100 g/L).
2) Moore: Ultra Spec DTM Acrylic Semi-Gloss Enamel HP29.
3) PPG: 6-900XI Speedhide Exterior Semi-Gloss.
4) S-W: Pro Industrial Acrylic Semi-Gloss, B66-651 Series.
5) Tnemec: Series 1029 Enduratone.

6. Concrete Substrates, Nontraffic Surfaces, Latex System:

a. Prime Coat: As recommended in writing by topcoat manufacturer.

b. Topcoat: Latex, exterior, semi-gloss.

1) Behr: Behr Pro e600 Exterior Semi-Gloss, 670 (<50 g/L).
2) Moore: Ultra Spec HP DTM Acrylic, Semi-Gloss HP29.
3) PPG: 6-900XI Speedhide Exterior Semi-Gloss.
4) S-W: Pro Industrial Acrylic, Semi-Gloss, B66-651 Series.
5) Tnemec: Series 1029 Enduratone.

7. Cement Board Substrates, Latex System:

a. Prime Coat: As recommended in writing by topcoat manufacturer.

b. Topcoat: Latex, exterior, semi-gloss.

1) Behr: Behr Pro e600 Exterior Semi-Gloss, 670 (<50 g/L).
2) Moore: Ultra Spec HP DTM Acrylic, Semi-Gloss HP29.
3) PPG: 6-900XI Speedhide Exterior Semi-Gloss.
4) S-W: Pro Industrial Acrylic, Semi-Gloss, B66-651 Series.
5) Tnemec: Series 1029 Enduratone.

8. CMU Substrates, Latex System:

a. Prime Coat: As recommended in writing by topcoat manufacturer.

b. Topcoat: Latex, exterior, semi-gloss.

1) Behr: Behr Pro e600 Exterior Semi-Gloss, 670 (<50 g/L).
2) Moore: Ultra Spec HP DTM Acrylic, Semi-Gloss HP29.
3) PPG: 6-900XI Speedhide Exterior Semi-Gloss.
4) S-W: Pro Industrial Acrylic Semi-Gloss, B66-651 Series.
5) Tnemec: Series 1029 Enduratone.

9. Exterior Gypsum Board Substrates, Latex System:

a. Prime Coat: As recommended in writing by topcoat manufacturer.

b. Topcoat: Latex, exterior, low sheen (unless otherwise indicated).

1) Behr: Behr Pro e600 Exterior Flat, 610 (<50 g/L).
2) Moore: Ultra Spec Ext Flat Finish N447.
3) PPG: Speedhide Exterior Flat 6-610XI.
4) S-W: A-100 Acrylic Flat, A6 Series.
5) Tnemec: Series 1026 Enduratone.

c. Topcoat: Latex, exterior, semi-gloss (where indicated).

1) Behr: Behr Pro e600 Exterior Semi-Gloss, 670.
2) Moore: Ultra Spec Ext Satin Finish N448.
3) PPG: 6-900XI Speedhide Exterior Semi-Gloss.
4) S-W A-100 Latex Low Sheen, A12-100 Series Topcoat: Latex, exterior, gloss.
5) Tnemec: Series 1029 Enduratone.

d. Topcoat: Latex, exterior, gloss (where indicated).

1) Behr: Premium Plus Int/Ext Hi-Gloss, 2-8050 (<50 g/L).
2) Moore: Ultra Spec Ext Gloss Finish N449.
3) PPG: Speedhide Exterior Gloss 6-8534.
4) S-W: A-100 Latex Gloss, A8 Series.
5) Tnemec: Series 1028 Enduratone.

B. Interior - New Construction:

1. Exposed Structural Steel:

a. Prime Coat: As recommended in writing by topcoat manufacturer.

b. Topcoat: Polyurethane, two-component, pigmented, gloss:

1) Tnemec: Series 1074 Endura-Shield.
2) PPG: Amercoat 450H.
3) S-W: Acrolon Ultra.
4) Behr: US Coatings UreGrip 3000 VOC; Distributed by Behr Process Corporation.
5) International: Interthane 990HS.

2. Handrails, Hollow Metal Doors, and Hollow Metal Frames and Ferrous Metals for Semi-Gloss Finish:

a. Prime Coat: As recommended in writing by topcoat manufacturer.

b. Topcoat 2 full coats, acrylic enamel, semi-gloss:

1) Behr: Direct To Metal Semi-Gloss, 3200 (<100 g/L).
2) Moore: DTM Acrylic Semi-Gloss M29.
3) S-W: Pro Industrial Semi-Gloss Acrylic.
4) PPG: Pitt-Glaze WB1 Pre Catalyzed Epoxy Semi-Gloss 16-510 (96 g/L VOC).
5) Tnemec: Series 1029 Enduratone.

3. Galvanized-Metal Substrates & Ductwork:

a. Prime Coat: As recommended in writing by topcoat manufacturer.

b. Topcoat, 2 coats, Water based enamel (satin):

1) Behr: Direct To Metal Semi-Gloss, 3200 (<50 g/L VOC).
2) Moore: Ultra Spec HP® D.T.M. Acrylic Low Lustre Enamel HP25 (< 145 g/L VOC).
3) PPG: Break Through Water-Borne Acrylic Satin V51-410 (<50 g/L VOC).
4) S-W: Pro Industrial High Performance Acrylic EgShel, B66-660 (< 100 g/L VOC).
5) Tnemec: Series 115 Uni-Bond DF (140 g/L VOC)

4. Gypsum Board Walls for Eggshell Finish:

a. Prime Coat: As recommended in writing by topcoat manufacturer.

b. Topcoat, 2 coats, -acrylic-latex enamel (eggshell):

1) Behr: Behr Pro i300 Interior Eggshell. 330 (<5 g/L VOC).
2) Moore: Ultra Spec® 500 Interior Eggshell Finish N538 (0 g/L VOC).
3) PPG: 6-4310XI Speedhide Zero VOC Interior Latex Eggshell (0 g/L VOC).
4) S-W: ProMar 200 Zero VOC Interior Latex EgShel, B20W2600 (< 50 g/L VOC).
5) Tnemec: Series 1026 Enduratone.

5. Gypsum Board Ceilings for Flat Finish:

    a. Prime Coat: As recommended in writing by topcoat manufacturer.

    b. Topcoat, 2 coats, Acrylic-Latex (flat):

        1) Behr: Behr Pro i100 Interior Flat, 110 (<50 g/L VOC).
        2) Moore: Ultra Spec® 500 Interior Flat Finish N536 (0 g/L VOC).
        3) PPG: 6-4110XI Speedhide Zero VOC Interior Latex Flat (0 g/L VOC).
        4) S-W: ProMar 400 Zero VOC Interior Latex Flat, B30-4600 (< 50 g/L).
        5) Tnemec: Series 180 W.B. Tneme-Crete.

6. Gypsum Wallboard Walls for Semi-Gloss Finish:

    a. Prime Coat: As recommended in writing by topcoat manufacturer.

    b. Topcoat, 2 coats, Acrylic-Latex (Semi-Gloss):

        1) Behr: BehrPro i300 Interior Semi-Gloss 370
        2) Moore: Pristine Ecospec Interior Latex Semi-Gloss (224).
        3) S-W: ProMar 200 Zero VOC Latex Semi-Gloss.
        4) PPG: 6-4510XI Speedhide Zero VOC Interior Latex Semi-Gloss (0 g/L VOC).
        5) Tnemec: Series 1029 Enduratone.

7. Gypsum Wallboard Walls for Abuse Resistant Assembly:

        1) Primer: As recommended in writing by topcoat manufacturer.
        2) Topcoat, 2 coats: "Scuff X" (Moore).

8. Gypsum Wallboard Walls for High Durability Finish:

        1) Primer: "Scuffmaster Prime Master / Primer Sealer" (Master Coatings Technology).
        2) Topcoat: "Scuffmaster Scrub Tough Eggshell" (Master Coatings Technology).

9. Concrete Wall and Ceilings (Dry Environments):

    a. Prime Coat: As recommended in writing by topcoat manufacturer.

    b. Topcoat, 2 coats, acrylic-latex enamel (eggshell):

        1) Behr: Behr Pro i300 Interior Eggshell, 330 (<5 g/L VOC).
        2) Moore: Ultra Spec® 500 Interior Eggshell Finish N538 (0 g/L VOC).
        3) PPG: 6-4310XI Speedhide Zero VOC Interior Latex Eggshell (0 g/L VOC).
        4) S-W: ProMar 200 Zero VOC Interior Latex EgShel, B20W2600 (<50 g/L VOC).
        5) Tnemec: Series 180 W.B. Tneme-Crete.

10. Concrete Walls and Ceilings (Wet Environments):

    a. Prime Coat: As recommended in writing by topcoat manufacturer.

    b. Topcoat, 2 coats, epoxy finish:

        1) Behr: Behr Pro Pre-Catalyzed Waterborne Epoxy Semi-Gloss HP150 (<10 g/L VOC).
        2) PPG: Amerlock 2 VOC Epoxy (84 g/L VOC).
        3) S-W: Pro Industrial WB Catalyzed Epoxy, Gloss, B73 Series (<50 g/L VOC).
        4) Tnemec: Series 113 H.B. Tneme-Tufcoat.

11. CMU Substrates Dry Environments:

    a. Prime Coat: As recommended in writing by topcoat manufacturer.

    b. Topcoat, 2 coats, acrylic-latex enamel (eggshell):

        1) Behr: Behr Pro i300 Interior Eggshell, 330 (<5 g/L VOC).
        2) Moore: Ultra Spec® 500 Interior Eggshell Finish N538 (0 g/L VOC).
        3) PPG: 6-4310XI Speedhide Zero VOC Interior Latex Eggshell (0 g/L VOC).
        4) S-W: ProMar 200 Zero VOC Interior Latex EgShel, B20W2600 (<50 g/L VOC).
        5) Tnemec: Series 180 W.B. Tneme-Crete.

12. CMU Substrates Wet Environments:

    a. Prime Coat: As recommended in writing by topcoat manufacturer.

    b. Topcoat, 2 coats, epoxy finish (Wet Environments):

        1) Behr: Behr Pro Pre-Catalyzed Waterborne Epoxy Semi-Gloss HP150 (<10 g/L VOC)
        2) PPG: Amerlock 2 VOC Epoxy (84 g/L VOC)
        3) S-W: Pro Industrial WB Catalyzed Epoxy, Gloss, B73 Series (<50 g/L VOC).
        4) Tnemec: Series 113 H.B. Tneme-Tufcoat.

13. Exposed to View Overhead Construction:

    a. Topcoat, 2 coats, Water Based Interior Dry Fog:

        1) Behr: Behr Pro Dryfall Flat, 890 White; 891 Black (<50 g/L VOC).
        2) Moore: Moore Dry Fall Latex Flat 395 (46g/L VOC).
        3) PPG: 6-725XI Speedhide SuperTech WB Flat Dry Fog (< 30 g/L VOC) or 6-724XI Speedhide SuperTech WB Semi Dry Fog (< 50 g/L VOC)-self priming.
        4) S-W: Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (<50 g/L VOC) Flat, EgShel, or Semi-Gloss.
        5) Tnemec: Series 115 Uni-Bond DF. (140 g/L VOC).

14. Exposed to View Overhead (Interior and Exterior) NLT Ceiling:

    a. First Intermediate Coat: Water-based varnish matching topcoat

    b. Topcoat: Varnish, water based, clear, gloss:

        1) Moore: LENMAR Spar Varnish 1V.109.
        2) PPG: SunProof Acrylic/Oil Semi-Transparent Stain.
        3) S-W: SW Woodscapes Exterior Polyurethane Semi-Transparent Stain, A15T5.
        4) Color: Match SW 3503 White Birch.

3.6 CLEAN UP

A. Just prior to final completion and acceptance, examine painted and finished surfaces and retouch or refinish as necessary.

B. Upon completion of work, remove paint and finishing spots and overspray from floors, glass and other surfaces. Remove rubbish, containers and accumulated material of whatever nature not caused by other trades from the project site and level work in a clean, orderly and acceptable condition.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of PAINTING shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of PAINTING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 09 96 23
GRAFFITI RESISTANT COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Clear non-sacrificial, anti-graffiti coating for architectural concrete including surface preparation.

B. Related sections:

1. Cast-In-Place Architectural Concrete: Section 03 33 00.
2. Unit masonry: Section 04 20 00.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature:

1. Materials description, installation instructions and specifications for materials used for coating.
2. Manufacturer's written maintenance instructions including names of cleaning materials to be used for different types of graffiti and the locations of purchase for each cleaning material.

B. Warranty: signed copies in form and content indicated.

1.4 QUALITY ASSURANCE

A. Coating applicator: Approved and/or certified by the Coating Manufacturer.

B. The manufacturer of the coating is to provide a representative for inspecting the surfaces to be coated and to verify the existing conditions and materials of the proposed installation are in compliance with the manufacturer's requirements prior to application. The manufacturer's representative is to also inspect the installation during application and upon completion of the coating to ascertain that the coating has been installed in accordance with the manufacturer's printed application instructions and this specification.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's unopened containers identified to show name, brand, mixing and application instructions. Store and protect containers from damage. Provide storage area temperature in accordance with the manufacturer's printed instructions.

1.6 PROJECT/SITE CONDITIONS

A. Verify that masonry surfaces, atmospheric and coating are not be lower than 50 deg F. Materials and that the weather is dry. Surface is to be clean and dry prior to application.

B. Provide enclosed, ventilated areas in accordance with the manufacturer's printed instructions.

C. Provide temporary protection to areas, finishes, and elements of the building that could be damaged by contact with coating materials, including glass surfaces, roofing, paint finishes and landscaping in accordance with the manufacturer's printed instructions.

D. Weather Conditions: Apply coating only when weather forecasts are for dry weather for not less than 24 hours. If weather conditions change during application cover coated surfaces in accordance with the manufacturer's printed instructions.

1.7 WARRANTY

A. Warranty that the graffiti resistant coating installation will be free of faults and defects, in accordance with the General Conditions, except that the Warranty is to be extended by the Coating Manufacturer's 5 year written warranty insuring the anti-graffiti performance of the coating.

B. The Warranty is to cover both labor and material, required to clean and recoat areas on which the coating has failed to control and allow removal of graffiti on solid masonry materials without damage to the masonry surface.

C. Provide copies of the warranty signed by the Coating Manufacturer.

D. This warranty is in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents.

1.8 SAMPLE APPLICATION

A. Before proceeding with the work, apply a sample area of approximately 100 sq. ft. to the site architectural concrete mockup installation. If no site mockup exists, apply sample application to an area designated.

B. This application is to be witnessed by the Commissioner, and after review it will be used as a guide for method of application and visual appearance of the finished work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURES

A. ProSoCo,Inc., Kansas City, KS 66117.

B. Textured Coating of America, Inc., Panama City, FL 32405.

2.2 MATERIALS

A. Non-Sacrificial Graffiti Resistant Coating: Clear transparent, water based, non-sacrificial graffiti resistant coating for application over masonry surfaces which is non-yellowing. Provide one of the following:

1. "Graffiti Control II" (ProSoCo).
2. "Graffiti Gard IV Low Luster" (Textured Coating of America).

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine surfaces of the application prior to application of materials. If deteriorated or unsuitable surfaces or conditions are encountered, immediately contact the Architect. The Architect will inspect the work and determine the corrective repairs required. Repair work for such conditions will be performed by others. Do not proceed with coating application until unsatisfactory conditions are corrected and inspected by the Coating Manufacturer's Representative. Application of the graffiti resistant coating constitutes acceptance of the existing conditions and construction.

B. Coordinate and verify that sealant work has been completed prior to the application of coating so as assure that the coating will not interfere with the adhesion of sealants.

C. Verify that masonry surfaces to be coated have been properly cleaned, rinsed, dried and inspected prior to the application of the coating. Allow masonry surfaces to dry for not less than 24 hours prior to coating application.

3.2 APPLICATION

A. Apply the coating in one or two coats in accordance with the manufacturer's printed instructions for the materials being coated.

B. Stir and mix material in accordance with label instructions prior to application. Apply material using manufacturer approved brushes, rollers or low-pressure airless spray equipment (40 psi maximum).

C. Verify on the site mockup the number of coats and amount of material used to coat brick, concrete unit masonry and cast stone fabrications prior to application on the building to avoid darkening of surfaces.

D. Spray surface lightly from top to bottom. Do not atomize/vaporize the material when using spray equipment. Use an overlapping horizontal spray pattern. Follow up with a vertical stroke for deep vertical recesses. Avoid flooding the surface or creating heavy rundowns.

E. Let treatment penetrate for one to two minutes. Remove buildups using a damp brush or roller.

F. Let previous coat dry to touch not less than 20 to 30 minutes. Lightly apply subsequent coats.

3.3 CLEANING

A. Upon completion of this part of the work, remove rubbish and debris as well as temporary coverings and masking. Clean adjoining surfaces, parts of the building and surrounding building areas soiled or stained due to spraying operations.

B. Immediately clean window glass and other surfaces that are soiled during application with materials and methods in accordance with the manufacturer's printed instructions.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of GRAFFITI RESISTANT COATINGS shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of GRAFFITI RESISTANT COATINGS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 10 14 16
PLAQUES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Plaques.

B. Related Sections:

1. Joint sealants: Section 07 92 00.
2. Glazing: Section 08 80 00.

1.3 ACTION SUBMITTALS

A. Product data: for items specified herein.

B. Shop Drawings:

1. Include fabrication and installation details and attachments to other work.
2. Show plaque mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each plaque.

C. Samples for Verification: For each type of plaque showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Plaques: Full-size Sample.
2. Exposed Accessories: Full-size Sample of each accessory type.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Sample Warranty: For special warranty.

1.5 QUALITY ASSURANCE

A. Accessibility Standard: For plaques indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", Illinois Accessibility Code, and ICC A117.1.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of plaques that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.

2. Comply with this specification for repair or replacement work.
3. Provide written warranty, signed by the fabricator/installer and manufacturer. Submit copies to the Commissioner.

B. Warranty Period: In accordance with the General Conditions except the warranty period is to be for five years instead of one year.

C. This warranty is in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. A.R.K. Ramos.

B. Southwell Company (The).

2.2 PLAQUES

A. Cast Plaque: Cast-metal plaque with background texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles.

B. Plaque Material: Cast stainless steel.

C. Plaque Thickness: 0.50 inch.

D. Finishes:

1. Integral Stainless-Steel Finish: As selected by Commissioner from full range of industry finishes.

E. Integral Edge Style: Square cut, polished.

F. Mounting: As indicated on Drawings.

G. Text and Typeface: Accessible raised characters and Braille. Final typeface and image to be provided by Commissioner.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of plaques, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:

    a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
    b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant slots unless otherwise indicated.

4. Plaque Mounting Fasteners:

    a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of plaque, screwed into back of plaque, or screwed into tapped lugs cast integrally into back of plaque unless otherwise indicated.
    b. Through Fasteners: Exposed metal fasteners matching plaque finish, with type of head indicated, installed in predrilled holes.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.4 FABRICATION

A. General: Provide manufacturer's standard plaques according to requirements indicated.

1. Preassemble plaques in the shop to greatest extent possible. Disassemble plaques only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.

3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match plaque finish.
6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted plaques to suit plaque construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

1. Stainless-Steel Brackets: Factory finish brackets to match plaque background finish unless otherwise indicated.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that plaque-support surfaces are within tolerances to accommodate plaques without gaps or irregularities between backs of plaques and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.

1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of plaque. Remove loose debris from hole and substrate surface.

    a. Concrete Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place plaque in position and push until flush to surface, embedding studs in holes. Temporarily support plaque in position until adhesive fully sets.
2. Shim-Plate Mounting: Provide 1/8-inch- thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed plaques and plaques that do not comply with specified requirements. Replace plaques with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as plaques are installed.

C. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by Commissioner.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of PLAQUES shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of PLAQUES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 10 14 36

SIGNS; RAIL RIGHT-OF-WAY, RETROREFLECTIVE, WITH FIBER REINFORCED PLASTIC SUBSTRATE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This specification covers requirements to furnish and install Right-Of-Way (ROW) signs having retroreflective properties and a fiber reinforced plastic substrate. These signs are used for alerting train operators to conditions, restrictions and instructions pertaining to safe train operation in accordance with the Chicago Transit CTA's "Rail System Rule Book".

1.03 REFERENCED DOCUMENTS

A. Industrial Standards make up a part of this specification to the extent specified. The most recent version of each standard referenced will govern in all instances. Standards referenced are as follows:

1. ASTM Standards
2. D 256-06: Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
3. D 543-06: Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
4. D 570-98 (2005): Standard Test Method for Water Absorption of Plastics.
5. D 635-06: Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
6. D 638-03: Standard Test Method for Tensile Properties of Plastics.
7. D 695-02a: Standard Test Method for Compressive Properties of Rigid Plastics.
8. D 732-02: Standard Test Method for Shear Strength of Plastics by Punch Tool.
9. D 790-03: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
10. D 1435-05: Standard Practice for Outdoor Weathering of Plastics.
11. D 3841-97 (2001): Standard Specification for Glass-Fiber-Reinforced Polyester Plastic Panels.
12. F 735-06: Standard Test Method for Abrasion Resistance of Transparent Plastics and Coatings Using the Oscillating Sand Method.

B. LIST OF SIGNS

The following is a list of CTA signs covered under this specification. The exact type of signs required and the quantities of each sign to be furnished and installed are shown on the plans.

CTA Item No.	CTA Artwork No.	Message on Sign	Sign Dimensions
2107073	OP-838	X	10″ X 10″ X 1/8″
2107074	OP-834	2	10″ X 10″ X 1/8″
2107075	OP-835	4	10″ X 10″ X 1/8″
2107076	OP-836	6	10″ X 10″ X 1/8″
2107077	OP-837	8	10″ X 10″ X 1/8″
2107086	OP-1469	2 Clear	12″ X 18″ X 1/8″
2107087	OP-1470	4 Clear	12″ X 18″ X 1/8″
2107088	OP-1471	6 Clear	12″ X 18″ X 1/8″
2107089	OP-1472	8 Clear	12″ X 18″ X 1/8″
2107117	OP-5331	Speed limit 6 mph	12″ X 18″ X 1/8″
2107093	OP-5332	Speed limit 10 mph	12″ X 18″ X 1/8″
2107094	OP-5333	Speed limit 15 mph	12″ X 18″ X 1/8″
2107095	OP-5334	Speed limit 20 mph	12″ X 18″ X 1/8″
2107096	OP-5335	Speed limit 25 mph	12″ X 18″ X 1/8″
2107097	OP-5336	Speed limit 30 mph	12″ X 18″ X 1/8″
2107098	OP-5337	Speed limit 35 mph	12″ X 18″ X 1/8″
2107099	OP-5338	Speed limit 40 mph	12″ X 18″ X 1/8″
2107115	OP-1335R1	Danger No clearance for person between trains	12″ X 18″ X 1/8″
2107116	OP-1336R2	Danger No clearance for person beyond this point	12″ X 18″ X 1/8″
2107123	OP-3562R1	Danger No clearance this side of track	12″ X 18″ X 1/8″
	OP-5343, Detail S-7A	Begin WA zone	12″ X 12″
	OP-5344, Detail S-7B	End WA zone	12″ X 12″
	OP-5613, Detail S-7C	WA Control Box	12″ X 12″

1.04 ARTWORK

A. The CTA will supply all artwork for signs furnished and installed by the Contractor. Artwork will be made available to the Contractor, after NTP, by CTA's Signage & Wayfinding Department, located at 567 W. Lake Street, Chicago IL. 60661, telephone 312-681-3667. The artwork provided will be produced in Adobe® Illustrator®.

B. The CTA will not accept any sign that was fabricated using artwork not furnished by the CTA, or that was fabricated using a version of CTA artwork that has been superseded.

PART 2 – PRODUCTS

2.01 DETAILED MATERIAL REQUIREMENTS

A. Each sign will be constructed using a one hundred twenty five (0.125") thousandths inch thick Fiber Reinforced Plastic (FRP) substrate panel, here after referred to as panel (or panels), with laminated film overlays and/or silk screening inks. The FRP panel will be compatible with the first layer of reflective film sheeting. Panels will be fabricated from commercially available FRP sheet stock and have salient characteristics as follows:

1. The panel material will be constructed of randomly oriented, chopped fiberglass reinforced, thermoset, pigmented polyester laminate.

2. The panel material will be acrylic modified, non-yellowing, and UV stabilized for outdoor weatherability. Panel material will be classified as Grade II (weather resistant) minimum as specified in ASTM D 3841, following a 3,000 +100 hour weatherometer test in accordance with ASTM D 1435.

3. The panel material will not contain visible cracks, pinholes, foreign inclusions, or surface wrinkles that could affect the intended use, alter the specific dimensions of the panel, or otherwise affect its serviceability.

4. The panel material will contain additives to retard flame propagation, and have a class HB (0.98" to < 2.5" per minute) flammability burn rating when tested per ASTM D 635. Glass fibers should not be readily discernable on the panel face. In addition panels will have a glass content no less than twenty one (21%) percent of the total panel weight. Color will be visually uniform with the pigments compounded into the resins before cure to make the color an integral part of the panel. The color can be black, gray, or white. The colors red, green or yellow are not acceptable.

5. The panel material will have the same smooth surfaces on both sides with a minimum of four one thousandths (0.004") inch thick protective layer of gel coat. The panel material will not have any visible fiberglass prominence, and will be stabilized throughout to prevent release of migrating constituents over time, (i.e., solvents, monomers, etc.), with the glass and a non-shrink resin, formulated to retard moisture absorption to no less than one, one thousandths (0.001") inch per square inch.

6. The panel material will exhibit the following average mechanical properties plus or minus ten (±10%) percent.

Mechanical Property	Avg. Requirement	ASTM Test Method
Tensile Strength	14,600 psi	D 638
Tensile Modulus	1,000,000 psi	D 638
Flexural Strength	26,000 psi	D 790
Flexural Modulus	1,400,000 psi	D 790
Compressive Strength	30,000 psi	D 695
Izod Impact Strength	7.0 to 21.0 ft·lbf/in.	D 256
Punch Shear Strength	12,000 psi	D 732
Face Impact Resistance	1.1 lbs/mil of thickness	F 735

7. The panel material will exhibit a thermal stability where as the panel strength and impact resistance is not appreciable affected over a temperature range of minus sixty five (65°F) degrees Fahrenheit to two hundred twelve (212°F) degrees Fahrenheit.

8. A suggested, commercially available manufactured FRP sheet product that has been tested and found to meet the CTA's requirements for this purpose is a traffic control sign panel material manufactured by American Fiber Technologies under their product name Fiber-Brite Survivor™. The FRP panels and manufacturer will be submitted to the CTA for review and approval prior to the start of work.

B. Graphic & Protective Film Layers - The retroreflective characteristics and the graphics will be achieved by applying as many as four (4) different layers of decal sheeting, silk screening ink, or combination of both, over the panel. The decal layers will be compatible, equal or better to the following, and applied in the order listed.

1. First layer (Reflective) - The first layer decal sheeting will be a high intensity grade retroreflective, highly durable, opaque sheeting with a pressure-sensitive adhesive, capable of remaining brilliantly reflective when viewed at wide entrance angles and when totally wet by rain. A retroreflective decal sheeting that has been tested and found to meet CTA's requirements for this purpose is 3M Scotchlite™ High Intensity Grade reflective sheeting, series 3800 specifically 3870 (Silver), 3871 (Yellow), 3872 (Red), 3875 (Blue) or 3877 (Green) as specified in the CTA item number description. The first layer will be compatible with the FRP approved panel.

2. Second layer (Transparent Color) - When required an Electronic Cuttable (E.C.) transparent color film, having a transparent pressure-sensitive adhesive will be applied as the second layer. A suggested sheeting that has been tested and found to meet CTA requirements for this purpose is 3M Scotchlite™ E.C. film series 1170, specifically 1171 (Yellow), 1172 (Red) 1175 (Blue) and 1177 (Green). The sheeting and manufacturer will be submitted to the CTA for review and approval prior to the start of work.

3. Third layer (Text Art) - The third layer (or second layer) will be text art as shown on the artwork, and will be made from Electronic Cuttable (E.C.) matte finish opaque non-reflective vinyl film, or an Engineering Grade reflective vinyl film, both having a pressure-sensitive adhesive. Suggested decal sheeting that has been tested and found to meet CTA requirements for this purpose is as follows.

   a. Non-Reflective Film: 3M Scotchcal™, Series 220, specifically 220-12 (Black), 220-10 (White), 220-53 (Cardinal Red), 220-15 (Bright Yellow), 220-37 (Sapphire Blue), and 220-46 (Kelly Green).
   b. Reflective Film: 3M Scotchlite™ E.C. (for Gerber machines), film series 280, specifically 280-10 (White), 280-71 (Yellow), 280-75 (Blue), 280-77 (Green), and 280-82 (Ruby Red).
   c. NOTE: Reflective film used for text art will be compatible with the film

layer it is applied to.

d. An acceptable alternative to decal material for the non-reflective text art would be opaque silk screening ink compatible with the first layer, and when required the second layer materials approved.

e. NOTE: The second and third layer films will be specifically designed for use on friction feed and flatbed computer aided sign making systems, and be durable, dimensionally stable, and capable of withstanding severe weather and handling conditions.

f. Fourth layer (Transparent Protection) - The fourth layer (or third layer) will be a protective clear colorless overlay film, having a transparent pressure-sensitive adhesive. The film will be durable, solvent resistant and resistant to graffiti such as spray paint, permanent markers, and lipstick. Graffiti will be easily removed by selective solvent wiping. The suggested decal sheeting for this purpose is 3M Scotchlite™ Protective Overlay Film, series 1150.

4. The layers of film will be applied per the film manufacturer's instructions for the substrate used.

2.02 PANEL PREPARATION

A. The panel material will be cleaned of all foreign matter (i.e.: surface dust, mold release compounds, grease, oil, wax, etc.) per the reflective vinyl film manufacturer's instructions.

B. The panels will be tested for out-gassing before being used in the fabrication of the signs, by applying a piece of the reflective sheeting to be used in the sign fabrication onto an FRP test sample that was cut from the same FRP sheet stock that will be used in production. Test sample should be allowed to condition for twenty-four (24) hours, or be oven baked for two (2) hours at one hundred fifty (150°F) degrees Fahrenheit before film application. If out-gassing occurs, the reflective sheeting should not be applied to the FRP panel material represented by the test substrate. Test samples that exhibit out-gassing can be recurred and retested after one (1) week. If out-gassing still occurs, the material will not be used in the production of the signs until retests indicate the material does not exhibit out-gassing.

2.03 FINISHED SIGN REQUIREMENTS

A. Signs will be used outdoors and will be expected to withstand all weather conditions for a minimum of five (5) years with minimal fading, delaminating or surface crazing.

B. Signs will withstand a temperature range of -20°F to +212°F.

C. The finished signs will not require frames to be installed.

D. The finished signs when resting on their back surface will be flat with no visible waviness or curled corners.

E. The layers of film on the finished signs will be free of air bubbles, wrinkles, and loose or ragged edges in and around text art. All layers will be firmly attached and will not

peel loose by rubbing, cleaning, or by flexing the sign. Film overlays will be trimmed around all holes to the same diameter as the holes. Trimming process will leave holes free of ragged edges.

2.04 MATERIAL CERTIFICATION

A. The Contractor will submit to the CTA for review and approval prior to the start of work material certifications signed by an authorized representative of the manufacturer that certifies items as follows:

B. Panel material meets or exceeds the test standards and other requirements specified.

C. That the FRP material used for the panels was tested for outgassing as specified and that the material used in the sign fabrication exhibited no outgassing at the time of sign fabrication.

D. Graphic and protective films used in the fabrication meet the requirements specified.

E. In place of a manufacturer's certified test data, the Contractor may submit documented evidence to the satisfaction of the CTA that representative production material of the type submitted has been used successfully in a substantial traffic signage program in similar climatic conditions for at least three years.

2.05 MARKINGS

A. The sign manufacturer will provide his identification mark permanently embedded on the face of the sign for future identification. The identification mark will be placed in the lower right hand corner and will not exceed an area measuring one half (1/2″) inch by one half (1/2″) inch in size. The mark will contain items as follows:

1. CTA design number (e.g.: OP-838)

2. The seven digit CTA Item (lot) number (e.g., 2107073)

3. The manufacturer's name and/or logo

4. The date of manufacture

2.06 SAMPLES

A. The Contractor will submit a full scale black-and-white paper proof print-out of the sign test graphics furnished by the CTA; in addition, they will submit one (1) four (4") inch by four (4") inch sample of the FRP substrate to be used in the sign fabrication, one (1) four (4") inch by four (4") inch sample each of the graphic & protective films to be used in the sign fabrication, and technical data sheets for all materials including the graphic & protective vinyl films (and/or inks) that will be used in the fabrication of signs.

1. The artwork will be in Adobe® Illustrator® electronic format (EPS file or an enhanced PDF file).

2. All samples will be furnished at no extra Contract time and no extra Contract cost and will become the property of the CTA for record of acceptance or rejection.

3. Grounds for rejection include items as follows:

   a. Failure of the samples or technical data sheets submitted to meet the specification.

4. Approval of sample does not relieve the Contractor of the requirement to furnish the same quality for each and every sign installed.

B. First Article Inspection – After NTP the Contractor will receive the individual artwork to be used in the fabrication of the sign(s) to be furnished under the Contract. The artwork will be in Adobe® Illustrator® electronic EPS file format.

1. Prior to full production, the Contractor must provide one (1) full sized finished sample of each individual type of sign to be furnished for evaluation with respect to size, color, artwork match, and compliance before full production run. Failure to submit a full sized sample will be sufficient cause for rejection of signs furnished and installed and the signs removed and replaced by the Contractor with no extra Contract time and no extra Contract cost considered.

   a. Submitted pre-production samples will be kept on file by CTA and will NOT be included in any invoice against the Contract. The Contractor will include the cost of the pre-production samples in their bid proposal pricing.

2. If the sample(s) is (are) rejected, the Contractor will be notified as to cause for rejection and will be required to re-submit a corrected sample.

3. Rejected samples will become the property of the CTA for record of rejection and will not be considered as part of the production order.

C. All samples will be submitted to the CTA for review and approval through the CM and photos of the samples uploaded to E-Builder to allow a formal review and status.

2.07 WOOD SIGN POSTS

A. Sign posts will be straight, clear, untreated Southern Yellow Pine or Douglas Fir with no more than one quarter (1/4") inch warp or deformation in any side and free from injurious defects.

B. Sign posts will have a smooth finish free of rough or sharp edges or splinters.

C. Sign posts will be two and three eighths (2 3/8”) inches square in section and three

feet six inches (3'-6") in length.

D. Sign posts will be attached at their designated location in a handrail stanchion base as shown on the plans.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Signage will be furnished and installed in locations and quantities are as shown on the plans.
B. Signs will be installed on the center footwalk unless indicated otherwise elsewhere in the Contract.
C. All signs will be installed using common hardware that is compatible with the stanchion base metal. All washers will be lock washers and all nuts will be lock nuts. All hardware used to install signs will be submitted to the CTA for review and approval prior to the start of work. Each individual piece of hardware to be used will have a sample submitted to the CTA for review and approval prior to the start of work. The CTA will retain all samples and photos of the samples furnished will be uploaded to E-Builder to allow a formal review.
D. Sign installation will conform to the CTA rail vehicle clearance envelope shown on the plans.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work for SIGNS; RAIL RIGHT-OF-WAY, RETROREFLECTIVE, WITH FIBER REINFORCED PLASTIC SUBSTRATE shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for work covered in this section. Payment for the Work of SIGNS; RAIL RIGHT-OF-WAY, RETROREFLECTIVE, WITH FIBER REINFORCED PLASTIC SUBSTRATE shall be included in the contract lump sum price as shown in the Schedule for Prices for TRACKWORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Trackwork: 340000.

END OF SECTION

SECTION 10 41 60

TRANSIT INFORMATION PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Provide information panels, aluminum framed, to display current information such as schedules/schedule changes, maps, and temporary conditions at various rapid transit stations. The design and installation of Transit Information Panels will make the information clearly visible to the public and ease its updating by the Commissioner.

1.03 DESIGN REQUIREMENTS

A. It is not the purpose of this specification to specify all the intricate design characteristics of information panel. However, this specification does include typical characteristics and requirements that the information panel shall have in order to comply with the Commissioner's intentions.

B. Signs shall be used outdoors and shall be expected to withstand weather conditions for their installed location for a minimum of 10 years with minimal fading.

C. Free-standing information panels required consist of 2 styles: 2 or 3 aluminum poster frames mounted on a stainless steel panel.

D. Panels shall be mounted as indicated on Drawings with stainless steel supports on each end of the stainless steel board assembly. See Drawings or contact the Commissioner to determine the number of each type of information panel required for this project.

E. A sketch of a aluminum poster frame is available from the Commissioner as reference. The two/three aluminum poster frames style is referred to as a P-37. The sketch is not intended to be complete with exact dimensions, however, the sketch, is representative of a design that would meet the approval of the Commissioner.

1.04 ACTION SUBMITTALS

A. Shop Drawings: Submit for fabrication and installation prior to manufacture. Drawings shall include plans, elevations, and large-scale details of character layout and anchorages and accessories. Location template drawings shall be submitted with shop drawings.

B. Submit product data for the materials to be used.

1.05 REFERENCES

A. ASTM B209 -Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

C. ASTM D1003 – Standard Test Method for Haze and Luminous Transmittance of Transparent.

D. ASTM E84 -Standard Test Method for Surface Burning Characteristics of Building Materials FS CCC-W-408 - Wall Covering, Vinyl-Coated.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery: transit information panel shall be adequately protected during delivery to prevent damage from scratching, stains, discoloration or other causes. Damage to any surface during fabrication, handling, shipment, storage, and installation shall be remedied by the Contractor at the Contractor's own expense.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Poster Frame Model

1. Frames on stainless steel panel: aluminum frame. Satin finish. Finished size: as indicated.
2. Fasteners: Concealed design for cosmetic appearance and fabricated from non-corrosive material. Fasteners required to be activated for access or maintenance shall be stainless steel and shall thread into stainless steel inserts in the enclosure. Attach fasteners to inside cavity of the aluminum frame.
3. Legends and Headers: Use supplied artwork from the Chicago Transit Authority to produce die-cut vinyl appliqué for the header and legend fields of the transit panel. Helvetica Bold is the preferred font. The vinyl material used for header and footer shall be a permanent set, electronically cuttable, high performance, opaque gloss black vinyl film, for use on stainless steel, such as

Avery 1003, 3M Scotchcal 220 or equal. Follow drawings for installation location on panel.

4. The aluminum poster frame model uses 2 rectangular stainless steel 2 inch by 6 inch by 1/4 inch tube supports with 1/2 inch thick welded stainless steel base plates at the bottom of the tubes for the anchor attachment to the floor that will use 4 bolts per side.
5. Stainless steel cladding shall be welded to internal stainless steel frame. Frame shall have a minimum of 2 inch by 2 inch by 1/8 inch tubing continuously welded at joints.
6. Information panels shall have vertical stainless steel 3/4 inch reveals, which will be visible from front and back, running full height of panel at both ends between panel and tube supports legs.

B. Sign shall be constructed using porcelain enamel on 16 gauge steel, in compliance with all applicable technical specifications.

C. Approved manufacturer of the Aluminum Poster Frame for the Commissioner: Alpina Manufacturing, 3418 North Knox Avenue, Chicago, Il 60641; 1-800-915-2828, 1-800-217-9431 (fax).

2.02 FABRICATION

A. Aluminum Poster Frame Model

1. Protection of metals against galvanic action shall be provided wherever dissimilar metals are in contact. All metals, except galvanized steel which will be in contact with concrete, mortar, plaster, or other masonry, shall be protected. Protection shall consist of painting the contact surfaces with a heavy brush coat of bituminous paint.
2. Panel shall be delivered completely assembled. If the assembly cannot be delivered complete, the Contractor shall shop-assemble the complete assembly, mark, and dissemble before shipping to insure proper assembly in the field. Field joints in Transit Information Panel faces shall not be allowed.
3. Welding of assembly shall be done in accordance with appropriate specifications of American Welding Society and shall be done with electrodes and methods specified by the manufacturers of alloys being welding. Welds behind finished surfaces shall be so done as to minimize distortion and discoloration of finished side. Weld beads on exposed finished surfaces shall be ground and finished to match and blend with finish on adjacent parent metal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install transit information panel units level, plumb and at the height indicated with the transit information panel surfaces free from distortion or other defects in appearance.

3.02 Cleaning

A. Upon completion of the installation, clean soiled transit information panel surfaces in accordance with the manufacturer's instructions.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of TRANSIT INFORMATION PANELS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of TRANSIT INFORMATION PANELS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 10 42 50

VITREOUS ENAMELED STEEL SIGNS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This specification covers the requirements for furnishing and installing vitreous enameled steel (porcelain) signs for the Chicago Transit Authority.

B. This specification is intended to be descriptive, not restrictive, and is solely for the purpose of indicating the type and quality of vitreous enamel signs which would meet the approval of the Commissioner.

1.03 RELATED REQUIREMENTS:

A. Related Sections: The following sections contain requirements that relate to this section:

1. Metal Fabrications: Section 05 50 00.
2. Fiberglass Embedded Signs-AB: Section 10 42 70.

1.04 REFERENCE STANDARDS

A. The Work is subject to applicable portions of the following standards:

1. ”Specification for Architectural Porcelain Enamel on Steel for Exterior Use,” PEI S-10, Porcelain Enamel Institute (PEI).
2. ASTM A424

1.05 SUBMITTALS

A. Submit Sign Schedule with a description, drawing number(s) and, where available, item number(s).

B. Submit a sample finished sign fabricated using artwork supplied by the Commissioner. Artwork will be furnished in Adobe® Illustrator® electronic format.

C. .

D. Sample metal blank shall follow Detail "C" of CTA Drawing OP-8442, except as noted herein. The steel blank shall measure 12 inches x 18 inches as indicated in the drawing, however the 4 holes shall be 3/8 inch diameter rather than 5/16 inch diameter. Only 2 of the 4 holes in the finished sample shall have grommets designed for 1/4" diameter fasteners installed. Sample shall be produced in PMS 200 blue, white, and black.

E. Verify accurate receipt of each digital artwork received by returning a paper proof copy of each to Commissioner before any production runs are made.

F. Upon approval of paper proof, produce and submit a sample of the finished production sign for inspection with respect to size, color, and compliance to this specification; prior to full production of the signs.

PART 2 - PRODUCTS

2.01 MATERIAL

A. Mounting holes, unless otherwise specified, in the finished enameled signs shall be 5/16 inch plus or minus 1/64” diameter and fitted with 300 series stainless steel grommets to prevent cracking of the enamel during the mounting application.

B. Enameled holes shall be round and free of irregularities and defects that can affect the eyelet installation, cause crazing or chipping of the enamel during or after eyelet installation, or create irreparable misalignment of the eyelet centers within plus or minus 1/16” of the center to center distances dimensions specified on the drawing.

C. The base metal for signs shall be 16 gage porcelain enameling grade steel conforming to ASTM A 424. The Type shall be determined by the Contractor.

D. Finished signs that are less than 6 inches in length, when resting on the back surface shall be flat within a tolerance of plus or minus 1/32 inch measured diagonally. Finished signs shall be free of sharp edges, burrs, or any other defect that can prove hazardous to personnel or detrimental to the mounting process.

E. Signs shall have full color coverage with no defects on surfaces and edges such as discoloration, bubbles, pin holes, chipping or surface crazing.

F. Signs will be used outdoors and shall be expected to withstand weather conditions for the city of Chicago and surrounding suburbs, for a minimum of 10 years with minimal fading, cracking and surface crazing.

G. Colors indicated in the descriptions shall be equal to Pantone numbers (747XR Standard). Typical CTA color examples with cross references are as follows:

Color	Pantone #
Safety Red	200
Red	186

Orange	172
Yellow	012
Green	355
Olympic Blue	299
Accessible Blue	300 C
Historic Blue	282 C
Pace Bus Blue	Reflex Blue C
Purple	267
Brown	161
Neutral Gray	425 C
Pink Line Pink	204 C
Black	Process Black C White

H. Prior to the application of the porcelain enamel coating, the base metal shall be treated with a suitable metal treatment designed to produce maximum adherence of the porcelain enamel coating. Holes shall be punched or drilled and holes and edges to be dressed to remove burrs, sharp edges and irregularities prior to treatment.

I. The vitreous porcelain enamel sign coatings shall consist of one ground coat and one or more cover coats fired at a temperature from 1400 deg F to 1600 deg F. Unless otherwise specified the final coat shall be a glossy finish.

J. Following the firing of the background color, additional porcelain enamel colors are to be applied by the silk screen process, or other method approved by the CTA, to accomplish the desired graphic design.

K. Art work for requested signs shall be provided by the Commissioner in electronic format.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation, signs shall be inspected by the Commissioner. The purpose of this inspection is to verify quality of manufacture and conformance to requirements for the fabrication, color, artwork, etc. of each type of sign. Inspection will be conducted at the Contractor's premises, or at any other mutually agreeable location. The Contractor shall provide the Commissioner with a minimum of seven working days' notice prior to inspection.

B. Verify locations, sizes, installation, mounting conditions, type of anchorage required, and working conditions in the field.

C. A representative from the Commissioner may review the existing conditions with the installer prior to installation. The purpose of this inspection is to verify actual locations, method and quality of installation, dimensions, heights, space limitations, and other installation conditions for each sign. The scheduling of this inspection shall be mutually agreed upon by all parties.

D. Contractor to verify the existence of any utilities cables or other existing items or construction that may be in the way of the new signs and this installation. Relocate sign as approved to avoid relocation of utilities or interference with the sign as approved by the Commissioner.

E. After installation, a final inspection in the field will be conducted by the Commissioner. The purpose of this inspection is to verify quality of installation, correct location of signs, etc. The Contractor shall provide the Commissioner with a minimum of seven working days' notice prior to inspection.

3.02 INSTALLATION

A. General: Install signs according to Contract documents or to match existing locations, heights, and mounting details unless indicated or directed otherwise. Variations may be directed by or approved by the Commissioner's field representative during the pre-installation walk-thru or during the actual installation based on actual field conditions and interference. Use approved mounting methods, mounting accessories, and attachment devices. No glue installations are permitted.

B. Installation and anchorage shall be solid and secure. Provide and install indicated backer plates, frames, support, posts, and other mounting accessories. Provide and install any additional steel framing or other support or accessories required. Where indicated or required, modify existing frame to accept new sign assembly.

C. Install signs and mounting accessories level, plumb, and flush with substrates. Sign surfaces shall be free from distortion or other defects in appearance. Mounting heights shall be as shown on drawings, as required and consistent throughout project unless indicated otherwise or required to avoid interference and approval by the Commissioner.

D. Provide and install required attachment devices, brackets, pendants and hardware. Fasteners and other accessories shall be as specified for the application. Fasteners and accessories shall be stainless steel unless noted otherwise. Use expansion anchors, self- tapping screws, pop-rivets, bolts and nuts, etc. as required. Drill as required. Use countersunk screws where exposed or necessary. Exposed fasteners shall be tamper resistant. Weld where indicated with full, tack, or stitch welds. Glue installations of any kind are not permitted, including as a means to attach the sign to backer plate.

E. Installation of backer plate:

1. Directly to Substrate: Attach backer plate directly to wall, column, light pole, railing, windbreak, etc. by welding or using countersunk screws. Hole locations may be new, existing, or existing to be tapped. Use metal spacers behind the backer plate at each screw location where there are obstructions or minor projections at the surface where indicated on the drawings. Use countersunk expansion anchors when securing backer plate to masonry or concrete.
2. To Metal Frames, Horizontal Supports, Vertical Support Posts or railings: Attach backer plate to a frame made up of metal channels or tubes by welding or using countersunk screws. Attach backer plate to metal channel or tube

supports, posts, angles, straps, or hangers by welding or using countersunk screws.

F. Installation of Metal Frames or Supports:

1. Weld or bolt metal frames, supports, or support posts to beam, columns, light poles, railing, or windbreak as directed. Use expansion anchors for securing frames, supports, or hangers to masonry or concrete. Drill and grout or imbed supports in new concrete where indicated.

G. Installation of Plastic and Frame:

1. Unless indicated otherwise, secure plastic frame to built-up welded metal channel frame with stainless steel pop rivets. Provide holes in frame to accept plastic signframe. Where indicated, install plastic sign frame directly to steel fascia or steel ad frame. Install sign in plastic frame.

H. Installation of Signs:

1. Directly to Substrate: Determine that surface is clean and smooth. Secure signs to substrate using stainless steel pop-rivets. See Drawings for spacings.
2. To Surface: Surface mounted signs include installations on any flat surface which can be, but are not limited to, walls, canopy support and platform columns, sign frames, sign supports, and stair risers. Fastening hardware shall be 1/4-20 tamper-resistant machine screw (TORX T27 with Security Pin 1/4-20, T27) with 1/4-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet, as determined by the Commissioner.
3. To Metal Frame: Welded metal tube or channel frame with mitered corners shall be slightly larger than sign. Secure sign to frame with pop rivets using approved spacings.
4. To Backer Plate: Metal surface of backer plate shall be clean and smooth with countersunk screws properly installed. Backer plates shall be same exact size as sign. Secure sign to backer plate using stainless steel pop-rivets or tamper-resistant machine screws as indicated (drill/tap backer plate to accept screws) using approved spacings.
5. Pendant Bracket Mounted Sign: Pendant mountings are generally described as those which require two sign faces, back to back, attached to and supported by metal brackets (or similar metal supports), sandwiched between the two sign faces. Brackets shall be configured to provide proper mounting of sign. Fastening hardware and type of installation shall be equivalent to that which is existing.
6. Bracket-Mounted Units: Provide the manufacturer’s standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices to comply with manufacturer’s directions.
7. Panel Mounted Non-Illuminated signs: Panel mounted signs include installations on any flat or curved surface which can be, but are not limited to, acoustical panels, etc. Fastening hardware shall be 1/4-20 taper resistant machine screws (TORX T27 with Security Pin 1/4-20, T27) with 1/4-20 self-locking head nut (nylon insert) attached to panel. Glue installations are not permitted.

8. Trim signs as required to fit locations only with approval of Commissioner. Modify existing sign frames, backer plates, supports, etc. as required for new signs.

3.03 FIELD PAINTING

A. The pre-finished backer plates shall have their finish touched up as required where exposed to view after installation of the signs.

B. Galvanized metals cut or drilled in the field shall have its galvanized finish touched up in the field with approved galvanizing repair paint.

C. Dissimilar metals: To avoid galvanic action, separate dissimilar metals with approved paint.

D. Any mounting accessories such as angles, channels, plates, bent plates, clip angles, tubes, posts, etc. that will be exposed to view after installation of the sign, shall be field painted to match the backer plates. New wood posts and other members shall also be primed and finished to match the backer plates.

E. Care shall be taken to not get paint on the new signs or any other existing surface.

3.04 CLEANING AND PROTECTION

A. Signs shall be adequately protected during their delivery and installation to prevent damage by scratches, marring, stains, discoloration, or other causes. The sign faces shall be protected with a protective covering. The signs shall be crated. Damage to any surface during fabrication, handling, shipment, storage, and installation shall be remedied by the Contractor at Contractor's own expense. Replace any damaged signs that cannot be cleaned or repaired.

B. Before delivery to the site, each sign shall be tagged or labeled with the identifying number and installation location as shown in the specifications. Labeling shall be on both the sign and the protective covering.

C. At completion of the installation, remove the protective coating and clean soiled sign surfaces, and surfaces against which the new sign has been mounted, in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Commissioner.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of VITREOUS ENAMELED STEEL SIGNS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of VITREOUS ENAMELED STEEL SIGNS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 10 42 70

FIBERGLASS EMBEDDED SIGNS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This specification covers the requirements for furnishing and installing fiberglass embedded signs for the Chicago Transit Authority.

B. This specification is intended to be descriptive, not restrictive, and is solely for the purpose of indicating the type and quality of fiberglass embedded signs which would meet the approval of the Commissioner.

1.03 RELATED DOCUMENTS

A. Related Sections: The following sections contain requirements that relate to this section:

1. Metal Fabrications: Section 05 50 00.
2. Vitreous Enameled Steel Signs-AB: Section 10 42 50.

1.04 SUBMITTALS

A. Submit Sign Schedule with a description, drawing number(s) and, where available, item number(s).

B. Submit a sample sign fabricated using artwork supplied by the Commissioner. Artwork will be furnished in Adobe® Illustrator® electronic format.

C. Verify accurate receipt of each digital artwork received by returning a paper proof copy of each to Commissioner before any production runs are made.

D. Upon approval of paper proof, produce and submit a sample of the finished production sign for inspection with respect to size, color, and compliance to this specification; prior to full production of the signs.

PART 2 - PRODUCTS

2.01 MATERIAL

A. Sign shall be constructed using Fiberglass Reinforced Plastic (FRP) material that meets the requirements specified herein.

B. Signs shall be a solid one-piece panel with graphic elements inseparable from the fiberglass sign so it will not delaminate. Laminated products will not be accepted.

C. Signs shall be manufactured of non-yellowing, R-70 clear resin (or UV stabilized, acrylic- modified polyester resin) reinforced with high solubility, chopped strand fiberglass mat so that the index of refraction ensures total clarity of color, copy and graphics. Glass fibers should not be readily discernable on the sign face. In addition signs shall have a glass content no less than 28% of the total sign weight.

D. Signs shall be manufactured of a flame retardant resin, tested and comply with U.L. 94V-1. Contractor to supply certification of conformance plus certification of random flame test sampling during production runs. Mgr. Graphics & Design to specify sampling schedule.

E. Signs shall withstand an ambient temperature range of -65 deg F to 350 deg F.

F. Signs shall have the following values: Barcol hardness of 50 (minimum) with the following approximate values: tensile strength of 20,000 psi, compressive strength of 20,000 psi and flexural strength of 30,000 psi.

G. Minimum impact of strength shall be 15 ft lbf/in, notched.

H. Sign face shall be opaque or translucent with a semi-gloss or matte finish, as indicated, with a minimum embedment of graphic elements of 0.031 inches (1/32”). When exposed to elements, sign face shall not be subject to fiberbloom.

I. Sign face shall retain legibility and finished appearance when sprayed with a 10 percent solution of hydrochloric, nitric, or sulfuric acid for one-half hour or when scrubbed by a brush of medium hardness using common commercial cleaning compounds such as ammonia, laundry soaps, detergents, carbon tetrachloride, or petroleum base solvents.

J. The sign edges shall not be crazed or cracked, and the edge finish shall be smooth, clean and neat.

K. The finished signs, when resting on the back surface, shall be flat with no visible waviness or curled corners.

L. Manufacturer of sign shall provide an inconspicuous symbol permanently on the face sign of the sign for identification with future warranty considerations. The symbol shall be placed in the lower right hand corner and shall not exceed 1/2" x 1/2" in size.

M. The manufacturer shall also permanently mark the Commissioner's seven digit item number on the back of signs having CTA Item numbers, for field identification.

N. Signs will be used outdoors and shall be expected to withstand weather conditions for the Chicago region, for a minimum of 10 years with minimal fading, delaminating, cracking and surface crazing.

O. Art work for requested signs shall be provided by the Commissioner in electronic format.

2.02 QUALITY ASSURANCE

A. Contractor shall certify that signs meet or exceed the following test standards. If requested, the Contractor shall provide the results of these tests within 10 calendar days. Signs shall not be appreciably changed as a result of these tests.

1. MIL Spec P7788F surface endurance and scratch resistance, thermal shock, humidity and impact.
2. DSET Lab. Inc. Emmaqua accelerated weathering for a minimum exposure of one million Langleys without color fade.
3. Federal Test Method Standard 141, Method 6152; "Accelerated weathering".
4. United Stated Postal Service Acidity, cleaning compounds and fluids.

    a. Two signs shall be immersed in a 0.1 M HCL solution for 30 minutes.
    b. Two signs shall be immersed in a 0.1 M NH_3 solution for 30 minutes.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation, signs shall be inspected by the Commissioner. The purpose of this inspection is to verify quality of manufacture and conformance to requirements for the fabrication, color, artwork, etc. of each type of sign. Inspection will be conducted at the Contractor's premises, or at any other mutually agreeable location. The Contractor shall provide the Commissioner with a minimum of seven working days' notice prior to inspection.

B. Verify locations, sizes, installation and mounting conditions, type of anchorage required, and working conditions in the field.

C. A representative from the Commissioner may review the existing conditions with the installer prior to installation. The purpose of this inspection is to verify actual locations, method and quality of installation, dimensions, heights, space limitations, and other installation conditions for each sign. The scheduling of this inspection shall be mutually agreed upon by all parties.

D. Contractor to verify the existence of any utilities cables or other existing items or construction that may be in the way of the new signs and this installation. Relocate

sign as approved to avoid relocation of utilities or interference with the sign as approved by the Commissioner.

E. After installation, a final inspection in the field will be conducted by the Commissioner. The purpose of this inspection is to verify quality of installation, correct location of signs, etc. The Contractor shall provide the CTA with a minimum of seven working days' notice prior to inspection.

3.02 INSTALLATION

A. General: Install signs according to Contract documents or to match existing locations, heights, and mounting details unless indicated or directed otherwise. Variations may be directed by or approved by the Commissioner's field representative during the pre-installation walk-thru or during the actual installation based on actual field conditions and interference. Use approved mounting methods, mounting accessories, and attachment devices. No glue installations are permitted.

B. Installation and anchorage shall be solid and secure. Provide and install indicated backer plates, frames, support, posts, and other mounting accessories. Provide and install any additional steel framing or other support or accessories required. Where indicated or required, modify existing frame to accept new sign assembly.

C. Install signs and mounting accessories level, plumb, and flush with substrates. Sign surfaces shall be free from distortion or other defects in appearance. Mounting heights shall be as shown on drawings, as required and consistent throughout project unless indicated otherwise or required to avoid interference and approval by the Commissioner.

D. Provide and install required attachment devices, brackets, pendants and hardware. Fasteners and other accessories shall be as specified for the application. Fasteners and accessories shall be stainless steel unless noted otherwise. Use expansion anchors, self- tapping screws, pop-rivets, bolts and nuts, etc. as required. Drill as required. Use countersunk screws where exposed or necessary. Exposed fasteners shall be tamper resistant. Weld where indicated with full, tack, or stitch welds. Glue installations of any kind are not permitted, including as a means to attach the sign to backer plate.

E. Installation of backer plate:

1. Directly to Substrate: Attach backer plate directly to wall, column, light pole, railing, windbreak, etc. by welding or using countersunk screws. Hole locations may be new, existing, or existing to be tapped. Use metal spacers behind the backer pate at each screw location where there are obstructions or minor projections at the surface where indicated on the drawings. Use countersunk expansion anchors when securing backer plate to masonry or concrete.
2. To Metal Frames, Horizontal Supports, Vertical Support Posts or railings: Attach backer plate to a frame made up of metal channels or tubes by welding or using countersunk screws. Attach backer plate to metal channel or tube supports, posts, angles, straps, or hangers by welding or using countersunk screws.

F. Installation of Metal Frames or Supports:

1. Weld or bolt metal frames, supports, or support posts to beam, columns, light poles, railing, or windbreak as directed. Use expansion anchors for securing frames, supports, or hangers to masonry or concrete. Drill and grout or imbed supports in new concrete where indicated.

G. Installation of Signs:

1. Directly to Substrate: Determine that surface is clean and smooth. Secure signs to substrate using stainless steel pop-rivets. See Drawings for spacings.
2. To Surface: Surface mounted signs include installations on any flat surface which can be, but are not limited to, walls, canopy support and platform columns, sign frames, sign supports, and stair risers. Fastening hardware shall be 1/4-20 tamper-resistant machine screw or TORX T27 (with security pin) 1/4-20, T27 with locking hex head nut with 1/4-20 self-locking hex head nut (nylon insert) or stainless steel rivet, as determined by the Commissioner.
3. To Metal Frame: Welded metal tube or channel frame with mitered corners shall be slightly larger than sign. Secure sign to frame with pop rivets using approved spacings.
4. To Backer Plate: Metal surface of backer plate shall be clean and smooth with countersunk screws properly installed. Backer plates shall be same exact size as sign. Secure sign to backer plate using stainless steel pop-rivets or tamper-resistant machine screws as indicated (drill/tap backer plate to accept screws) using approved spacings.
5. Pendant Bracket Mounted Sign: Pendant mountings are generally described as those which require two sign faces, back to back, attached to and supported by metal brackets (or similar metal supports), sandwiched between the two sign faces. Brackets shall be configured to provide proper mounting of sign. Fastening hardware and type of installation shall be equivalent to that which is existing.
6. Bracket-Mounted Units: Provide the manufacturer’s standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices to comply with manufacturer’s directions.
7. Panel Mounted Non-Illuminated signs: Panel mounted signs include installations on any flat or curved surface which can be, but are not limited to, acoustical panels, etc. Fastening hardware shall be 1/4-20 taper resistant machine screws (TORX T27 with security pin) with 1/4-20 self-locking head nut (nylon insert) attached to panel. Glue installations are not permitted.

3.03 FIELD PAINTING

A. The pre-finished backer plates shall have their finish touched up as required where exposed to view after installation of the signs.

B. Galvanized metals cut or drilled in the field shall have its galvanized finish touched up in the field with approved galvanizing repair paint.

C. Dissimilar metals: To avoid galvanic action, separate dissimilar metals with approved paint.

D. Any mounting accessories such as angles, channels, plates, bent plates, clip angles, tubes, posts, etc. that will be exposed to view after installation of the sign, shall be field painted to match the backer plates. New wood posts and other members shall also be primed and finished to match the backer plates.

E. Care shall be taken to not get paint on the new signs or any other existing surface.

3.04 CLEANING AND PROTECTION

A. Signs shall be adequately protected during their delivery and installation to prevent damage by scratches, marring, stains, discoloration, or other causes. The sign faces shall be protected with a protective covering. The signs shall be crated. Damage to any surface during fabrication, handling, shipment, storage, and installation shall be remedied and paid for by the by the Contractor. Replace any damaged signs that cannot be cleaned or repaired.

B. Before delivery to the site, each sign shall be tagged or labeled with the identifying number and installation location as shown in the specifications. Labeling shall be on both the sign and the protective covering.

C. At completion of the installation, remove the protective coating and clean soiled sign surfaces, and surfaces against which the new sign has been mounted, in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Commissioner.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of FIBERGLASS EMBEDDED SIGNS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of FIBERGLASS EMBEDDED SIGNS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 10 42 80

ALUMINUM SIGNS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This specification covers the requirements for furnishing and installing aluminum signs for the Chicago Transit Authority. The type, design, size, graphics, locations and other details of the signs and their installation as shown on the drawings.

1. The pre-fabricated aluminum signs shall consist of aluminum substrates with mounting holes and pre-printed retroreflective vinyl sign faces applied to one or both sides.

B. This specification is intended to be descriptive, not restrictive, and is solely for the purpose of indicating the type and quality of fiberglass embedded signs which would meet the approval of the Authority.

C. Related Sections: The following sections contain requirements that relate to this section:

1. Division 05 Section, "Metal Fabrications".

1.03 REFERENCES

A. The Work is subject to applicable portions of the following standards:

1. ANSI H35.2 - Dimensional Tolerances for Aluminum Mill Products.
2. ASTM B 209 - Standard Specification for Aluminum & Aluminum-Alloy Sheet & Plate.
3. ASTM B 580 - Anodic Oxide Coatings on Aluminum.
4. ASTM D 1730 - Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting.
5. ASTM D 4956 - Specification for Retroreflective Sheeting for Traffic Control.
6. ASTM E 810 - Test Method for Coefficient of Retroreflection of Retroreflective Sheeting.
7. Illinois Department of Transportation (IDOT) Standard Specification for Traffic Control Items:

a. Type B Specification.

8. American Association of State Highway and Transportation:

   a. AASHTO Specification M268.

1.04 SUBMITTALS

A. Contractor is required to provide the following for the Authority's review and approval according to Division One Section, 01 30 00, Submittals.

B. Product Data: Provide product data, specifications, manufacturer's installation instructions, and manufacturer's maintenance recommendations for all products and materials used in the fabrication and installation of the signs of this section.

C. Test Data: Provide certified test data indicating that the materials provided meets the requirements of this specification section and the reference standards listed.

D. Samples: Provide samples of all types of signs, installation materials and other materials provided.

   1. Contractor is required to submit a full scale black-and-white paper print-out sample of the proposed signs, along with a 4" x 4" sample of the retroreflective vinyl film, with protective liner, and a 4" x 4" sample of the aluminum sheet that will be used to fabricate the signs. The sample print-out(s) shall be printed using the artwork provided by the Authority. Artwork will be furnished in Adobe® Illustrator® electronic format (EPS files, or an enhanced PDF file).

   2. The samples will be forwarded to the Authority's Manager of Signage and Wayfinding Department for review and approval before signs are fabricated and installed.

   3. Failure of Contractor to submit the samples and obtain approval before production shall be sufficient cause for rejection of delivered signs.

   4. The samples will be kept by the Authority to compare with the production signs and will not be available for installation at the project site.

E. Production Quality: Contractor shall submit evidence to the satisfaction of the Authority that representative production material of the type to be used has been used successfully in a substantial traffic signage program in similar climatic conditions for at least seven (7) years.

F. Fabrication Quality: Fabricator shall submit representation indicating his successful experience in producing signs of similar type, quality and quantity for a period of at least seven (7) years.

G. Provide shop drawings for backer plates and frames; including method of attachment to substrate and spacing of fasteners.

H. Provide product data and specifications for the fasteners and related hardware to

be used for each type of sign, backer plate, sign frame, bracket and for each application and/or substrate to be fastened to.

I. Product data and specifications shall indicate the type of fastener, size of fastener, length of fastener, fastener material, zinc coating (if applicable), finish and number of fasteners provided for each application.

1.05 QUALITY ASSURANCE

A. Structural: Design structural support framing, posts and other means of support and attachment components under direct supervision of a Professional Structural Engineer experienced in the design of this work and licensed in Illinois and as required by the Authority.

B. Full-Size Mock-up Testing: Have a specimen representative of project conditions tested by an independent testing agency for compliance with specified criteria and as required by the Authority.

C. Manufacturer Qualifications: Company specializing in manufacturing aluminum signs of the type and quantity required for this project for a period of at least seven (7) years.

D. Installer Qualifications: Company experienced in installing aluminum signs of the type and quantity required for this project for a period of at least three years and approved by the manufacturer of the signs.

1.06 DELIVERY, STORAGE AND PROTECTION

A. Delivery: Signs, posts and accessories shall be delivered to the project site in sufficient time for their scheduled installation.

B. Storage: Store signs, posts and accessories on site protected from the weather and damage.

C. Protection: Signs shall be protected with covering to avoid scratches and other damage during handling, delivery, storage and installation.

1.07 WARRANTY

A. Installation of signs shall be warrantied for a period of one (1) year after substantial completion. Signs shall be warrantied from dislodging, misalignment or other malfunction.

B. Signs and sign installations that fail within the warranty periods shall be replaced or repaired in entirety at no cost to the Authority and to the satisfaction of the Authority.

PART 2 - PRODUCTS

2.01 SIGN MATERIALS

A. Signs required shall be listed in the Contract Document with a description, drawing number(s) and, where available, item number(s).

B. All mounting holes, unless other specified, shall be 3/8 inch diameter and fitted with a 5/16 inch inside diameter stainless steel (or other approved material) grommet to prevent damage to the sign during the mounting application.

C. The aluminum signs and materials to be furnished under this specification include the following.

1. Pre-fabricated Signs - Aluminum substrates with mounting holes and pre-printed either on coated white paint base or retroreflective vinyl (e.g. D.O.T. STOP sign, No Parking sign, Do Not Enter sign.)

2. Custom Signs – Aluminum substrate with mounting holes and pre-printed either on coated white paint base or retroreflective vinyl and either an electro-cut vinyl applique or a permanent printed vinyl applied to the surface.

3. Rolls of transparent protective overlay film.

4. Framing members, posts, accessories, fasteners, etc. required for the sign fabrication and installation of the signs.

D. Finished Signs: The finished signs furnished shall be constructed using the following materials:

1. One (1) blank aluminum substrate with required holes.

2. One (1) or Two (2) pre-printed engineering grade retroreflective vinyl sheeting sign faces, one each per side

E. Sign Blank Substrates: The sign blank substrates shall be fabricated from 0.080" thick aluminum sheet, cut and drilled (or punched) to the dimensions as required for installation, and shall meet the following requirements:

1. The blank aluminum substrates shall be fabricated from either 6061-T6 or 052- H38 aluminum alloy sheet that complies with ASTM B 209

2. The aluminum sheet used in the fabrication of the blank substrates shall be within the permissible variations for thickness, squareness and flatness as specified in ANSI H35.2.

F. Finished blank substrates shall be flat, and free of distortion, sharp edges, burrs,

or any other defects.

G. The blank aluminum substrates shall receive a chemical conversion coating that meets the requirements of anyone of the following standards:

1. ASTM B 580, Type C Architectural Class II, natural color (clear or medium grey).

2. ASTM D 1730, Type and Method shall be at Supplier's discretion.

H. The chemical conversion process selected by the Contractor shall leave a surface coating that is fully compatible with the pressure sensitive adhesive used on the back of the retroreflective sheeting.

2.02 MANUFACTURERS

A. Manufacturers that produce aluminum signs that may conform to the requirements of this specification section include, but are not limited to the following:

1. Bowman Displays Digital Imaging, Inc.
2. Approved Equal.

2.03 RETROREFLECTIVE VINYL SIGN FACE

A. The retroreflective vinyl sign faces used in fabrication of the signs shall be cut from flexible white, engineering grade retroreflective sheeting equal in performance to 3M Scotchlite® part no. 3290 (white) which has the following salient characteristics. Alternate acceptable materials are 3M Scotchcal® 6800-010 (white), Oracal™ 5600-010 (white), FDC™ 2402-02 (white) and Avery™ A7801-R (white). Prismatic™, High Intensity™ and Diamond Grade™ reflective sheeting is not acceptable.

B. The retroreflective sheeting shall be a typically enclosed lens glass-bead sheeting having a smooth flat outer surface. The sheeting shall be a durable retroreflective sheeting designed for the production of traffic control devices. The sheeting shall have a precoated pressure sensitive adhesive backing, in compliance with ASTM D 4956, Class 1, protected by an easily removable liner.

C. The retroreflective vinyl sheeting used in the fabrication of the signs shall meet all the performance requirements specified in ASTM D 4956, for Type I sheeting, or IDOT Standard for Traffic Control Items, Type B specification.

D. Photometric: The sheeting shall meet the minimum coefficients of retroreflection values in ASTM D 4956, Table 4 for Type I sheeting. The values are expressed in candelas per foot candle per square foot (candelas per lux square meter) as measured in accordance with ASTM E 810. The sheeting shall maintain at least 90% of the values shown in Tables 4 with water falling on the surface similar to a rainfall, when measured in accordance with the standard rainfall test of AASHTO M 268.

E. In addition to meeting the ASTM and IDOT requirements specified, the face of the retroreflective sheeting shall have a glossy finish without clearcoat. The material shall not stretch upon removal of the adhesive backing.

F. The sheeting used in sign fabrication, will be considered for qualification only when the material meets the requirements of this specification; and the Contractor provides certified sheeting manufacturer's test data showing that representative production material to be used for sign face fabrication meets the requirements of this specification.

G. The finished signs shall be furnished with the retroreflective vinyl film pre-printed with the artwork.

2.04 COLORED PROCESS INK AND VINYLS

A. The color of the ink to be used in the sign face printing process shall vary based on the application of the sign. If electrocut vinyl is required, use Pantone™ Matching System color swatches for conversion to 3M, Avery or Oracle part numbers to satisfy the colors needed.

B. The inks used in the printing process shall be transparent and shall not reduce the coefficients of retroreflection of the vinyl film more than 70% of the values in ASTM D 4956, Table 4.

C. The inks used in the printing process shall be waterproof and resistant to fading. The inks shall be those recommended by the manufacturer of the retroreflective sheeting for the printing process employed.

D. Colors indicated in the descriptions shall be equal to Pantone numbers (747XR Standard). Typical CTA color examples with cross references are as follows:

Color	Pantone #
Safety Red	200
Red	186
Orange	172
Yellow	012
Green	355
Olympic Blue	299
Accessible Blue	300 C
Historic Blue	282 C
Pace Bus Blue	Reflex Blue C
Purple	267
Brown	161
Neutral Gray	425 C
Pink Line Pink	204 C
Black	Process Black C
White	

2.05 SIGN FABRICATION

A. Signs required shall be listed in the Sign Schedule and shown on the Contract Documents with a description, drawing number(s), item number(s), method of installation and location.

B. All mounting holes, unless otherwise specified, in the finished enameled signs shall be 5/16 inch plus or minus 1/64" diameter.

C. Finished signs shall be flat within a tolerance of plus or minus 1/32 inch measured diagonally. Finished signs shall be free of sharp edges, burrs, or any other defect that can prove hazardous to personnel or detrimental to the mounting process.

D. All signs shall have full color coverage with no defects on all surfaces and edges such as discoloration, bubbles, pin holes, chipping or surface crazing.

E. The fabricated signs shall be free of air bubbles, wrinkles, or any other defects that can affect the performance and appearance of the sign or the application of the printed overlay.

F. The fabricated signs shall be trimmed flush around the perimeter edges and holes. Finished holes shall be completely clear of any vinyl film and must accept 5/16" threaded screws after trimming.

G. Trimmed vinyl shall be free of ragged and loose edges, or separation from the aluminum substrate.

H. All signs shall have full color coverage with no defects on all surfaces and edges such as discoloration, bubbles, pin holes, chipping or surface crazing.

I. All signs will be used outdoors and shall be expected to withstand all weather conditions for the city of Chicago and surrounding suburbs, for minimum of ten (10) years with minimal fading, cracking and surface crazing.

2.06 ARTWORK

A. The artwork to be used in the custom printing process of the finished signs will be furnished by the Authority. No other artwork will be acceptable. If using D.O.T. signs, use the Manual on Uniform Traffic Control Devices for Streets and Highways, latest edition, to follow proper guidelines for standard parking enforcement and roadway signage.

B. The printed detail on all sign faces shall be sharp, clear and easily readable, and the colors shall be uniform.

C. The Contractor will receive from the Authority the art work required to make the sample sign(s) and then, upon approval of the sample(s), all the signs required for this contract. The artwork will be furnished in Adobe® Illustrator® electronic EPS file format.

D. The Contractor shall verify accurate receipt of each digital artwork received by returning a paper proof copy of each, to the Signage & Wayfinding department c/o Manager of Signage & Wayfinding, located at 567 W. Lake Street, Chicago IL. 60661, before any production runs are made. The paper proof does not have to be in color.

E. Upon approval of paper proof, the Contractor shall produce and submit to the Authority's Signage & Wayfinding Department the sample of each finished production sign for inspection with respect to size, color, and compliance to this specification.

F. All Pre-Production samples delivered to the Authority, shall be signed for by an Authority employee. Signature shall include delivery time and date.

G. When samples are not delivered directly to a member of the Signage & Wayfinding Department, the Contractor must notify the Signage & Wayfinding Department, that the delivery was made. The following information shall be provided at the time of notification:

1. The location of delivery.
2. The party that signed for the delivery.
3. The date and time of delivery.

H. It shall be the Contractor's responsibility to obtain a signed receipt for delivery of samples. The Authority will not be responsible for delays in sample approval if the Contractor fails to comply with the requirements specified in this section.

I. When samples are mailed directly to the Signage & Wayfinding department by posted mail, the Contractor shall notify the Signage & Wayfinding Department the same day that the samples were sent. It shall be the Contractor's responsibility to contact the Signage & Wayfinding Department within three (3) days of mailing, to confirm the samples were received.

J. Upon approval of sample sign(s), the Contractor will receive individual artwork to be used to fabricate signs being produced for this project. The artwork will be furnished in Adobe® Illustrator® electronic format.

K. Contractor shall verify accurate receipt of each digital artwork received by returning a paper proof copy of each to Manager, Signage and Wayfinding, located at 567 W. Lake St., Chicago, IL 60661, Telephone 312-681-3660, before any production runs are made.

2.07 TRANSPARENT PROTECTIVE OVERLAY FILM

A. The protective overlay film furnished shall be a clear, colorless film, which can be used in lieu of clear coating. It shall be durable, solvent resistant and coated with a transparent, pressure sensitive adhesive protected by a removable liner.

B. The transparent protective overlay film shall be designed for UV blocking and to provide a barrier to staining by graffiti and other markings when applied directly to

3M Series 225, transparent printable overlay sheeting having thermally inked graphics applied using the Gerber MAXX2 thermal printing process.

C. Color: When the protective overlay film is applied in accordance with the manufacturer's recommendation over the printable sheeting and thermal ink graphic, the color of the graphic shall conform to the original color requirements of the screen processed color.

D. Photometrics: A composite produced by applying protective overlay film onto the transparent printable sheeting and the reflective sheeting shall conform to the original coefficient throughout the effective life of the reflective sheeting.

E. Field Performance: The expected performance life of the sign face constructed of overlay film, printable overlay, and reflective sheeting shall be equivalent to the expected field performance life of the retroreflective material used.

F. Storage: The overlay film, when stored according to the manufacturer's recommendations, shall be suitable for use for a period of up to one year.

2.08 BACKER PLATES

A. Backer plates to be of steel, same exact size of sign, thickness as shown on the drawings or as required to firmly support the sign, provide attachment to the substrate and as approved by the Authority. Backer plate shall be hot dip galvanized after fabrication including any drilling or cutting. Backer plates should not have sharp edges or corners. Backer plate design subject to the review and approval of CTA signage and Wayfinding Department.

2.09 FASTENERS

A. Provide and install all required attachment devices, washers, bolts and other hardware required for each application. Fasteners and other accessories shall be as specified or as directed for the application, type of sign, location and substrate.

B. All fasteners, washers, bolts and accessories shall be stainless steel unless noted otherwise.

1. Approved fasteners, washers, bolts, accessories, plates, frames, brackets and other metal that is not stainless steel must be hot dip galvanized.

2. Use expansion anchors, self-tapping screws, pop-rivets, drive rivets, bolts and nuts, etc. as required. Use countersunk screws where exposed or necessary. Exposed fasteners shall be tamper resistant.

2.10 ENVIRONMETNAL CONDITIONS

A. Signs shall be suitable for unsheltered indoor and outdoor use within a temperature range of -30 deg F to 120 deg F.

B. All signs will be used outdoors and shall be expected to withstand all weather

conditions of the Chicago region with no or minimal fading, cracking, surface crazing, streaking, chalking, peeling, pitting, or delaminating.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation, all signs shall be inspected by the Authority. All signs must meet the quality parameters of the approved sample. The purpose of this inspection is to verify quality of manufacture and conformance to requirements for the fabrication, color, artwork, etc. of each type of sign. Inspection will be conducted at the Contractor's premises, the project site, or at any other mutually agreeable location. The Contractor shall provide the Authority with a minimum of seven working days' notice prior to inspection.

B. Installer of signs shall verify all locations, sizes, installation and mounting conditions, type of anchorage required and working conditions in the field.

C. A representative from the Authority may review the existing conditions with the installer prior to installation. The purpose of this inspection is to verify actual locations, method and quality of installation, dimensions, heights, space limitations, and other installation conditions for each sign. The scheduling of this inspection shall be mutually agreed upon by all parties.

D. Contractor to verify the existence of any utilities cables or other existing items or construction that may be in the way of the new signs and this installation. Relocate the sign as approved to avoid relocation of utilities or interference with the sign as approved by the Authority.

E. After installation, a final inspection in the field will be conducted by the Authority. The purpose of this inspection is to verify quality of installation, correct location of signs, etc. The Contractor shall provide the Authority with a minimum of seven working days' notice prior to inspection.

3.02 REMOVAL OF EXISTING SIGNS

A. Removal of existing signs:

1. If applicable, or as otherwise directed, the Contractor shall remove all existing signs of the type that is being replaced or that are nonconforming. All existing signs shall be turned over to the Authority and delivered to a specific location as directed. Also remove all existing accessories not needed for the new signs. Remove all existing signs and accessories with care so as not to damage the signs or existing surfaces.

2. Existing signs to be removed may be pop riveted, bolted, or welded to its substrate. Unless noted to be re-used, existing backer plates, framing, straps, anchors, support posts, etc. used with the existing signs shall be removed. Other items may have to be removed, relocated, or altered to allow for the installation of the new signs.

B. Clean surfaces where existing signs have been removed and clean surfaces that

are to receive new signs. Remove any projections or obstructions. Do not reuse existing anchorage devices and other accessories.

C. For any surface where existing signs and their accessories have been removed and the new signs will not cover, touch up the finish and/or paint to match the existing adjacent surfaces.

D. Contractor shall identify any existing historic landmark or monument type signs. These signs shall not be removed unless approved otherwise in writing by the Authority.

3.03 INSTALLATION

A. General: Install signs according to Contract documents or to match existing locations, heights, and mounting details unless indicated or directed otherwise. Variations may be directed by or approved by the Authority's field representative during the pre-installation walk-thru or during the actual installation based on actual field conditions and interference. Use approved mounting methods, mounting accessories, and attachment devices. No glue installations are permitted.

B. Installation and anchorage shall be solid and secure. Provide and install all indicated or required backer plates, frames, support, posts, and other mounting accessories. Provide and install any additional steel framing or other support or accessories required. Where indicated or required, modify existing frame or other support to accept new sign assembly.

1. Sign fastener installation shall be capable of withstanding wind, vibration, abuse and vandalism and as approved by the Authority.

C. Install signs and all mounting accessories level, plumb, and flush with substrates. Sign surfaces shall be free from distortion or other defects in appearance. Mounting heights shall be as shown on drawings, as required and consistent throughout project unless indicated otherwise or required to avoid interference and approval by the Authority.

D. Provide and install all required attachment devices, brackets, pendants and hardware. Fasteners and other accessories shall be as specified for the application. All fasteners and accessories shall be stainless steel unless noted otherwise. Use expansion anchors, self-tapping screws, pop-rivets, bolts and nuts, etc. as shown or required. Drill as required. Use countersunk screws where exposed or necessary. Exposed fasteners shall be tamper resistant. Weld where indicated with full, tack, or stitch welds. Glue installations of any kind are not permitted, including as a means to attach the sign to a backer plate.

E. Installation of backer plate:

1. Directly to Substrate: Attach backer plate directly to wall, column, light pole, railing, windbreak, etc. by welding or using countersunk screws. Hole locations may be new, existing, or existing to be tapped. Use metal spacers behind the backer pate at each screw location where there are obstructions or minor projections at the surface where indicated on the drawings. Use countersunk expansion anchors when securing backer plate to masonry or

concrete.

2. To Metal Frames, Horizontal Supports, Vertical Support Posts or railings: Attach backer plate to a frame made up of metal channels or tubes by welding or using countersunk screws. Attach backer plate to metal channel or tube supports, posts, angles, straps, or hangers by welding or using countersunk screws.

F. Installation of Metal Frames or Supports:

1. Weld or bolt metal frames, supports, or support posts to beam, columns, light poles, railing, or windbreak as directed. Use expansion anchors for securing frames, supports, or hangers to masonry or concrete. Drill and grout or imbed supports in new concrete where indicated.

G. Installation of Hangers:

1. Install Flexible hangers where indicated, securing the pivot assembly to the canopy structure and to the sign frame or backer plate as directed.

H. Installation of Signs:

1. Directly to Substrate: Determine that surface is clean and smooth. Secure signs to substrate using stainless steel pop-rivets or drive-rivets (such as at solid walls, masonry, etc.). Spacings as shown on the drawings or as directed by the Authority.

2. To Surface: Surface mounted signs include installations on any flat surface which can be, but are not limited to, walls, canopy support and platform columns, sign frames, sign supports, and stair risers. Fastening hardware shall be 1/4-20 tamper-resistant machine screw or TORX T27 with Security Pin or 1/4-20 Drive Rivets with 1/4-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet, as determined by the Authority.

3. To Metal Frame: Welded metal tube, channel or angle frame with mitered corners same size or slightly larger than sign. Secure sign to frame with pop rivets using approved spacings.

4. To Backer Plate: Metal surface of backer plate shall be clean and smooth with all countersunk screws properly installed. Backer plates shall be same exact size as sign. Secure sign to backer plate using stainless steel pop-rivets or tamper- resistant machine screws as indicated (drill/tap backer plate to accept screws) using approved spacings.

5. Pendant Bracket Mounted Sign: Pendant mountings are generally described as those which require two sign faces, back to back, attached to and supported by metal brackets (or similar metal supports), sandwiched between the two sign faces. Brackets shall be configured to provide proper mounting of sign. Fastening hardware and type of installation shall be equivalent to that which is existing.

6. Bracket-Mounted Units: Provide the manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices to comply with manufacturer's directions.

7. Panel Mounted Non-Illuminated signs: Panel mounted signs include installations on any flat or curved surface which can be, but are not limited to, acoustical panels, etc. Fastening hardware shall be 1/4-20 tamper resistant machine screws or TORX T27 with Security Pin or 1/4-20 Drive Rivets with 1/4-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet as determined by the Authority, attached to panel. Glue installations are not permitted.

8. Wall mounted Non-Illuminated signs: Wall mounted signs include installations on any flat surface which can be, but are not limited to, canopy support and platform columns, sign frames, and stair risers. Fastening hardware shall be ¼-20 tamper- resistant machine screw or TORX T27 with security pin or ¼-20 Drive Rivets with ¼-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet, as determined by the Authority.

9. Trim signs as required to fit locations only with approval of Authority. Modify existing sign frames, backer plates, supports, etc. as required for new signs.

10. Track Level ROW signs: Will be mounted to nonconductive posts and secured with a bolt and ¼"-20(NY Lock) nylon insert self-locking steel hex nut as depicted in the Contract Plans. Product data nonconductive will be forwarded to the Authority for review and approval before the posts are fabricated and installed.

11. Track Access Gate signs: Will be mechanically fastened to mounting clips as depicted in the Contract Plans. The mounting clips will be either mechanically fastened or welded to the stainless steel mesh infill of the access gate.

3.04 FIELD PAINTING

A. The pre-finished backer plates, framing members or support members shall have their finish touched up as required where exposed to view after installation of the signs.

B. Galvanized metals cut or drilled in the field shall have its galvanized finish touched up in the field with approved galvanizing repair paint.

C. Dissimilar metals: To avoid galvanic action, separate dissimilar metals with approved paint.

D. Any mounting accessories such as angles, channels, plates, bent plates, clip angles, tubes, posts, etc. that will be exposed to view after installation of the sign, shall be field painted to match the backer plates. New wood posts and other

members shall also be primed and finished to match the backer plates.

E. Care shall be taken to not get paint on the new signs or any other existing surface.

3.05 QUALITY CONTROL

A. All artwork of signs to be sharply and consistently detailed; with sharp and clear images and lettering; easily readable and all colors shall be uniform.

B. The aluminum signs shall be free of air bubbles, wrinkles, delamination or any other defects that affect the performance and appearance of the sign or the application of the printed overlay.

C. The aluminum signs shall be trimmed flush around the perimeter edges and holes. Finished holes shall be completely clear of any vinyl film and must accept 5/16" threaded screws after trimming.

D. Trimmed vinyl shall be free of ragged and loose edges, or separation from the aluminum substrate.

E. Aluminum sheet to be of consistent thickness, to be flat, with square corners and free of distortion. Aluminum sign and backer plate, if applicable, shall be free of any sharp or rough edges, burrs or other defects.

F. Installation of sign assembly shall be tight and secure. Sign shall be hung at required height, straight and even.

G. Replace defective signs if directed by the Authority. Re-install signs that are crooked, uneven or loose.

3.06 TESTING

A. The retroreflective sheeting furnished shall meet the test requirements specified ASTM D 4956 for the following:

1. Coefficient of Retroreflection.
2. Specular Gloss.
3. Daytime Color.
4. Shrinkage.
5. Flexibility.
6. Adhesive.
7. Impact Resistance.
8. Resistance to Accelerated Weathering.

B. In addition to the testing required by ASTM D 4956, the sheeting shall meet the following test requirements.

1. Coefficient of Retroreflection During Rainfall: The coefficient of retroreflection of the sheeting, when totally wet, shall not be less than 90% of the dry values specified in Tables 4 in ASTM D 4956. Wet performance measurements shall be made on new sheeting.

2. The coefficient of retroreflection under simulated rainfall conditions (wet performance) shall be determined using ASTM E 810, with the attune of the water nozzle setup shown in Illustration 5 in Section 12 of this specification.

3. Standard Rainfall Water Test per AASHTO M 268, Section 7.10.0.
   a. Place the test panels on which the sheeting has been applied in an upright position 6" below and 4" in front of the water nozzle.

   b. Apply sufficient water pressure so that the upper surface of the spray envelope strikes the top of the specimen. With water falling on the specimen, determine the coefficient of retroreflection at angles of 0.2 degrees observation and -4 degrees entrance only. Where more than one panel of a color is measured, the coefficient of retroreflection during the rainfall shall be the average of all the determinations.

3.07 CLEANING AND PROTECTION

A. Signs shall be adequately protected during their delivery and installation to prevent damage by scratches, marring, stains, discoloration, or other causes. The sign faces shall be protected with a protective covering. The signs shall be crated. Damage to any surface during fabrication, handling, shipment, storage, and installation shall be remedied by the Contractor at Contractor's own expense. Replace any damaged signs that cannot be cleaned or repaired.

B. Before delivery to the site, each sign shall be tagged or labeled with the identifying number and installation location as shown in the specifications. Labeling shall be on both the sign and the protective covering.

C. At completion of the installation, remove the protective coating and clean soiled sign surfaces, and surfaces against which the new sign has been mounted, in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Authority.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work for ALUMINUM SIGNS shall not be measured for payment.

4.03 PAYMENT

A. No separate payment shall be made for work covered in this section. Payment for the Work of ALUMINUM SIGNS shall be included in the contract lump sum price as shown in the Schedule for Prices for TRACKWORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Trackwork: 340000.

END OF SECTION

SECTION 10 42 90

BRAILLE TACTILE SIGNS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This specification covers the requirements for furnishing and installing tactile and Braille signs for the Chicago Transit Authority.

B. This specification is intended to be descriptive, not restrictive, and is solely for the purpose of indicating the type and quality of tactile and Braille signs which would meet the approval of the Commissioner.

C. Provide new combination tactile and Braille message signs as required. Unless otherwise indicated, signs will display identical tactile and Braille messages. Refer to the sign schedule in the Contract drawings for a list of signs to be provided for this project.

1.03 RELATED REQUIREMENTS:

A. Related Sections: The following sections contain requirements that relate to this section:

1. Metal Fabrications: Section 05 50 00.
2. Vitreous Enameled Steel Signs-AB: Section 10 42 50.
3. Fiberglass Embedded Signs-AB: Section 10 42 70.

1.04 REQUIREMENTS

A. Tactile and Braille characters shall conform to a nominal finished character height of 0.031”.

B. Braille characters shall be Grade 2 as determined by National Library Service (NLS), Library of Congress specification #800. The finished characters shall be legible by a Library of Congress certified Grade 2 Braille reader.

1.05 SUBMITTALS

A. Submit a sample finished sign fabricated using artwork supplied by the Commissioner. Artwork will be furnished in Adobe® Illustrator® electronic format.

B. Upon approval of sample sign, Contractor will receive individual artwork to be used to fabricate signs being produced for this project. The artwork will be furnished in Adobe® Illustrator® electronic format.

C. Verify accurate receipt of each digital artwork received by returning a paper proof copy of each to Commissioner before any production runs are made.

D. Return 2 full-size, dated Braille-Embossed paper (hardcopy) proof using Grade 2 Translation of each new or revised sign artwork requested by the Commissioner.

E. Submit Braille translations within proofs should such translation be lacking in the preliminary artwork supplied by the Commissioner. CTA sign design numbers do not require Braille translation.

F. Upon acceptance, the Commissioner will return one paper proof bearing a dated, authorized signature to indicate approval for production.

G. Upon approval of paper proof, produce and submit a sample of the finished production sign for inspection with respect to size, color, and compliance to this specification; prior to full production of the signs.

H. Signs required shall be listed in the Sign Schedule and the Contract Documents with a description, drawing number(s) and, where available, item number(s).

1.06 QUALITY ASSURANCE

A. Accessibility Standard: For signs indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", Illinois Accessibility Code, and ICC A117.1.

PART 2 - PRODUCTS

2.01 MATERIAL

A. The base sign shall be constructed of a single, homogenous piece of zinc alloy. By weight, the alloy zinc content shall be 98 percent or greater. To dissuade theft, materials with high salvage value shall not be utilized in the alloy composition.

B. The sign shall display a surface hardness within the range 85 – 105 Rockwell hardness, H scale (HRH) as determined by ASTM E 18.

C. Signs shall be composed, sized, formatted and styled as specified in the contract release. The Commissioner shall provide sign artwork in an electronic format consistent with Adobe Illustrator software. Unless otherwise requested, the latest version of the artwork shall be used.

D. Unless otherwise requested, the sign shall have a nominal thickness of 0.13".

E. Signs shall be free of sharp edges and protuberances potentially injurious to bare human flesh. remove flashing, burrs, and pointed corners.

F. Unless otherwise requested, the tactile letter font shall be Helvetica Medium.

G. Characters shall be well defined. Braille characters shall be distinct mounds that yield smooth feel. Tactile characters shall feature dulled edges. Sharp-edged cylinders shall not be used for Braille characters nor round-edge relief for tactile.

H. Unless otherwise specified, the top surfaces of tactile and border relief shall be coated with white catalyzed polyurethane. The background, edges and mounting hole circumferences shall be located with dark gray catalyzed polyurethane, compliant with Pantone Matching System (PMS) color swatch 425. The mounting (rear) surface shall be coated with a moisture impervious, acid-resistant catalyzed epoxy of arbitrary color.

I. Signs shall be finished with a clear, non-yellowing, non-glare matte industrial grade catalyzed polyurethane. The coating shall isolate the sign colored surface coatings from wear, corrosive cleaners, human sweat and body oils.

J. With fully cured coatings, the sign coloration shall comply with the 70 percent contrast requirement herein.

K. Locate sign mounting holes 0.02" or less from the requested true position.

L. The sign shall be suitably flushed and neutralized of etching acids and process chemicals prior to the application of any coating. Applications shall be in accord with the coating manufacturer's recommendations.

M. The sign message (front) surface shall be parallel to the mounting surface within 0.04" or less.

N. Exposed sign surface shall be smooth. The surfaces shall be free of porosity, pits, sinks and blemishes. Welds and casting seams shall be ground flush with adjacent surfaces.

O. Finished signs that are less than 6 inches in length, when resting on the back surface shall be flat within a tolerance of plus or minus 1/32 inch measured diagonally. Finished signs shall be free of sharp edges, burrs, or any other defect that can prove hazardous to personnel or detrimental to the mounting process.

P. Signs shall have full finish and color coverage with no defects on surfaces and edges such as discoloration, bubbles, pin holes, chipping or surface crazing.

2.02 ENVIRONMENTAL CONDITIONS

A. Signs shall be suitable for unsheltered indoor and outdoor use within a temperature range of - 30 deg F to 120 deg F.

B. Signs will be used outdoors and shall be expected to withstand weather conditions of the Chicago region, for a minimum of 10 years with no or minimal fading, cracking, surface crazing, streaking, chalking, peeling, pitting, or delaminating.

2.03 PACKAGING AND IDENTIFICATION

A. Signs shall be individually packaged. The packaging shall isolate the sign from scratching, staining, scuffing and chipping by adjacent signs.

B. Should the Contractor elect to furnish signs with identification beyond that herein specified, the identification shall be located on the mounting (rear) surface. The identification shall be confined within a region not to exceed 20 percent of the available surface. The Commissioner's sign identification is incorporated in the sign exposed artwork.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation, signs shall be inspected by the Commissioner. The purpose of this inspection is to verify quality of manufacture and conformance to requirements for the fabrication, color, artwork, etc. of each type of sign. Inspection will be conducted at the Contractor's premises, or at any other mutually agreeable location. Provide the Commissioner with a minimum of seven working days' notice prior to inspection.

B. Verify locations, sizes, installation and mounting conditions, type of anchorage required, and working conditions in the field.

C. A representative from the Commissioner may review the existing conditions with the installer prior to installation. The purpose of this inspection is to verify actual locations, method and quality of installation, dimensions, heights, space limitations, and other installation conditions for each sign. The scheduling of this inspection shall be mutually agreed upon by all parties.

D. Verify the existence of any utilities cables or other existing items or construction that may be in the way of the new signs and this installation. Relocate sign as approved to avoid relocation of utilities or interference with the sign as approved by the Commissioner.

E. After installation, a final inspection in the field will be conducted by the Commissioner. The purpose of this inspection is to verify quality of installation,

correct location of signs, etc. The Contractor shall provide the Commissioner with a minimum of seven working days' notice prior to inspection.

3.02 INSTALLATION

A. General: Install signs according to Contract documents or to match existing locations, heights, and mounting details unless indicated or directed otherwise. Variations may be directed by or approved by the Commissioner's field representative during the pre-installation walk-thru or during the actual installation based on actual field conditions and interference. Use approved mounting methods, mounting accessories, and attachment devices. No glue installations are permitted.

B. Installation and anchorage shall be solid and secure. Provide indicated backer plates, frames, support, posts, and other mounting accessories. Provide and install any additional steel framing or other support or accessories required. Where indicated or required, modify existing to accept new signs.

C. Install signs and mounting accessories level, plumb, and flush with substrates. Sign surfaces shall be free from distortion or other defects in appearance. Mounting heights shall be as shown on drawings, as required by codes and consistent throughout project unless indicated otherwise or required to avoid interference and approval by the Commissioner.

D. Provide and install required attachment devices, brackets, supports, and hardware. Fasteners and other accessories shall be as specified for the application. Fasteners and accessories shall be stainless steel unless noted otherwise. Use expansion anchors, self- tapping screws, pop-rivets, bolts and nuts, etc. as required. Drill as required. Use countersunk screws where exposed or necessary. Exposed fasteners shall be tamper resistant. Weld where indicated with full, tack, or stitch welds. Glue installations of any kind are not permitted, including as a means to attach the sign to backer plate.

E. Installation of backer plate:

1. Directly to Substrate: Attach backer plate directly to wall, column, light pole, railing, windbreak, etc. by welding or using countersunk screws. Hole locations may be new, existing, or existing to be tapped. Use metal spacers behind the backer pate at each screw location where there are obstructions or minor projections at the surface where indicated on the drawings. Use countersunk expansion anchors when securing backer plate to masonry or concrete.
2. To Metal Frames, Horizontal Supports, Vertical Support Posts or railings: Attach backer plate to a frame made up of metal channels or tubes by welding or using countersunk screws. Attach backer plate to metal channel or tube supports, posts, angles, straps, or hangers by welding or using countersunk screws.

F. Installation of Metal Frames or Supports:

1. Weld or bolt metal frames, supports, or support posts to beam, columns, light poles, railing, or windbreak as directed. Use expansion anchors for securing frames, supports, or hangers to masonry or concrete. Drill and grout or imbed supports in new concrete where indicated.

G. Installation of Signs:

1. Directly to Substrate: Determine that surface is clean and smooth. Secure signs to substrate using stainless steel pop-rivets. See drawings for spacing.
2. To Surface: Surface mounted signs include installations on any flat surface which can be, but are not limited to, walls, canopy support and platform columns, sign frames, and sign supports. Fastening hardware shall be 1/4-20 tamper-resistant machine screw or TORX T27 (with security pin) 1/4-20, T27 with locking hex head nut with 1/4-20 self-locking hex head nut (nylon insert) or stainless steel rivet, as determined by the Commissioner.
3. To Metal Frame: Welded metal tube or channel frame with mitered corners shall be slightly larger than sign. Secure sign to frame with pop rivets using approved spacing.
4. To Backer Plate: Metal surface of backer plate shall be clean and smooth with countersunk screws properly installed. Backer plates shall be same exact size as sign. Secure sign to backer plate using stainless steel pop-rivets or tamper-resistant machine screws as indicated (drill/tap backer plate to accept screws) using approved spacing.
5. Pendant Bracket Mounted Sign: Pendant mountings are generally described as those which require two sign faces, back to back, attached to and supported by metal brackets (or similar metal supports), sandwiched between the two sign faces. Brackets shall be configured to provide proper mounting of sign. Fastening hardware and type of installation shall be equivalent to that which is existing.
6. Bracket-Mounted Units: Provide the manufacturer’s standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices to comply with manufacturer’s directions.
7. Panel Mounted Non-Illuminated signs: Panel mounted signs include installations on any flat or curved surface which can be, but are not limited to, acoustical panels, etc. Fastening hardware shall be 1/4-20 taper resistant machine screws (Tamper Pruf No head) with 1/4-20 self-locking head nut (nylon insert) attached to panel. Glue installations are not permitted.
8. Trim signs as required to fit locations only with approval of Commissioner. Modify existing sign frames, backer plates, supports, etc. as required for new signs.
9. Provide supports as shown or required for support of tactile and Braille signs. Supports to be stainless steel unless approved otherwise. Supports to be anchored into or to substrates.

3.03 FIELD PAINTING

A. The pre-finished backer plates shall have their finish touched up as required where exposed to view after installation of the signs.

B. Galvanized metals cut or drilled in the field shall have its galvanized finish touched up in the field with approved galvanizing repair paint.

C. Dissimilar metals: To avoid galvanic action, separate dissimilar metals with approved paint.

D. Any mounting accessories such as angles, channels, plates, bent plates, clip angles, tubes, posts, etc. that will be exposed to view after installation of the sign, shall be field painted to match the backer plates. New wood posts and other members shall also be primed and finished to match the backer plates.

E. Care shall be taken to not get paint on the new signs or any other existing surface.

3.04 CLEANING AND PROTECTION

A. Signs shall be adequately protected during their delivery and installation to prevent damage by scratches, marring, stains, discoloration, or other causes. The sign faces shall be protected with a protective covering. The signs shall be crated. Damage to any surface during fabrication, handling, shipment, storage, and installation shall be remedied. Replace any damaged signs that cannot be cleaned or repaired.

B. Before delivery to the site, each sign shall be tagged or labeled with the identifying number and installation location as shown in the specifications. Labeling shall be on both the sign and the protective covering.

C. At completion of the installation, remove the protective coating and clean soiled sign surfaces, and surfaces against which the new sign has been mounted, in accordance with the manufacturer’s instructions. Protect units from damage until acceptance by the Commissioner.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of BRAILLE TACTILE SIGNS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of BRAILLE TACTILE SIGNS shall be included in the

contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 10 44 16

FIRE EXTINGUISHERS & ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Portable fire extinguishers.
2. Fire extinguisher mounting brackets.

1.03 SUBMITTALS

A. Product data:

1. For each specified type of extinguisher.
2. For each specified cabinet indicating dimensions, materials, cabinet type, door construction, panel and trim style, and door hardware.

B. Shop Drawings: Details showing mounting methods.

C. Samples: for initial selection purposes in form of manufacturer's color charts showing full range of colors available for those units with factory-applied finishes.

D. Copy of manufacturer's warranty for each product submitted.

E. The fire extinguisher submitted for approval must meet the approval of the Commissioner's Safety Department for durability and operational reliability.

1.04 REFERENCES

A. Underwriters Laboratories (UL).

B. AAMA 608.1.

C. NFPA 10.

D. NAAMM Manual.

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers from one source from a single manufacturer. Obtain brackets and/or cabinets from same manufacturer as extinguisher or verify that the brackets and/or cabinet are suitable, approved and of proper size for the extinguisher provided.

B. Coordination: Verify the size, type and capacity of the extinguishers provided with the Commissioner's requirements and standards.

C. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

1.06 WARRANTY

A. Extinguishers shall be warrantied by the manufacturer for a period of 12 years after the date of acceptance by the Commissioner. Extinguishers shall remain in full operating condition and withstand corrosion during the warranty period or be replaced by the manufacturer at no cost to the Commissioner.

B. Brackets and cabinets shall be warrantied for a period of at least one year from the date of acceptance against malfunction, corrosion and deterioration of the finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Ansul Fire Protection.
2. Badger-Powhatan.
3. American Specialties Inc.
4. J.L. Industries.
5. Larsen's Manufacturing Co.
6. Modern Metal Products (Cabinets).
7. Miller-Peerless, Ri-Del Manufacturing, Inc.
8. Potter-Roemer, Inc.

2.02 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers of each type listed for each location shown on the drawings or as required by the Commissioner, from manufacturer's standards, that comply with authorities having jurisdiction.

1. Abbreviations indicated below identify extinguisher types related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in the extinguisher.

B. Performance:

1. The extinguishers shall operate satisfactorily within the temperature range of 140 deg F and minus 40 deg F.
2. Extinguishers shall not require a periodic recharge and not be required to be recharged until used.

C. Pump-Type Water Filled Fire Extinguisher: Provide in Customer Assistant Kiosk, Storage Room, Plumbing Equipment Room, Elevator Control Room, Escalator Controller Space. Provide 2.5 Gallon, UL-rated containing approved antifreeze solution good for temperatures as low as minus 40 deg Fahrenheit in a copper tank of minimum thickness of 22 gauge. The outside of the tank shall be painted with red enamel and the tank shall have a carrying handle and a footrest.

1. The double-action pump shall be constructed of copper and brass parts and be fastened by means of a non-ferrous casting, which is also part of a locking device to secure the pump in a closed position. Provide a gasket between the casting and the tank to prevent water leakage. The pump plunger shall have a spade type-type cast brass handle, which shall serve to carry the extinguisher. The output of the pump shall be such that eight complete strokes shall pump approximately 16 ounces of water.
2. The discharge hose shall be equipped with a nonferrous nozzle. A three-ply rubber hose shall be 33.5 inches long and capable of passing a 400 psi hydraulic test for five minutes. The hose shall be protected against kinking at its attaching end by a coil spring surrounding hose and secured to the pump casting. The tank shall be equipped with a small socket, soldered or brazed to the tank for insertion of hose nozzle when not in use.

D. Multipurpose Dry Chemical Type: Provide in Customer Kiosk, Electrical Room, Communication Room, Storage Room, Plumbing Equipment Room, Escalator Controller Space. Provide UL-rated 20A – 120BC, 20-lb. nominal capacity, in enameled steel container. Extinguishing agent shall be monoammonium phosphate-base dry chemical that shall meet or exceed the minimum requirements of Underwriters Laboratories, Inc. and Factory Mutual Laboratories for the type of dry chemical.

E. Carbon Dioxide Type: Provide in Elevator Control Room, Escalator Controller Space. Provide UL-rated 5-BC, 10-lb nominal capacity, in manufacturer's standard enameled metal container.

F. Fire Extinguishers:

1. Provide hand held cartridge type fire extinguishers as required by codes set in cabinets. Extinguishers shall be A-B-C- class, meeting U.L. rating 2A-10BC, containing 5.5 lbs. of dry chemical in a seamless aluminum body.
2. Provide necessary attachments and pressures gauges as required for Underwriters' Label and rating.

3. Operation of the hand held extinguisher shall be operated by a lever which punctures a cartridge disc, allowing carbon dioxide gas contained therein to escape into the dry chemical container and expel the dry chemical when the hose nozzle is opened. The puncturing mechanism of the extinguisher shall be protected against accidental operation by suitable means for methods of puncturing.
4. Extinguisher assembly shall consist of the chemical chamber or container, carrying handle, cartridge receiver, carbon dioxide cartridge, puncturing mechanism, hose and shut off nozzle.

   a. The shell of the chemical chamber shall be made of steel. The outer surface of the chemical chamber shall be zinc-coated, bonderized or copper-plated. The interior of the chemical chamber shall be treated to resist corrosion.

   b. The hose shall be non-kinking, ½" I.D. x 31-1/2" long.

   c. The shut-off nozzle (discharge nozzle) shall have a spring-loaded lever-operated valve. Parts of the nozzle and valve shall be made of corrosion resistant materials. The operation of the valve shall be such as to prevent any pressure leaks or moisture absorption, which might tend to cake the dry chemical. The discharge from the nozzle shall be in an expanding round stream.

   d. The dry chemical chamber shall have a fill opening measuring approximately 2 inches in diameter or more to assure easy and rapid filling with dry chemical. The design of the extinguishers shall allow for ease of re-assembly.

   e. Extinguishers shall be furnished with a fill cap indicator that will show when the extinguisher has been used. The device shall be a tamperproof stem that "pops-up" when the extinguisher is actuated and the stem shall remain in this position until it is reset at the time of the recharging.

G. Markings:

1. Extinguishers shall be die-stamped with the words "PROPERTY OF CTA" with letters 3/8" high stamped around the barrel of the extinguisher approximately 3/8" up from the bottom edge of the extinguisher.
2. Extinguishers shall have a metal label affixed indicating that it is approved by the Underwriters Laboratories and Factory Mutual Laboratories.
3. Operating instructions for the portable extinguishers shall be positioned to face outward when the extinguisher is mounted on a wall, in accordance with U.L. Standard 299. Recharging instructions shall be positioned on the side opposite the operating instructions.

2.03 MOUNTING BRACKETS

A. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish.

2.04 IDENTIFICATION

A. Identify bracket-mounted extinguisher with FIRE EXTINGUISHER in red letter decals applied to wall surface. Use letter size, style, and location as selected by Commissioner.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine walls and partitions for thickness and framing for cabinets to verify mounting prior to installation.

B. Examine rough-in for hose valves, hose racks and cabinets to verify locations of piping connections prior to cabinet installation.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.

1. Fasten and secure mounting brackets to structure, square and plumb.

C. Locations of fire extinguisher shall be marked with a 12 inch square red diamond painted on the wall near the fire extinguisher support. The red diamond shall be 78 inches above the floor for quick identification of fire extinguisher location.

3.03 WARRANTY, MAINTANCE AND OPERATING INSTRUCTIONS

A. Provide the Commissioner with fully executed copies of the warranty and copies of maintenance and operating instructions for each type of extinguisher, bracket and cabinet installed.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of FIRE EXTINGUISHERS & ACCESSORIES shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of FIRE EXTINGUISHERS & ACCESSORIES shall be included in the contract lump sum price as shown in the Schedule of Prices for.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 10 45 40

ROTOGATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Provide rotogates as required by the Contract Documents. The stainless steel rotogate assembly consists of a manually operated rotating gate with framed barrier, ceiling, and canopy structure.

B. Related Work Specified Elsewhere:

1. Metal Fabrications: Section 05 50 00.
2. Decorative Metal: Section 05 70 00.

1.03 QUALITY ASSURANCE

A. Field Measurements: If possible, take field measurements prior to preparation of shop drawings and fabrication. Do not delay job progress; when taking field measurements before fabrication might delay work, allow for adjustments during installation.

B. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Qualifications: No work, shop drawings or materials shall be bought or ordered until the manufacturer of the rotogates has been approved by the Commissioner. Comply with the following:

1. The manufacturer shall have at least 10 continuous years' experience in the manufacture of the type of work under this contract.
2. The manufacturer's plant shall be open to the Commissioner's representative for the Commissioner's inspection. Complete fabrication methods and procedures shall be demonstrated to the Commissioner upon request.
3. The manufacturer shall demonstrate that their plant is adequate to handle fabrication and installation within the construction period.

1.04 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product specifications and installation instructions for products and processes used, including finishes.

B. Shop Drawings: Prior to fabrication, the rotogate manufacturer shall submit shop drawings to the Commissioner for approval. Shop drawings shall indicate dimensions, details, installation details, elevations, plans, sections, components, material list, assembly, etc. of each type of rotogate. Include plans, elevations and details of fittings, connections, and anchorages to other work. Shop drawings shall indicate actual field verified dimensions and conditions. The manufacturer shall make any changes specified in line with the requirements. Approval of shop drawings shall not release the manufacturer from furnishing the equipment in full compliance with these requirements.

C. Samples: Provide samples of stainless steel in finish specified.

1.05 INFORMATIONAL SUBMITTALS

A. Provide templates needed for anchor and bolt installation.

B. As-built Drawings, Parts Lists, and Instructions: Furnish three sets of as-built drawings, maintenance instructions, circuit diagrams, and parts lists at the time of delivery of equipment. Drawings shall enable identification of parts and subassemblies for ease in future ordering of repair parts.

C. Certification: Provision of rotogates, including fabrication and installation, shall be in strict compliance with safety and code requirements of federal, state, and local government agencies having jurisdiction. Contractor shall submit written certification of required compliance prior to fabricating and installing.

D. Manufacturer shall certify that the proposed locations and applications of the rotogates have been reviewed and that the rotogate will function properly in those locations and conditions.

E. Manufacturer shall also certify that replacement parts for the rotogate will be available for purchase by the Commissioner after the expiration of the warranty period.

1.06 WARRANTY

A. Rotogates shall be warrantied for a period of one year after final acceptance for defects in materials, workmanship, and installation and be repaired or replaced to the satisfaction of the Commissioner and at no cost to the Commissioner. Rotogates that fail to operate smoothly and as designed shall similarly be replaced within the warranty period.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Material shall be delivered to the project in sealed containers bearing manufacturer's name and material identification. Materials shall be stored in strict accordance with the manufacturer's printed directions.

B. Protection: Protect materials against damage from mechanical abuse, plaster, salts, acids, staining, and other foreign matter by an approved means during transportation, storage and erection and until completion of construction work. Unsatisfactory materials shall be removed from the premises, and damaged materials replaced with new materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Product: "HS-427-S model" (Controlled Access, Inc.) or comparable products, as approved by Commissioner of:

1. Tomsed Corp. Turnstiles by Boon Edam, Lillington, NC.
2. Hayward Turnstiles, Inc., Milford, CT.
3. Controlled Access Inc., Brunswick, OH.
4. Alvarado Manufacturing Comp., Chino, CA.
5. Perey Turnstiles, Bridgeport, CT.

2.02 MATERIALS

A. General: Furnish complete stainless steel rotogate assemblies each with a three wing section consisting of assembled rotor section, arms, assembled barrier section, cage section, floor and ceiling plates.

1. The rotogates shall be so designed and constructed so as to permit convenience passage of persons freely in one direction of rotation and prevent passage in the opposite direction. The direction of travel through the rotogate shall be reversible without requiring additional parts.
2. The clear height of the rotogates shall be 7'-0". The diameter of a non-handicap single rotogate shall be as indicated on the drawings. The total height of the rotogate cage shall be as indicated on the drawings.
3. Each rotor shall have 3 vertical sets of arms, one set per rotor wing, spaced 120 degrees apart on centerline. Each arm shall consist of a single stainless steel section, equally spaced. The maximum vertical space between the horizontal rotor arms for each section shall be 5". The rotor arms shall be minimum 1-1/2" square cross section tubing with minimum .097" thick wall, bolted to malleable cast iron clamps at the rotor post, with the ends of the arms spun welded closed with edges ground and polished smooth.
4. Rotor and Barrier Vertical Members shall be 0.25" thick angles. Arms are pinned into rotor with malleable cast iron clamps and secured with 3/8" diameter bolts. Clamps 5-step process plated with certified 50 year salt-fog-chamber test.

5. The barrier comb sections shall consist of minimum 1-1/2" square cross section (to match arms) stainless steel tubing, minimum .097" thick wall, spaced equally and offset with the rotor arms, bolted to the support post, with the ends of the arms spun welded closed with edges ground and polished smooth and finished to match the rotor arms. The maximum vertical space between the horizontal barrier arms shall be 5" to match the rotor arms. The configuration shall be such that a person should not tend to be caught between the rotor arm section and the barrier section.
6. The shield assembly or cage is to be constructed with 3 vertical stainless steel "U" channels attached to the floor and ceiling; with 1" stainless steel bands of minimum .38" stainless steel, spaced equally, curved to form the circumference of the rotogate, and welded to the channels. The maximum vertical distance between the bands shall not exceed 5".
7. Heel guards on the bottom arms of rotor shall be "U" shaped channels surrounding the lower arms and extending to the floor.
8. The full round ceiling plate shall be fabricated of stainless steel, minimum 11 ga., attached to internal supports of structural steel channel and the mechanism housing. The internal steel support system, which contains the rotogate controls shall not be open to view. The exterior section span the entire shield and barrier assembly. Ceiling canopy to be provided with welded stiffeners and structural reinforcements consisting of minimum 0.375" steel angles.
9. The bottom bearings for the rotors shall be of the friction type to minimize spinning and corrosion. A mechanical clutch mechanism to be used to restrict traffic flow to exit only; using a machined clutch body and hardened 1" thick ratchet assembly. Over-running clutch design, drill rod steel rollers, hardened inner clutch ring and keyway. Hardened steel star gear, steel bearings and 2" thick flame-cut and hardened steel housing. Operation of rotogate shall be silent and resistant to "free-wheeling."
10. Rotogate to be of heavy duty design and operation, with heavy duty operating mechanism.
11. As required and/or shown on the drawings, the ceiling of the rotogate shall have a fascia extending upward. Fascia shall extend the full perimeter of the ceiling, be of one piece metal, welded as required, reinforced as required, and be of 16 ga. stainless steel, minimum. Height of fascia as shown on the Drawings or as required by field verified dimensions.
12. When installed at unprotected exterior locations, the rotogate shall be designed and fabricated to withstand the elements and operate properly under weather conditions. The rotogate shall have adequate protection from moisture infiltration of its mechanism and moving parts.

B. Protection from Dissimilar Materials: Stainless steel shall be protected from direct contact with dissimilar materials as follows:

1. Dissimilar metals shall be painted with a heavy brush coat of zinc chromate paint.
2. Stainless steel surfaces in contact with mortar, concrete, or other masonry material shall be given one heavy brush coat of alkali-resistant bituminous paint.

C. Stainless Steel: Exposed materials shall be stainless steel, UNS S31600, with No. 4 brushed finish unless otherwise indicated.

2.03 FABRICATION

A. Field Measurements: Before proceeding with fabrication, verify dimensions and take such measurements as are required for fabrication and erection of the work.

B. Standards:

1. Work under this section shall be executed by a qualified manufacturer. Field work shall be done by skilled mechanics. Angles and lines shall be straight and true; surfaces shall be smooth and free from waves and buckles. Fit work in place and install work in a firm manner.
2. Shop assembled members shall be welded. No field riveting will be permitted; bolted field connections may be reinforced by welding. Welds shall be ground smooth and flush with adjacent surfaces.
3. Where welding occurs, it shall be by the electric arc process in accordance with American Welding Society's Code of Arc and Gas Welding in Building Construction.
4. Welding shall be executed by operators who have been qualified previously by tests as prescribed by the American Welding Society's "Standard Qualification Procedure" to perform the work required.
5. No flame cutting of steel will be permitted in the field. Members flame-cut in the shop shall be finished to an acceptable appearance equal to a sheared finish. Holes shall not be flame-cut in either shop or field. No cutting of structural shapes shall be done in the field without the consent of the Commissioner.
6. Materials shall be properly marked and match-marked where field assembly is required. The sequence of shipment shall be such as to expedite erection and minimize the field handling of materials.
7. Use care in handling and erection to insure that steel shall not be twisted bent, or otherwise damaged, and should any difficulty be encountered, it shall be immediately reported to the Commissioner.
8. Connections at angles, miters and junctions which cannot be forged or welded shall be made with blind screws from the back or other concealed fastenings. Furnish and install additional clips, angles, braces, framing and supports required for anchoring this work to the masonry or structural frame of building or for supporting other work as shown. Provide proper expansion joints in continuous metal work where required, as approved by the Commissioner. Exposed work shall be finished smooth and even, with close joints and connections.

2.04 PROTECTION FROM THE ELEMENTS

A. Provide additional materials or systems necessary to protect the mechanisms of the rotogates and assure continuous proper operation when rotogates are indicated to be installed exposed and without protection from the elements.

2.05 STAINLESS STEEL FINISHES

A. Comply with ASTM A480/A480M. Remove or blend tool and die marks and stretch lines into finish.

B. Polished finish: Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.06 PROTECTION OF STAINLESS STEEL FINISH

A. Provide a transparent polymer film covering for shop fabrication and protection during erection. Film shall be applied with a roller coating and thermal setting technique which when erected in place can be stripped from the finished surface.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine the areas and conditions under which rotogates are to be installed and remedy any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide required support necessary for the installation of the rotogate, including any required framing or blocking required below the floor or above the ceiling necessary to secure the rotogate to. Provide and install any additional stainless steel bars or barriers required to enclose the space and support the rotogate.

3.03 INSTALLATION

A. Install rotogate in accordance with manufacturer's directions and under the supervision of a factory representative. Equipment shall be installed plumb, square, in proper alignment and securely anchored in the building construction.

3.04 ERECTION

A. Furnish erection equipment, tools and anchorage items for proper installation of the work.

B. Erect and assemble work in place in proper sequence.

C. Use approved anchoring devices, screws and bolts, in finish to match rotogate.

3.05 TESTS AND INSPECTION

A. Make repairs, adjustments, replacements, and tests that are necessary to provide satisfactory operation in full compliance with these requirements. During the installation and test period, furnish the services of a professional engineer to perform tests.

B. Any omission to disapprove the work at the time of inspection, or during the guarantee period, shall not relieve the Contractor of any of Contractor's obligations.

C. The Contractor shall replace any part or parts which fail within the guarantee period unless failure is due to negligence or damage beyond normal. Such parts, assemblies, or subassemblies shall be replaced within a period of 30 working days from time of notification. Labor for replacement of such parts and assemblies and subassemblies shall be supplied by the contractor, and the Contractor shall furnish all material and pay shipping expenses both from and to the property.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of ROTOGATES shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of ROTOGATES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 10 74 00

STATION PLATFORM GAP FILLER AND ENCLOSURE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The work under this Section shall include furnishing labor, materials, tools and equipment necessary for the fabrication, delivery and installation of gap fillers and gap filler enclosures; and materials necessary for the installation of the gap fillers and gap filler enclosures on station platforms.

B. Provide number of gap fillers and enclosures as shown on Drawings. Gap filler enclosures to be as located on the platforms as shown on Drawings.

1.03 SUBMITTALS

A. Samples: Pre-production samples of gap filler and gap filler enclosure materials and finished samples specified in this section. Provide stainless steel sheet sample indicating pattern, texture, and finish.

B. Product data: Manufacturer's technical data, specifications and installation instructions for gap fillers and gap filler enclosures, including materials, accessories, finishes, graphics, etc.

C. Shop drawings: Indicate dimensions, details, attachment devices, for fabrication of gap filler and gap filler enclosure. Provide connection details to different materials as applicable to each type of platform construction. Show anchorage and accessory items. Provide templates for anchors and bolts required for installation.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing fabrications similar to that indicated for this Project, with sufficient production capacity to produce the required number of units.

B. Welds to comply with latest AWS Standards for Stainless Steel welding.

PART 2 - PRODUCTS

2.01 PLATFORM GAP FILLERS

A. MATERIAL:

1. The gap filler shall be fabricated as indicated on the Drawings.
2. Weight of assembled gap filler shall not exceed 40 pounds.
3. Gap filler shall be constructed of 1/4" thick fiberglass reinforced plastic and structural core AL 600. FRP laminate skins shall be fabricated from premium vinylester resin and unidirectional M8610 continuous fiberglass mat. Fire retardant agents shall be added to enable the FRP to meet flammability and flame spread requirements.
4. Caster mounts shall be molded into the basic structure.
5. Stabilizing bars shall be stainless steel.
6. Wheel/Fork Combo Colson Series 1 Catalog no. 1-2210-1-3-43 available from Industrial Wheel and Tool Co, Oak Park, Il.

B. TESTING:

1. FRP shall meet flammability and flame spread requirements. Original data sheets on FRP are not acceptable. A pre-production sample shall be submitted for testing prior to production run to either:

    a. Underwriters Laboratories, Inc. 333 Pfingsten Road Northbrook, IL 60062 (708)272-8800
    b. Wiss, Janney, Elstner Assoc., Inc. 330 Pfingsten Road Northbrook, IL 60062 (708)272-7400
    c. Warnock Hersey, Inc. 8431 Murphy Drive Middleton, WI 53562 (608)836-4400

2. Property Test Method Test Value

    a. Flammability: ASTM E 162 (radiant panel IS 35 max. test) (additional provision is that there shall be no flaming drippings).
    b. Flame spread: ASTM E 84 (tunnel test) FSI 25 max.
    c. A certificate of previous testing approval may be submitted instead of retesting.

C. FABRICATION:

1. Gap filler shall support a load of 600 pounds with a safety factor of at least three based upon the ultimate strength of the material. Gap filler shall be dimensionally and structurally equivalent to approved sample currently at CTA. A preproduction sample shall be submitted for engineering evaluation prior to production run. Test should take place in the "normally used" position.
2. Maximum 1/8" gap (bowing) permissible at either end of laminate when placed on flat surface.
3. 3" draft angle permissible for mold removal except where noted.

4. Washers must sit flush on inner surface.
5. Wheel mounting surface must be flat and level.

D. FINISHES:

1. Laminated surfaces shall be smooth and abrasion free.
2. Gap filler exterior coating shall be isophtalic polyester gel-coat with UV-9, safety yellow color. The final product shall be colored and stenciled per CTA requirements to be supplied by CTA.
3. Gap filler ramp surface shall be anti-skid.
4. The gap filler shall conform to Federal Register V56, the wheel chair logo, by being properly identified with the international symbol of accessibility.

2.02 PLATFORM GAP FILLER ENCLOSURES

A. MATERIAL:

1. Finishes:

a. Gap Filler Enclosure: 16 gage UNS S30400 Stainless Steel with a Satin finish both sides.

1) Where Indicated: 5-wl pattern as manufactured by Rigidized Metals Corp., 685 Ohio Street, Buffalo, N.Y. 14203 or an equal product submitted to and approved by the Commissioner.

2. Hinges: Continuous 18 gage stainless steel piano hinge with a 1/8" diameter stainless steel pin, continuous style, 1-1/2" flat width, equal to CTA lot no. 1903001 on access doors.
3. Lock: R.H. Locks, lot no. 4130015 shall be provided by the CTA for installation by the Contractor.
4. Anchor Materials: Alloy Group 2 (A4) stainless steel bolts (ASTM F 593) and nuts (ASTM F 594). Verify locations and types and installations; verify conditions in the field.

B. FABRICATION:

1. Gap filler enclosure shall be dimensionally and structurally equivalent to approved sample currently at CTA. A pre-production sample shall be submitted for engineering evaluation prior to production run.
2. Structure shall be spot or tack welded.
3. Sharp edges and corners shall be removed.
4. CTA supplied locks shall require modification by vendor as indicated on the Drawings. Outer door assembly shall lock positively when closed with minimum force.

C. FINISHES:

1. Sheet metal shall be free of distortion, drag edges, sharp corners, burrs and weld slag or splatter.

2. Lock surfaces coming into contact with stainless steel shall be painted with black primer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish gap fillers and gap filler enclosure instructions, and directions for installation of proper anchorages including, platform concrete anchors to be embedded in concrete slab and wood platform anchors.

3.02 INSTALLATION

A. Furnish and install gap fillers and enclosures as indicated and located on the Drawings and in accordance with the station location condition. Install gap filler enclosures adjacent to structural supports.

B. The gap filler, gap filler enclosure and required installation hardware shall be packaged together as a complete gap filler assembly for each location.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of STATION PLATFORM GAP FILLER AND ENCLOSURE shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of STATION PLATFORM GAP FILLER AND ENCLOSURE shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 10 80 00

TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes toilet room accessory items as scheduled, including the following:

1. Toilet Tissue Dispensers.
2. Toilet Seat Cover Dispenser.
3. Grab Bars.
4. Sanitary Napkin Disposal.
5. Mirror and Shelf.
6. Soap Dispenser.
7. Double-Prong Robe Hook.
8. Waste Receptacle.
9. Mop and Broom Holder/Utility Shelf
10. Hand dryers.
11. Underlavatory Guards.

B. Related Sections include the following:

1. Division 26 Sections, electrical, for warm air dryer.

1.03 SUBMITTALS

A. Product data for each toilet room accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting methods, specified options, and finishes.

B. Schedule indicating types, quantities, sizes, and installation locations (by room), mounting heights, for each toilet room accessory item to be provided for the project.

C. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.

D. Maintenance instructions including replaceable parts and service specifications.

1.04 REFERENCES

A. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock- Forming Quality.

C. A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

D. ASTM B456 – Standard Specification for Magnetic Particle Examination of Large Crankshaft Forgings.

E. ASTM C1036 – Standard Specification for Flat Glass.

F. ASTM F446 - Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area.

1.05 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that shall be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Commissioner.

C. Electrical Components: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.06 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

B. Deliver inserts and anchoring devices set into masonry as required to prevent delaying the Work.

1.07 WARRANTY

A. Mirrors: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within a warranty period of 15 years from date of Final Acceptance.

B. Electric Hand Dryer: Submit a written warranty executed by the dryer manufacturer, agreeing to replace the dryer if it malfunctions or develops defects within a warranty period of 5 years from date of Final Acceptance.

C. Other Accessories, Materials and Work: Submit a written warranty executed by the various manufacturers and the Contractor, agreeing to replace any accessories, materials or work that becomes defective, inoperative, dislodged, loose, or its finish becomes defective due to defective materials or workmanship within a warranty period of 1 year from date of Final Acceptance.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers which may be incorporated in the work include; but are not limited to, the following:

1. A & J Washroom Accessories.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co.
6. McKinney/Parker.

2.02 MATERIALS, GENERAL

A. Stainless Steel: ASTM A 240, UNS S30400, with satin No. 4 finish, 0.034-inch minimum thickness.

B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16; Castings, ASTM B 30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 1008, 0.04-inch minimum. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 653, with G60 hot-dip zinc coating.

E. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

F. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

G. Baked Enamel Finish: Factory-applied, gloss white, baked acrylic enamel coating.

H. Mirror Glass: Nominal 0.23-inch thick, conforming to ASTM C 1503, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

I. Fasteners: Screws, bolts, and other devices of same material as accessory unit, stainless steel, or of galvanized steel where concealed.

2.03 TOILET TISSUE DISPENSERS

A. Toilet Tissue Dispenser: American Specialties Model No. 0042 or equal; for jumbo rolls. Surface mounted with concealed anchorage, stainless steel, satin finish, 22 gage one-piece, seamless construction. Unit shall be equipped with 18 gage hood hinged to shell. Spindle shall be chrome plated plastic with a heavy duty internal spring. Approximate size of unit to be 11 inches by 5 inches.

2.04 TOILET SEAT COVER DISPENSERS

A. Toilet Seat Cover Dispenser: Bobrick Model No. B-221 or equal. Surface mounted with concealed anchorage, stainless steel, satin finish, 22 gage one-piece, seamless construction. Approximate size of unit to be 15 3/4 inches wide by 11 inches high by 2" deep. Dispenses 250 single or half-fold toilet seat covers. Keyed access panel.

2.05 GRAB BARS

A. Stainless Steel Type grab bars with wall thickness not less than 0.05 inch and as follows:

1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
2. Clearance: 1-1/2-inch clearance between wall surface and inside face of bar.
3. Gripping Surfaces: Smooth, satin finish.
4. Heavy-Duty Size: Outside diameter of 1-1/2 inches.

B. Concealed Mounting Flanges: Provide Stainless Steel, 1/8" thick plate; end flanges 2" X 3 1/8" with two holes for attachment to wall. Intermediate flanges 2 5/8" X 3 1/8" wide X 3 1/8" diameter.

C. Snap Flange Covers: 22 gage Stainless Steel with satin finish 3 ¼" diameter X 1/2" deep. Each cover snaps over mounting flange to conceal mounting screws.

2.06 SANITARY NAPKIN DISPOSAL

A. General: Fabricate sanitary napkin disposal cabinet of satin finish stainless steel, not less than 0.034-inch thick, all-welded construction with seamless exposed

walls. Provide door of seamless satin stainless steel, minimum 0.05-inch thick, with 9/16 inch 90 degree returned edges for maximum rigidity. The door or disposal panel to be secured to the cabinet with a concealed, full-length stainless piano hinge. Door to be equipped with tumbler lockset. Disposal panel to have for identification an international graphic symbol identifying napkin disposal.

1. Mounting: Surface-mounted, with stainless steel collar to extend unit from nominal 4-inch-thick wall cavity.
2. Disposal receptacle shall have a capacity of 1.2 gallons.

2.07 MIRROR AND SHELF UNITS

A. Glass Mirror with Stainless Steel Angle Frame: Mirror shall have a one-piece, stainless steel angle frame, 3/4" x 3/4", not less than 0.04 inch, with continuous integral stiffener on all sides and beveled front to hold frame tightly against mirror, corners shall be mitered with hairline joints, heliarc welded, ground, and polished smooth; exposed surfaces shall have satin finish. Edges shall be protected by plastic filler strips and the back shall be protected by full-size, shock-absorbing, water- resistant, nonabrasive, 3/16" thick polyethylene padding. Galvanized steel back shall be not less than 0.034 inch and full mirror size. Back shall have integral one- piece, galvanized steel, horizontal hanging brackets located at top and bottom for mounting on concealed rectangular wall hanger and to prevent the mirror from pulling away from the wall and for a rigid, tamperproof and theft-proof installation. Spring action locking devices secure mirror to concealed wall hanger. There shall be no exposed screws or bolts. Mirror shall be removable from wall hanger for re-glazing mirror.

B. Unless otherwise indicated on drawings, mirror shall be 18" x 30". Integral stainless steel shelf to be 5 inches deep.

2.08 LIQUID SOAP DISPENSER

A. Soap Dish: Surface-mounted, wall-mounted, vandal proof design, satin-finished, 20 gage, stainless steel soap dispenser with rectangular wall bracket equipped with backplate for concealed mounting. Tumbler type lock. Stainless steel cover with unbreakable window type refill indicator. Stainless steel piston, springs, and internal parts designed to dispense soap in measured quantity by pump action. Minimum 40 ounce capacity tank.

1. Soap Valve: Designed for dispensing soap in liquid form.
2. Valve shall be operable with one hand and with less than 5 pounds of force to comply with barrier-free accessibility guidelines.
3. Provide 4 sets of keys for the soap dispenser lock.

B. Surface mounted soap dispenser to be Bobrick B-2111 (vertical) or approved equal.

2.09 ROBE HOOK

A. Surface Mounted Double-Prong Robe Hook: Heavy-duty satin finished stainless steel double-prong robe hook. Flange and support arm shall be 22 gage and equipped with a concealed, 18 gage mounting bracket that is secured to a concealed, 19 gage wall plate with a stainless steel setscrew. Cap shall be 14 gage welded to the support arm.

2.10 WASTE RECEPTACLE

A. Surface Mounted Receptacle Unit: Stainless steel unit fabricated of 20 gage, stainless steel with no. 4 satin finish. Hemmed top edge with return to inside. Waste receptacle provided with hooks to hang reusable, heavy duty vinyl liner, minimum 12.8 gallon capacity. Structural assembly of receptacle shall be of continuous and seamless welded construction. Unit shall have gently radiused front vertical edges and may have a bowed front face. There shall be no exposed fastening devices or spot welded seams. Approximate overall size to be 15” wide X 24” high X 9” deep maximum. Receptacle shall be screw mounted to the wall through keyhole slots with concealed heavy duty stainless steel reinforcement straps and concealed theft resistant locking screws.

B. Trash receptacles shall be as manufactured by American Specialties, Inc., Yonkers, New York or an approved equal.

2.11 MOP AND BROOM HOLDER/UTILITY SHELF

A. Mop and Broom Holder/Utility Shelf: Combination unit with 0.05-inch, stainless steel shelf with 1/2-inch returns, 0.062-inch support brackets for wall mounting. Provide 0.062-inch stainless steel hooks for wiping rags on front of shelf, together with spring-loaded, rubber hat, cam-type mop/broom holders; 1/4-inch-diameter stainless steel drying rod suspended beneath shelf. Provide unit 36 inches long, 6 inches deep and complete with four mop/broom holders and three hooks.

B. Provide two triangular brackets, same material as shelf, welded to shelf underside, to support the shelf.

2.12 HAND DRYERS

A. Surface mounted. Hand dryer control assembly activated by an infrared optical sensor located next to the air outlet and shall operate as long as hands are under the air outlet with a 35-second lockout feature when hands are removed.

B. Cover, including nozzle, to be one piece 18 gage brushed stainless steel with seamless exposed surfaces. Cover to be heavy-duty, rib-reinforced, die-cast zinc alloy. Parts to be rust proof. Cover to be secured to base with tamper-resistant screws, bolts and latch.

C. Size of unit shall be approximately 12" wide X 12" high X 6" deep projecting from wall.

D. Internal hand dryer parts shall be coated according to Underwriters' Laboratories, Inc. requirements. Entire mechanism shall be internally grounded.

E. Electric Requirements: 110/120 V., 12.5 A., 1500 W, 60 Hertz.

F. Motor to be instant starting, brushless, 5/8 hp, 20,000 rpm, with self-lubricating bearings, providing air velocity of 16,000 LFM (linear feet per minute) at the air outlet and 14,000

G. LFM at the hands 4 inches below the air outlet.

H. Heating element (900 W) to be protected by an automatic resetting thermostat, which shall open whenever air flow is cut off and shall close when flow of air is resumed, and produce an air temperature of 130 deg – 145 deg F at 72 deg F ambient room temperature at the hands 4 inches below the outlet.

I. Warm-air dryer to be model number Xlerator XL-SB as manufactured by Excel Dryer, Inc. or a similar model by one of the following manufacturers:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. Excel Dryer Corporation.
6. General Accessory Manufacturing Co.
7. World Dryer Corporation.

J. Decibel rating for hand dryer shall be 90 decibels or less. The Xlerator brand hand dryer must be equipped with their optional 1.1 nozzle to meet the decibel requirement.

2.13 UNDERLAVATORY GUARDS

A. Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping, and allow service access without removing coverings.

B. Material for underlavatory guards to be antimicrobial, molded-plastic, color white.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers which may be incorporated in the work include; but are not limited to, the following:

1. Plumberex Specialty Products, Inc.
2. TCI Products.
3. Truebro, Inc.

2.14 ACCESSORIES

A. Hardware and accessories: Manufacturer’s standard design, heavy-duty hardware and accessories.

B. Anchorages and Fasteners: Manufacturer’s standard exposed fasteners of stainless steel with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications.

2.15 FABRICATION

A. General: Only a maximum 1-1/2-inch-diameter, unobtrusive stamped manufacturer logo, as approved by Commissioner, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. General: No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item either by a printed, waterproof label or a stamped nameplate indicating manufacturer's name and product model number.

C. Surface-Mounted Toilet Room Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

D. Recessed Toilet Room Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

E. Keys: Provide universal keys for access to toilet room accessory units requiring internal access for servicing, re-supply, etc. Provide minimum of six keys to Commissioner’s representative.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install toilet room accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as specified by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated. Secure solidly to structural substrate.

1. Mounting height for hand dryers to be 37” from floor to bottom of dryer.
2. Mounting height for trash receptacles:

a. Semi-recessed receptacle unit: Top of unit 43" above floor.
b. Surface mounted receptacle unit: Top of receptacle maximum 40" above floor.

B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.

C. Install grab bars firmly with concealed anchorage and manufacturer's approved or supplied mounting kits and fasteners to structural wall, structural blocking or structural framing to withstand a load of at least 250 lbf in any direction, complying with ASTM F 446. Install grab bars according to manufacturer's directions and recommendations.

D. Secure toilet room accessories to solid substrate, not into hollow spaces.

E. Provide wall reinforcing as required for solid anchorage of accessories.

F. Provide electrical supply and connection for electric hand dryer as required and according to code.

3.02 ADJUSTING AND CLEANING

A. Adjust toilet room accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of TOILET ROOM ACCESSORIES shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of TOILET ROOM ACCESSORIES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 10 81 00

PIGEON CONTROL SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Provide labor, materials and supervision to install pigeon control system to the surface of the platform canopy as indicated in the Drawings. The bird wire shall stop pigeons, seagulls, and larger birds from landing and roosting on the building structure.

1.03 ACTION SUBMITTALS

A. Samples: Each type of hardware, including proposed fastening methods.

B. Shop Drawings: Detail system components and their relationship to the structure.

1.04 INFORMATIONAL SUBMITTALS

A. Descriptive information from the manufacturer including catalogs, installation instructions and other descriptive material.

B. Warranty: Provide Warranty on Material and Installation.

C. Provide statement by official indicating that they are a certified installation company.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Furnish products from one manufacturer for entire project.

B. Obtain technical information from the manufacturer.

C. Utilize authorized Installers who are knowledgeable in pigeon control product installations.

D. Installer shall visit the site to gather information of existing site conditions.

1.06 WARRANTY

A. Product shall carry a minimum 5-year guarantee against U.V. breakdown.

B. Installation shall be guaranteed for 2 years.

1.07 PRODUCT HANDLING

A. Protect materials from damage before, during and after the installation.

1.08 PROJECT CONDITIONS

A. Coordination: Furnish anchoring devices required to fasten system to and around existing building structure. Coordinate installation with existing conditions and within on site tolerances.

B. Visit site and field measure prior to fabrication and delivery of materials.

1.09 SYSTEM DESCRIPTION

A. Design Requirements: Measure the width of the surface and determine the appropriate mounting system as determined by site conditions and mounting surface.

PART 2 - PRODUCTS

2.01 BASIS OF DESIGN

A. Bird-B-Gone Bird Wire 2000 - Modular Post and Wire System.

2.02 MATERIAL

A. Wire: 0.45mm 1 x 7 stainless steel wire, U.V. stabilized clear nylon coated to 0.7mm finished diameter.

B. Crimps: Nickel-plated copper.

C. Metal Hardware: 316-grade stainless steel.

D. Plastic Hardware: High impact U.V. stabilized thermoplastic.

E. Number of Rows: As determined by the manufacturer and based on project conditions.

F. Mounting System: As determined by the manufacturer and based on project conditions.

2.03 MOUNTING SYSTEMS

A. Steel: Use stick-on bases with an outdoor construction adhesive.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the installation area and note any detrimental or hazardous work conditions. Notify contracting officer or inspector of the detrimental work conditions.

B. Do not proceed with the installation until conditions are corrected.

3.02 SURFACE PREPARATION

A. Surface should be thoroughly cleaned and free of bird droppings, nesting materials, rust, peeling paint or other debris.

B. Remove or repair articles that may damage product after installation, including overhanging foliage, brush and loose parts on the structure.

3.03 INSTALLATION

A. Install as recommended by the manufacturer.

B. Pigeon control system should be installed correctly, covering the entire depth of the surface, not just the perimeter.

1. Follow contours and angles closely.
2. Space materials in accordance with manufacturer’s recommendations.
3. Adhesive should be allowed to dry overnight.

3.04 INSPECTION

A. Immediately correct and repair as necessary.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of PIGEON CONTROL SYSTEM shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of PIGEON CONTROL SYSTEM shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER Architectural Work: 090000.

END OF SECTION

SECTION 11 05 20

FARE COLLECTION EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Provide conduit, cable, and related work for fare collection equipment as indicated on the Drawings.

B. Install fare collection equipment supplied by the Commissioner.

1.03 QUALITY ASSURANCE

A. Comply with the requirements specified in Section 01 40 00 QUALITY REQUIREMENTS.

B. Installer of fare collection equipment shall be acceptable to the CTA.

C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

1.04 SEQUENCING / SCHEDULING

A. Schedule and install Fare Collection Equipment in conformance with the requirements of the accepted project phasing.

B. Storage and transportation of existing equipment will be provided by the Chicago Transit Authority.

1.05 COORDINATION

A. Coordinate fare collection equipment related Work. Coordinate the fare collection equipment Work with the CTA, the Installer of the equipment, and the work of other trades.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide conduit and cable in conformance with the requirements specified under electrical sections describing basic electrical materials and methods.

2.02 FARE COLLECTION EQUIPMENT

A. The fare collection equipment will be supplied by the Chicago Transit Authority (CTA) and includes the following items.

1. Turnstiles (TT), End Cabinet (EC), Accessible Turnstiles (TA).

2. Ventra vending machines (EVM).

PART 3 - EXECUTION

3.01 PREPARATION

A. Provide conduit and cable in conformance with the requirements for cable and conduit specified under Division 26, Electrical and as required for the fare collection equipment.

3.02 EXAMINATION

A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.03 INSTALLATION

A. Install the fare collection equipment in accordance with the written instructions of the fare collection equipment manufacturer.

3.04 PROTECTION

A. Protect the Work during the construction period so that it will be without any indication of use or damage at the time of acceptance.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of FARE COLLECTION EQUIPMENT WORK shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of FARE COLLECTION EQUIPMENT shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK, except for the work included in Article 3.01 PREPARATION.

B. Payment for the work included in Article 3.01 PREPARATION shall be included in the contract lump sum price as shown in the Schedule of Prices for ELECTRICAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 01900.100.

B. Electrical Work: 260000.

END OF SECTION

SECTION 12 24 13
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Manually operated roller window shades, including:

1. Single rollers.
2. Visually Transparent Single-Fabric Shadecloth.

B. Related Sections:

1. Customer Assistant Kiosk: Section 13 06 00.

1.3 ACTION SUBMITTALS

A. Product data sheets for window shades.

B. Shop Drawings: Showing complete assembly and installation details, indicate supporting and adjacent building construction.

1. Show and describe anchors and fasteners on the shop drawings.

C. Samples for Initial Selection: For each colored component of each type of shade indicated.

1. Include similar samples of accessories involving color selection.
2. Window manufacturer's standard color samples for exposed metal components showing the complete range of available standard colors.

D. Samples for Verification:

1. Shade Material: Not less than 12 inch square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
2. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: including materials and fabrication descriptions and installation and operation instructions/specifications for window shades.

B. Warranty: Copies of the warranty in the form and content (terms) indicated herein.

1.5 QUALITY ASSURANCE

A. Comply with laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the work.

B. Fire-Performance Characteristics: Provide shade material tested in accordance with NFPA 701 - Vertical-Burn Test and rated "PASS".

C. Source Limitations: Obtain roller window shades through one source from a single manufacturer

D. Installing Contractor: Roller Window Shade Manufacturer authorized (Certified) installation and service firm with a minimum of 5 consecutive years roller window shade installation experience. Provide written evidence of installation experience to Commissioner upon request.

E. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Commissioner specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver roller window shades in original unopened containers and packaging with manufacturer's name, brand name, U.L classification, installation instructions, and using same designations indicated on Drawings.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller window shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller window shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for

operating hardware of operable glazed units through entire operating range. Notify Commissioner of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 WARRANTY

A. The roller window shades manufacturer is to provide a written warranty stating that the roller window shades installation and associated controls will be free of faults and defects in accordance with the General Conditions, except that the warranty is to be extended by the Roller Window Shade Manufacturer for the following:

1. Shadecloth: Provide warranty period of 10 years from Date of Substantial Completion that the shadecloth will not deteriorate, sag, or warp and will not be unfit for the use intended for the warranty period.

B. Provide warranty signed by the Installing Contractor and the Window Shade Manufacturer and submit 3 copies to the Commissioner.

C. This warranty is in addition to, and not a limitation of, other rights the Commissioner may have against the Contractor under the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

B. Acceptable Manufacturers:

1. MechoSystems, Inc, Long Island City, NY 11101
2. Lutron Shading Solutions by Vimco, Ashland, VA 23228.
3. Draper Inc., Spiceland, IN 47385.
4. Shade Techniques, LLC., Eaton IN 47338.
5. Hunter Douglas Contract, Poway CA.

2.2 BASIS-OF DESIGN

A. Roller Window Shade System: products, materials and installation methods of MechoSystems, Inc, Long Island City, NY 11101.

B. Visually Transparent Shadecloth (Single-Fabric): single thickness, opaque non-raveling vinyl fabric, woven from extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl, meets Greenguard Gold, 5 percent open, 2 by 2 dense basket-weave pattern. Colors selected from manufacturer's available range.

1. "1300 series" (MechoSystems).

2.3 MATERIALS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chain: No. 10 stainless steel chain rated to 90 pound minimum breaking strength.

a. Loop Length: Full length of roller shade unless otherwise indicated on Drawings.
b. Limit Stops: Provide upper and lower ball stops.

2. Provide Spring Lift-Assist Mechanisms for shades as recommended by manufacturer: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.

B. Roller Window Shade Components:

1. General: Provide hardware with regular drive and offset drive, reversible for left or right hand operation.
2. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service. Provide shade rollers reversible for left- or right-hand operation.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method, enabling shadecloth to be removed without having to remove the tube from retainer brackets or without removing brackets.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

E. Shadebands:

1. Shadeband Material: Visually Transparent Single-Fabric Shadecloth.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.
b. Color and Finish: As selected by Commissioner from manufacturer's full range.

F. Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches.
2. Guide Cables: Provide guide cables where recommended by Roller Window Shade Manufacturer.

2.4 FABRICATION

A. Product Safety Standard: Fabricate roller window shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of roller window shade system. Record field measurements on the submitted shop drawings. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay required installation schedules.

C. Fabricate units to completely fill openings from head to sill and jamb to jamb, measured at 74 deg F, unless specifically indicated otherwise on the Drawings. Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

D. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

2.5 FACTORY FINISHES

A. Aluminum Components: Baked enamel in manufacturer's standard colors.

B. Steel Components: Corrosion resistant-plated, satin-finished, or bonderized prior to painting with baked-enamel finish.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive the roller window shades. Installation of roller window shades constitutes acceptance of the existing conditions and substrates by the installer of the roller window shades and the roller window shade manufacturer.

B. If deteriorated or unacceptable conditions are encountered, immediately contact the Commissioner.

3.2 INSTALLATION

A. Install roller window shades, accessories and controls complete, level, plumb, and aligned with adjacent units in accordance with roller window shade manufacturer's printed instructions, and the final reviewed shop drawings. Surface mount roller window shades as shown on the Drawings.

B. Anchoring:

1. Determine the locations, quantities, capacity and design for anchors and fasteners used in the installation subject to review by the Commissioner.
2. Provide anchorage devices and fasteners as required to anchor, secure or attach the window shades, accessories and controls to the in place or subsequent construction, including but necessarily limited to bolts, nuts, screws, clips, washers, toggle bolts and other devices required to complete the installation of each window shade assembly.
3. Drill required holes in construction for anchorage of window shades and accessories. Remove and replace damaged construction.

C. Install units within the following tolerances:

1. Maximum variation of gap at window opening perimeter: 1/4 inch, per 8 feet (+/- 1/8 inch) of shade height.
2. Maximum offset from level: 1/8 inch.
3. Follow Manufacturer's edge-clearance specifications for shades where the width-to-height (W:H) ratio exceeds 1:3.

3.3 ADJUSTING

A. Adjust units for smooth operation. Adjust shade and shadecloth to hang flat without buckling or distortion. Replace units or components which do not hang properly or operate smoothly.

3.4 CLEANING

A. Touch up damaged finishes and repair minor damage in order to eliminate evidence of repair. Remove and replace work that cannot be satisfactorily repaired.

B. Clean exposed surfaces, including metal and shadecloth, using non-abrasive materials and methods recommended by the Window Shadecloth Manufacturer. Remove and replace work which cannot be satisfactorily cleaned.

3.5 DEMONSTRATION

A. Demonstrate operation method and instruct Commissioner's personnel in the proper operation and maintenance of the roller window shades.

3.6 PROTECTION

A. After installation, cover and protect exposed portions of the units from damage.

B. Just prior to final acceptance, remove protective coverings and clean surfaces as recommended by roller window shade manufacturer.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of ROLLER WINDOW SHADES shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of ROLLER WINDOW SHADES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 12 48 16
ENTRANCE FLOOR GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Recessed floor grilles and frames.

B. Related Sections:

1. Cast-in-place concrete: Section 03 30 00
2. Joint Sealants: Section 07 92 00
3. Resinous flooring: Section 09 67 23
4. Appropriate Division 22 sections for pan drain.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide foot grilles and frames capable of withstanding and supporting a uniform load of 300 lb/sq. ft. and 750 lb per wheel load) without exceeding the allowable design working stress of the materials involved, including anchors and connections.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordinate size and location of recesses in concrete to receive floor grilles and frames.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show complete layout and details of grilles, frame, drain pan, penetrating items, lockdown hardware including dimensions, anchorage, and setting requirements. Show relation to adjacent floor materials.

C. Samples: 10 inch x 10 inch corner sections of grille with frame and required hardware and anchors.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions.

B. Warranty: Signed copies of the warranty in the form and content (terms) indicated herein.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain foot grilles and frames through one source from a single manufacturer.

B. Accessibility Standard: For foot grilles indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", Illinois Accessibility Code, and ICC A117.1.

C. Provide sheet metal fabrications conforming with the following:

1. Specified requirements of the manufacturer of the metal.
2. Recommended practices contained in architectural Sheet Metal Manual, Sheet Metal and Air Conditioning Contractors National Association, Inc., current edition.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver foot grilles and accessories in such a manner as to prevent damage; store in a secure place.

B. Maintain grilles and accessories in original packaging with seals unbroken and bearing the name of the manufacturer and product.

C. Removed from the job site and replace damaged or otherwise unsuitable items.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify blocked-out openings in floors by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.9 WARRANTY

A. Provide Manufacturer's standard 5 year written warranty stating that the floor grilles and associated fabrications will be free of faults and defects in accordance with the General Conditions (from the date of final acceptance by the Commissioner).

B. Provide warranty signed by the Manufacturer and submit to the Commissioner

C. This warranty is in addition to, and not a limitation of, other rights the Commissioner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Kadee Industries Inc., Solon, OH 44139.

B. Babcock-Davis, Brooklyn Park, MN 55428.

C. C/S Group, Muncy, PA.

2.2 GRILLES

A. Subject to compliance with the specified requirements provide stainless steel grille units with stainless steel frames and manufacturer's standard hidden lockdown hardware. Sizes and configurations of grille units are shown on the Drawings. Provide one of the following:

1. "KD98" (Kadee).
2. "EleGrill" (Babcock-Davis).
3. "GridLine" (C/S Group).

2.3 DRAIN PAN MATERIALS

A. Stainless Steel Sheets: ASTM A 240, UNS S31600, cold-rolled, annealed, minimum thickness .0313 inch, unless otherwise indicated on the Drawings or required by conditions of fabrication and construction.

B. Welding Electrodes: Electrode metal of composition equivalent to parent metal, AWS Specifications.

2.4 GRILLE FABRICATION

A. Stainless-Steel Floor Grille:

1. Fabricate units fabricated from ASTM A 240, UNS S31600 stainless steel. Fabricate tread surface from minimum 0.071 inch x .156 inch stainless steel wire supported on minimum 0.070 inch thick x 1 inch stainless steel support rods spaced one inch on center.
2. Fabricate with standard slot opening of 0.125 inch. Join grille wires and support rods by electric resistance welding of joints.
3. Fabricate grille units 1-1/8 inch thick and designed to support a load of 300 pounds per square foot.
4. Finish stainless steel surfaces with a satin finish.

B. Perimeter Frame: Fabricate perimeter frame form ASTM A 240, UNS S31600 stainless steel, as standard with manufacturer for grille at type installation including anchors for the substrates present.

C. Intermediate Support Framing:

1. Fabricate perimeter frame from ASTM A 240, UNS S31600 stainless steel, as standard with manufacturer for grille type installation including anchors for the substrates present.
2. Provide intermediate support framing designed to support the grille load.

D. Furnish fastening and anchoring devices including screws, bolts, anchors and lockdown hardware.

2.5 STAINLESS-STEEL FINISHES

A. Comply with ASTM A480/A480M. Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

2.6 DRAIN PAN FABRICATION

A. Form metal drain pans to configurations and sizes indicated on the Drawings. Follow standard accepted fabrication practices unless otherwise shown on the Drawings or specified herein.

B. Fabricate and assemble units in the shop to same sizes and configurations as the foot grilles. Form corners and weld to form watertight units.

C. Hem exposed edges, bend back 1/2 inch to outside of pan. Form adjacent pans with one side overlapping the adjacent side to maintain a watertight joint between units.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, size, minimum recess depth, and other conditions affecting installation of floor grilles and frames.

B. Examine roughing-in for drainage piping systems to verify actual locations of piping connections before floor grille and frame and drain pan installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed floor grilles and frames and drain pans to comply with manufacturer's written instructions at locations indicated and with top of floor grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set floor-grille tops at height for most effective cleaning action. Coordinate top of floor-grille surfaces with doors that swing across grilles to provide clearance under door.

B. Frame & Drain Pan:

1. After finish flooring has been laid out, set drain pan, perimeter frame and intermediate support framing in position properly located and supported.
2. Brace and anchor frame to prevent dislocation during setting and finishing of finish flooring.
3. Position frame flush with top of adjacent finish floor material unless otherwise shown. Protect exposed stainless steel surfaces from damage during finish floor material installation and finishing and during the remainder of the construction period.

C. Grille:

1. Do not install grille in frame sooner than one day prior to the acceptance of the project by the Commissioner.
2. Align grille sections in frames and members of grille from section to section.
3. Anchor grille to perimeter fame and intermediate support frame using grille manufacturer's concealed fastener assemblies.

3.3 PROTECTION

A. Provide temporary plywood insert in frame of the same size and thickness as the grille. Remove and discard plywood upon installation of grille.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The work of ENTRANCE FLOOR GRILLES shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of ENTRANCE FLOOR GRILLES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 12 67 24
STAINLESS STEEL BENCHES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes material, labor, equipment, and accessories for the stainless steel benches on transit platforms, in station houses and other areas as shown:

1. Custom Stainless Steel Benches; design as approved by the Commissioner.

B. Related Sections:

1. Section 05 50 00, Metal Fabrications.

1.03 REFERENCES

A. ASTM A36 – Standard Specification for Carbon Structural Steel.

B. A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

C. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

D. ASTM A312 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes.

1.04 SUBMITTALS

A. Samples: Submit samples of products with materials and finishes specified in this section for approval.

B. Product Data: Submit manufacturer's technical data, specifications and installation instructions for benches.

C. Shop Drawings: Submit shop drawings for the design, fabrication and erection of the benches indicating dimensions and details of construction. Include plans, elevations, sections, profiles and details. Indicate heights, sizes and spacing of components. Submit shop drawings detailing connections to different materials as applicable in each station. Show anchorage, joinery and accessory items.

Show coordination with plumbing and electrical utility locations.

D. Indicate thicknesses of materials. Provide structural drawings and calculations certified by a structural engineer licensed in the State of Illinois that the construction of the benches will sustain live and impact design loads.

E. Manufacturer's Qualifications: Submit evidence of manufacturer's experience and ability to produce the benches of sufficient quantity.

F. Finishes: Provide product data, specifications and color, finish and gloss samples of primers, paints, sealers and varnishes, if any, to be used on the bench components for the Authority's selection and approval.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing fabrications similar to that indicated for this Project, with sufficient production capacity to produce the required number of units.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel", or when applicable, comparable AWS standards for UNS S31600 stainless steel.

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups as indicated on Construction Mockups drawing.

D. Production Facility Mockup review:

1. Make the production facility available to the Commissioner for review of the mockup prior to fabrication. Provide advance notice of a minimum of six weeks prior to the schedule of fabricating.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Benches shall be delivered with proper protection to prevent damage during shipping and handling.

B. Deliver benches to the site as complete pieces with no assembly required on site. Include accessories and attachment devices.

1.07 WARRANTY

A. Furnish a 1 year written warranty that items provided under this section shall be free from defects for one year from the date of final acceptance. The Contractor

shall repair or replace without expense to the Commissioner, within the warranty period, any materials or units that are defective or that show excessive weathering or wear.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Forms + Surfaces.
B. Landscape Forms.

2.02 MATERIALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

1. Steel Plates, Shapes, and Bars: ASTM A 36. Galvanize as indicated on drawings.
2. Stainless Steel Pipe: ASTM A312, UNS S31600.
3. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A240 UNS S31600.
4. Stainless Steel Bars and Shapes: ASTM A276, UNS S31600.

B. Hardware: Provide hardware, miscellaneous metal and accessories as shown and required.

1. Stainless steel carriage bolts to secure unit to platform, screws, tamper-resistant screws.

C. Platform Benches

1. Platform Bench shall be 10 gauge minimum to meet structural requirements or unless approved otherwise by the Authority, UNS S31600 Stainless Steel as indicated on the approved shop drawings.
2. Finish: Non-Directional Brushed.

D. Metal Framing: Provide as indicated:

1. Stainless Steel pipes.
2. Stainless steel plate: 11 gauge minimum to meet structural requirements.
3. Stainless Steel T angle.
4. Stainless Steel Angle 1/8” minimum to meet structural requirements.

2.03 FABRICATION

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop

drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles, curves and surfaces and straight sharp edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arises.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Remove sharp or rough areas on exposed surfaces.

F. Weld corners and seams continuously to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent. Grind exposed welds flush and smooth to match and blend with adjoining surfaces.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous. Cope or miter corner joints.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

I. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

J. Fabricate joints that will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

2.04 FASTENERS

A. General: Provide fasteners of same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or otherwise incompatible with metals joined. Provide Type 300 series stainless steel fasteners for exterior use. Select fasteners for the type, grade, and class

required and for type of loading and installation condition shown.

B. Provide tamperproof attachment fasteners as indicated on the design drawings or as approved in the shop drawings as required to attach to station platform substrate.

2.05 PLATFORM BENCHES

A. Fabricate Benches as designed on the drawings, complete with items indicated to produce the finished product including fasteners to attach to substrate as required.

2.06 STAINLESS STEEL FINISHES

A. Comply with ASTM A480/A480M. Remove or blend tool and die marks and stretch lines into finish.

B. Satin Finish: AISI No.4 polished, directional texture to match approved sample. Direction of texture shall be parallel to the long dimension of the member or surface.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Review bench locations on site and coordinate anchorage locations with other trades.

B. Set benches in place and anchor to station platforms and station floor at locations indicated by the Authority and in accordance with manufacturer's written instructions.

1. Benches shall be installed straight, even and level.

3.02 INSPECTION

A. Benches to be inspected after they are installed. They should be secure to their substrate. There should be no sharp edges, protrusions or other defects. There should be no chips or scratches to the finish on the metal.

B. Benches that are damaged or not installed properly should be repaired or replaced at no cost to the Authority and to the Authority's satisfaction.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of STAINLESS STEEL BENCH shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of STAINLESS STEEL BENCH shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION

SECTION 12 87 10

PLATFORM SAND BOXES AND TRASH RECEPTACLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This Section includes:

1. Custom Stainless Steel Sand Boxes installed on concrete platforms.
2. Stainless Steel Trash Receptacles

1.03 RELATED WORK

A. Related sections include but not limited to the following:

1. Metal Fabrications: Section 05 50 00.
2. Decorative Metal: Section 05 70 00.
3. Decorative Formed Metal: Section 05 75 00.

1.04 REFERENCES

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

C. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

D. ASTM A312/A312M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing fabrications similar to that indicated for this Project, with sufficient production capacity to produce the required number of units.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel", or when applicable, comparable AWS standards for UNS S31600 stainless steel.

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.06 SUBMITTALS

A. Samples: Submit samples of products with materials and finishes specified in this section for approval.

B. Product Data: Submit manufacturer's technical data, specifications and installation instructions for Platform Sand-Boxes and Trash Receptacle.

C. Shop Drawings: Shop drawings showing sizes and detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, profiles, and details of metal fabrications and their connections. Indicate heights, sizes and spacing of components. Show anchorage, joinery and accessory items. Show coordination with plumbing and electrical utility locations.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Sand Boxes shall be delivered with proper protection to prevent damage during shipping and handling.

B. Sand Boxes, with their accessories shall be as a complete assembly for each Platform Sand Box.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

1. Steel Plates, Shapes, and Bars: ASTM A36/A36M. Galvanize as indicated on drawings.

2. Stainless Steel Pipe: ASTM A312/A312M, Grade UNS S31600 or UNS S31603.
3. Stainless Steel Sheet, Strip, Plate, and Flat Bars: A 240, UNS S31600 or UNS S31603.
4. Stainless Steel Bars and Shapes: ASTM A276, UNS S31600 or UNS S31603.

B. Hardware: Provide hardware, miscellaneous metal and accessories as shown and required.

1. Continuous stainless steel piano hinge with offset one leaf.
2. Chain, half ring, and eyes, stainless steel.
3. Hasp, stainless steel.
4. Stainless steel radius edge, 12 gauge.
5. Stainless steel trim angle, 2" x 7/8" x 3/16".
6. 3/8" Stainless steel curved plate,
7. Rubber bumper.
8. Stainless steel carriage bolts to secure unit to platform, screws, tamper-resistant screws.

C. Sand Boxes:

1. Fabricate Sand Boxes as designed on the drawings, complete with items indicated to produce the finished product including fasteners. Coordinate hasp size and spacing requirements with CTA padlock requirements.
2. Sand Boxes shall be 11 gauge, UNS S31600 stainless steel. Profile as indicated on the drawings. Subject to compliance with requirements.
3. Finish: No. 4 finish.

D. Trash and Recycling Receptacles:

1. Basis-of-design product: Universal Receptacle by Forms+Surfaces.
2. Trash receptacles shall be 11 gauge, UNS S31600 Stainless Steel custom- perforated plate with perforations as indicated on Drawings.
3. Body Finish: Stainless Steel Sandstone.
4. Model: 36- Gallon, Side-opening (exterior), top-opening (interior).
5. Side-Opening Lid: Standard Opening / Round Opening, (1) 17.1"x6.0" / (1) 7.6 X6.5".
6. Top-Opening Lid: 10" Diameter Opening.
7. Lid material: Stainless steel.
8. Side-opening Graphics: Liter / Recycling.
9. Base material: Polyethylene, slate.
10. Trash receptacles liner shall be high-density plastic liner with a 36 gallon capacity. Color shall be Black. UL94HB fire rating.
11. Hardware: Stainless Steel
12. Fasteners: Trash receptacles shall be anchored to concrete using 1/2 inch diameter stainless steel expansion bolts.

2.02 FABRICATION

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles, curves and surfaces and straight sharp edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arises.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Remove sharp or rough areas on exposed surfaces.

F. Weld corners and seams continuously to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent. Grind exposed welds flush and smooth to match and blend with adjoining surfaces.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous. Cope or miter corner joints.

H. Provide for anchorage of type indicated; coordinate with supporting structure.

I. Fabricate and space anchoring devices to provide adequate support for intended use. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

J. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.03 FASTENERS

A. General: Provide fasteners of same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or otherwise

incompatible with metals joined. Provide UNS S31600 stainless steel fasteners for exterior use. Select fasteners for the type, grade, and class required and for type of loading and installation condition shown.

B. Provide tamperproof attachment fasteners as indicated on the design drawings or as approved in the shop drawings as required to attach to station platform substrate.

2.04 STAINLESS STEEL FINISHES

A. Comply with ASTM A480/A480M. Remove or blend tool and die marks and stretch lines into finish.

B. Satin Finish: AISI No.4 polished, directional texture to match approved sample.

C. Polished finish: Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Review sand boxes and trash receptacles locations on site and coordinate anchorage locations with other trades.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of PLATFORM SAND BOXES AND TRASH RECEPTACLES shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of PLATFORM SAND BOXES AND TRASH RECEPTACLES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

END OF SECTION

SECTION 12 93 00

SITE FURNITURE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

A. Provide site furnishings and installation including anchoring assemblies as indicated on the drawings and specified herein for:

1. Bicycle Rack
2. Tree Grate

B. Related Work

1. Section 31 00 00 – Earthwork
2. Section 32 13 13 –Concrete Pavement

1.3 SUBMITTALS

A. Submittals shall be in accordance with Division 01 specifications.

B. Prior to fabrication, Contractor shall submit for approval four sets of prints for the site furniture elements.

C. Prints shall indicate location, manufacturer, materials, finish, color, connection details, dimensions, and relationship to adjacent materials.

D. Contractor shall submit operation/maintenance recommendations, spare parts, manuals and warrantees to the Owner.

1.4 PRODUCT HANDLING AND STORAGE

A. Provide blocking and lateral support during transport and storage of site furniture units which is clean, non-staining, and will not cause harm to exposed finishes.

B. Protect edges of exposed members to prevent staining, chipping, or spalling.

PART 2 - PRODUCTS

2.1 BICYCLE RACK

A. BICYCLE RACK design based on FORMS + SURFACES "CAPITOL", Model number SKCAP-TD with the following characteristics:

1. Mounting: Surface-mounted
2. Finish: Powdercoat, Silver Texture
3. Capacity: Two (2)
4. Other manufacturer's products will be considered subject to meeting the design and performance characteristics described above and indicated on the drawings.

2.2 TREE GRATE

A. TREE GRATE design based on URBAN ACCESSORIES "5' x 10' Jamison", with the following characteristics:

1. Mounting: Tree Grate Frame w/ Rebar Embedment Anchor
2. Finish: 100% Grey Iron, Natural Patina
3. Size: 5' x 10'
4. Other manufacturer's products will be considered subject to meeting the design and performance characteristics described above and indicated on the drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. All surfaces shall be properly prepared and level prior to the installation and placement of site furniture. Contractor shall coordinate placement of site furnishings with work of other trades.

3.2 INSTALLATION

A. Each piece of site furniture shall be installed and placed in accordance with manufacturer's standards and specifications and in accordance with the plans. Any changes from manufacturer's specifications must be approved by the Owner's Representative.

B. Surface mounted furnishings shall be securely mounted to concrete paving with tamperproof anchorage assemblies.

C. All site furniture shall be installed plumb and level.

3.3 CLEANING

A. The area shall be kept clean at all times, and following installation, all materials and debris shall be removed from the area.

B. Marred areas on metal finishes shall be touched-up with primer and two coats of paint.

C. Exposed mounting hardware shall be touched-up with primer and two coats of approved paint.

D. Acid solutions, steel or any other wool, or any other harsh abrasives shall not be used.

PART 4 - EXECUTION

4.1 MEASUREMENT AND PAYMENT

A. The work of BICYCLE RACKS shall not be measured for payment.

4.2 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of BICYCLE RACKS shall be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000

END OF SECTION 12 93 00

SECTION 14 21 00

ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Provide labor, material, equipment, and services necessary to provide, commission, and maintain the Electric Traction Passenger Elevator system, operable in exterior environment, as shown on the drawings, specified herein, and as otherwise required for a complete working system. Elevator shall meet applicable APTA Heavy-Duty Guidelines and in compliance with Chicago Building Department standards.

1. Elevator schedules at the end of this section indicate required performances, controls, capacities, dimensions, features and finishes for each elevator required for this project.
2. Elevator components, controls and machinery must be non-proprietary.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Concrete: Section 03 30 00.
2. Structural Steel: Section 05 10 30.
3. Decorative Metal: Section 05 70 00.
4. Glazing: Section 08 80 00.
5. Painting: Section 09 91 00.
6. Division 22 Sections, Mechanical.
7. Division 26 Sections, Electrical.
8. Division 27 Sections, Communications.
9. Division 28 Sections, Fire Detection Alarm.

C. Related Work: provide a complete functional elevator system according to the Drawings, Specifications, and Code. Coordinate elevator installation with the work at the station and platform in order to maintain the schedule and to ensure the orderly sequence of the work.

1. Work that must be supplied under other sections include foundation work, elevator pit, structure and enclosure for hoistway, metal (and glass) panel system, temporary lighting for hoistway, hoistway ventilation, guide rail support, lifeline attachments, elevator cab cameras and communication, pit lighting, control space lighting, access doors, sump pit and sump pump in elevator pit and other work as required for a complete operational system.

2. Work that must be provided under other sections also include the construction of a machine room as required for the elevator(s) and include the following, as required: Door, frame, hardware, ventilation, heat, air conditioning, lighting, outlet, switch, electrical service, smoke detector, floor drain, and other items.

3. Coordinate the structural design of the hoistway and coordinate the electrical, mechanical, communication and other requirements for the particular elevator to be used.

4. Pit drainage: Coordinate location of sumps, pumps, pipe, and related wiring.

5. Provide and install an OSHA compliant fiberglass pit ladder; adhere to applicable codes.

D. Coordination Meetings: Coordination meetings shall be held bi-weekly during the elevator construction period with responsible parties to facilitate the coordination and execution of the work.

1.03 REFERENCES

A. ABMA: American Bearing Manufacturer Association.

B. AISI: American Iron and Steel Institute.

C. American Public Transportation Association (APTA): Heavy-Duty Transportation System Elevator Design Guidelines.

D. ASME A17.1, A17.2, A17.5, A17.6; current required edition; Safety Code for Elevators and Escalators.

E. ASTM A36: Standard Specification for Carbon Structural Steel.

F. ASTM B151: Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Rod and Bar.

G. AWS: American Welding Society.

H. Chicago Building Code.

I. FCC: Federal Communications Commission.

J. IBC: International Building Code.

K. ICC A117.1, Accessible and Usable Buildings and Facilities.

L. IEEE: Institute of Electrical and Electronic Engineers standards.

M. Illinois Accessibility Code.

N. NEMA: National Electrical Manufacturer's Association.

O. NFPA 70: National Electrical Code (NEC).

P. NFPA 80: Standard for Fire Doors, Fire Windows.

Q. NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems.

R. USDOJ: 2010 ADA Standards for Accessible Design.

1.04 DEFINITIONS

A. Traction Elevators: Elevators in which cars are hoisted either directly or indirectly by ropes or cables over power-driven traction sheaves, complete with components, equipment, machines, controls, and devices as indicated and as required for safely operating elevators at rated speed and capacity including car enclosures, hoistway entrances, operation systems, signal equipment, guide rails, electrical wiring, roping or cables, buffers, and devices for operations, and for complete elevator installation.

B. Defective Elevator Work: Operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

C. The Code: ANSI/ASME A17.1, Safety Code for Elevators and Escalators.

1.05 PROJECT CONDITIONS

A. Elevator Manufacturer shall certify that hoistway, pit, machine room layout, dimensions, including auxiliary equipment as indicated on Drawings, and electrical service, as shown and specified are adequate for elevator system being provided.

B. Elevators shall not be used for construction purposes or Contractor's use of transporting materials or equipment during construction.

C. Protection: During installation, and until elevator systems are fully operative, make necessary provisions to protect systems from damage, deterioration, injury to pedestrians, the general public, and environmental conditions.

D. Coordination Requirements:

1. Floor finish in cab.

2. Lock and key requirements: coordinate with the Commissioner.

3. Pit Drainage: coordinate location of sump pits, pumps, pipes and related wiring with elevator installer.

4. Safety Training: Contractor shall attend appropriate safety training programs provided by the Commissioner at no extra cost.

5. Methodology: Meet with the Commissioner and provide a written method of installation for approval.

6. Electrical: Coordinate communications, smoke detectors, shunt trip breakers, CCTV, power, and cab lighting requirements.

7. Construction schedule: Coordinate deliveries, installation, and testing.

8. Shop drawings to indicate the individual responsibilities for each component of the elevation system. Noting "by others" is not allowed.

1.06 DESIGN CRITERIA

A. Provide elevators designed for heavy duty transit system usage, capable of being in operation 24 hours per day, 7 days per week.

B. Exterior Installation: Provide units designed to operate while exposed to natural elements such as sunlight, rain, snow, slush, ice, dust, and conditions of relative humidity while exposed to rock salt, de-icing chemicals, and other corrosive elements.

C. Elevator systems shall be designed with provisions for thermal expansion and contraction of the complete assembly.

D. Temperature Control: Maintain the ambient temperature of the elevator equipment rooms, shaft, etc. at a temperature range recommended by the elevator manufacturer. Provide auxiliary heat, air conditioning, and/or ventilation, including equipment, fans, dampers, controls and electrical power, as necessary to maintain that range. Coordinate work with other trades.

1. Push button operation within the cab shall operate fully within this temperature range.

2. The vertical travel distance of the cab shall be uninterrupted within

this temperature range.

1.07 SYSTEM PERFORMANCE REQUIREMENTS

A. The elevator schedules indicate required performances, controls, capacities, and electrical requirements for each elevator or group of elevator systems.

B. Car Performance:

1. Car speed plus or minus 5 percent of contract speed under any loading condition or direction of travel.

2. Car Capacity: Safely lower, stop and hold (per code) up to 125 percent of rated load.

C. System Performance:

1. Vertical Vibration (maximum): 15-17 mg.
2. Horizontal Vibration (maximum): 10-12 mg.
3. Jerk Rate (maximum): 3.3 – 5.25 ft/sec^2.
4. Acceleration (maximum) 1.6 – 2.6 ft/sec^2.
5. In Car Noise: = 55 dB(A).
6. Leveling Accuracy: plus or minus 3 mm.
7. Starts per hour (maximum): 240.

D. Accessibility Requirements: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", Illinois Accessibility Code, and ICC A117.1.

1.08 ACTION SUBMITTALS

A. Product Data: Submit manufacturer’s product literature for each principal component or product specified herein. Indicate capacities, dimensions, design, layout, finishes, accessories, available options, and similar information. Provide information on performance and operating characteristics, features of control system, signals, and operating system. Indicate any variations from specified requirements.

B. Provide product data and shop drawings for required temperature control equipment and installation including auxiliary heat, air conditioning and/or ventilation equipment, fans, dampers and controls.

C. Shop Drawings for each elevator:

1. Dimensioned plans, elevations, sections and large-scale details indicating service at each landing, clearances, coordination with

building structure and relationships with other construction, and details of car enclosures and hoistway entrances.

2. Indicate required hoistway and pit dimensions, showing guide rails, buffers, and other components in hoistway.
3. Indicate maximum rail bracket spacing.
4. Indicate location and layout of elevator equipment, signals, control panels, call stations, indicator lights, graphics, and similar items.
5. Indicate interior and exterior elevator cab elevations and reflected ceiling plan.
6. Indicate any variations from specified requirements plus maximum dynamic and static loads imposed on building structure at points of support.
7. Indicate hoist beam requirements.
8. Indicate access and ventilation for elevator machinery rooms and hoistways; indicate location, sizes, and details of access doors and hoistway door and frames.
9. Indicate clearances between the elevator car, machinery and hoistway.

D. Elevator Machine Room:

1. Provide shop drawings for elevator machine room including plans, elevations, sections and details for construction. Show locations of equipment and panels.

E. Wiring diagram detailing locations and wiring for power, signal and control systems and differentiating clearly between manufacturer-installed wiring and field-installed wiring. Indicate maximum and average power demands; electrical characteristics and connection requirements.

1. Circuits to be organized and numbered.

2. Provide electrical characteristics and connection requirements.

3. Provide the expected heat dissipation of elevator equipment space, elevator shaft and controller space BTU based on maximum possible full load starts per hour.

F. Wiring Schematics: Submit wiring schematics and interconnections for the elevator control and drive system. Also, submit intercom system connection and controls.

1. Submit control wiring diagrams. Control diagrams shall be ladder type. Control diagram rungs/ lines should be numbered. Control points and equipment points i.e. relays should be tagged.
2. Submit control panel layout showing location of equipment installed in the control panel including relays, circuit boards, transformers, power supplies, wiring trays etc.

3. Wiring Schematics: Submit wiring schematics and interconnections for the elevator control and drive system. Also, submit intercom system connection and controls.

G. Samples of exposed finishes of car enclosures, hoistway entrances, and signal equipment.

1. 6 inch by 6 inch square samples of sheet materials.
2. 12 inch lengths of running trim members.
3. Range color samples of car floor finish material for selection by the Commissioner.
4. Provide samples, as requested by the Commissioner, of other elevator components including call buttons, indicator lights, glazing, etc.

1.08 INFORMATIONAL SUBMITTALS

A. Include elevator diagrams to indicate elevator service to each level.

B. Submit elevator manufacturer's project specific QA/QC plan.

C. Provide clash detection log from BIM indicating no conflicts.

D. Elevator Manufacturer shall provide a letter certifying that hoistway, pit and machine room layout and dimensions including auxiliary equipment as indicated on Drawings, and electrical service, as shown and specified are adequate for elevator system being provided.

E. Provide specification compliance checklist indicating components. Indicate deviations from the specifications with explanation of deviation.

F. Provide hoist beam requirements and maximum loads imposed on building structure.

G. Documentation certifying the experience requirements of the manufacturer, certifying the experience of the installer, and a list of completed projects.

H. Include certified test reports on required testing for required temperature control equipment.

I. Pre-acceptance Test Forms

1. ASME A17.1, Safety Code for Elevators and Escalators, Appendix X.
2. ASME A17.2, Guide for Inspection of Elevators, Escalators and Moving Sidewalks, Appendix B.

J. Temperature Control: Provide data and calculations indicating the possible design temperature extremes based on location, environmental conditions and other factors and how the temperature variations will be controlled.

K. Submit a copy of the warranty.

L. Maintenance Programs: Within 60 days after Notice To Proceed is received, and prior to installation, Contractor shall submit detailed interim and revenue service maintenance programs, showing functions to be performed and their scheduled frequency.

1. Provide training video on DVD format. Video shall include the assembly and disassembly of the escalator and components that are utilized in the escalator, lubrication points, location of control and any other areas of service or maintenance.

M. Submit a copy of checklist for use in testing to be performed in accordance with the Code and nonmandatory appendices acceptance tests.

1.09 CLOSEOUT SUBMITTALS

A. Maintenance Manuals: Submit 2 copies of binders for each elevator with documents required by the Code. These shall include but not be limited to documenting the Maintenance Control Program (MCP), cab evacuation plans, operating and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, emergency instructions, and similar information. Include diagnostic, maintenance and repair information available to manufacturer's and installer's maintenance personnel. Include a maintenance and lubrication schedule and directions. Include a copy of the elevator warranty, maintenance agreement, and maintenance schedule.

B. Certificates and Permits: Provide the Commissioner with copies of inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of elevators. One permanent frame for the certificate or operating permit shall be mounted in the car (or alternate location in the Customer Assistant Shelter as approved by the City of Chicago) and a duplicate shall be provided in the cab frame.

C. Diagnostic Tools: Deliver to the Commissioner a laptop computer, cables, and other accessories with diagnostic software and other required software installed for the Commissioner's use.

1. The Latest intel processor, 16 gb ram, 128gb ssd drive.
2. Windows based with latest operating system with non-proprietary program, product data and specifications, Elevator program with input/outputs descriptions, and software installed.

D. Upon completion, record drawings are to be submitted including schematic control wiring and electrical wiring diagrams and electronic and hard copies of

ladder diagrams, logic, program with input/outputs descriptions showing each rung, software, cables and laptop computer windows based with the latest operating system with the non-proprietary program and software installed.

1.10 QUALITY ASSURANCE

A. Manufacturer: Minimum of 10 years of experience in the fabrication, installation and service of elevators of the type and performance specified. The manufacturer shall have a documented quality assurance program.

B. Elevator manufacturing plants and manufacturing and installation processes to operate a quality management system that complies with the requirements of the ISO 9001. The scope of the certification to include design, manufacturing and installation of the elevator components and systems.

C. Installer Qualifications: Engage the elevator manufacturer or an Installer approved by the elevator manufacturer and who has completed the elevator installations similar in material, design, and extent to that indicated for this Project and with a minimum of 10 years of experience installing elevators and has a record of successful in-service performance. Documentation shall be submitted to support this requirement.

D. Regulatory Requirements: Comply with applicable requirements of the following:

1. ASME/ANSI A17.1, Safety Code for Elevators and Escalators (hereafter referred to as the "Code").

   a. Seismic Risk Zone: Project is located in Zone 0.
   b. Earthquake Emergency Operation: Comply with requirements in ASME A17.1.

2. National Electrical Code.

3. Institute of Electrical and Electronic Engineers (IEEE) standards.

4. National Fire Protection Association (NFPA 70, 80, 130)

5. Accessibility Requirements: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", Illinois Accessibility Code, and ICC A117.1.

6. Chicago Building Code: Conform to applicable codes for manufacture and installation of elevator system.

7. Provide and pay for tests and permits.

8. Welding: Welding shall be performed in accordance with the requirements of AWS or CWB Welders shall produce evidence of current certification by AWS or CWB.

9. Labeling: Every elevator controller shall be clearly marked permanently on the controller with rated load and speed, manufacturer serial number, and the designated Owner identification.

10. Obtain and pay for necessary permits, and perform such tests as may be required for acceptance and approval of elevators by jurisdictional agencies.

11. Notify the proper inspectors to witness required testing.

E. Factory Inspections:

1. Provide for the Commissioner's representatives to visit the factory where the elevator control panels are being manufactured. Do not ship the control panels without the written approval of the Commissioner after conclusion of the factory visit.
2. Provide for the Commissioner's representatives to visit the factory where the elevator is being manufactured. Do not ship the elevator without the written approval of the Commissioner after conclusion of the factory visit.
3. Fabrication Hold Points will be established during the course of the project.

1.11 DELIVERY, STORAGE AND HANDLING

A. If the construction site is not prepared to receive the elevator equipment at the agreed ship date, store the equipment in a secure, dry, protected, and easily accessible storage area.

1.12 WARRANTY

A. Warranties: Provide warranty, signed by the Contractor, elevator installer, and elevator manufacturer; guaranteeing to correct failures in the elevator system; replace, repair, or restore defective components, materials and workmanship of elevator work or equipment which occur during the warranty period.

1. Warranty period shall be for 12 months starting on the date of acceptance by Commissioner after test period and Substantial Completion.
2. Test period may commence after acceptance by the City Inspector and will consist of 30 days of continuous operation of the elevator without any interruptions caused by the warrantable defects.
3. Warranty period shall be for premature wear of ropes shall be 3 years.

B. The elevator warranty shall not deprive the Commissioner of other rights the Commissioner may have under other provisions of the Contract Documents and shall be in addition to other warranties made by the Contractor under requirements of the Contract Documents.

1.13 SPARE PARTS AND STOCK

A. Provide adequate spare parts on-site to ensure minimal downtime of the elevators during the warranty period. Spare parts shall include the list below at a minimum.

B. Code parts for replenishment tracking purposes.

C. Parts may be used by the Contractor for maintenance but shall be restocked within two weeks of their use.

1. Spare Parts and Maintenance Material: Provide to Commissioner's designated location, the following spare parts. The parts shall be delivered prior to Substantial Completion.

a. 2 safety/governor assemblies.
b. 4 hoistway door rollers.
c. 2 car door rollers.
d. 4 hoistway door gibs.
e. 4 cab door gibs.
f. 2 electronic door detectors.
g. 1 set of replacement lights for the elevator cab.
h. 1 box of each type of fuses.
i. 2 complete door interlock assemblies.
j. 2 door operator motors.
k. 2 complete pushbutton assemblies for car operating station and hall stations.
l. 4 complete set of brake pads.
m. 2 microprocessor controllers.

PART 2 PRODUCTS

2.01 ELEVATOR SYSTEM

A. Provide AC gearless (Elevator 01) and geared (Elevator 02) type heavy duty electric traction elevator system including machine room subject to compliance with the design and performance requirements of this specification.

B. Elevator components, controls and machinery must be non-proprietary to facilitate the future maintenance of the equipment.

2.02 ELEVATOR MACHINE ROOM

A. Comply with the Code.
B. Contractor to provide an elevator machine room of size and location according

to approved shop drawings that have been coordinated with the elevator manufacturer's requirements, applicable codes and the requirements of subcontractors. Machine room to be sized for the equipment, motors, panels and controls for the specific elevator(s) as well as allow sufficient space for maintenance of the equipment by personnel.

1. Machine room to be of fire rated non-combustible construction per code. Floor of machine room to be structurally capable of supporting the weight and vibration of the equipment.

B. Machine room to be constructed according with materials that have been submitted and approved by the Commissioner.

2.03 MANUFACTURERS

A. Manufacturers that may produce and install elevator systems specified herein include, but are not limited to, the following:

1. Fujitec America, Inc.

2. Kone Elevator Co.

3. Mid-American Elevator Company, Inc.

4. Otis Elevator Co.

5. Schindler Elevator Co.

6. ThyssenKrupp Elevator Co.

2.04 MATERIALS AND COMPONENTS

A. General: Provide manufacturer's standard pre-engineered elevator systems that comply with or fulfill the requirements of the elevator schedule or, at manufacturer's option, provide custom-manufactured elevator systems that will fulfill requirements. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard pre-engineered elevator systems and as required for a complete system. Unpainted, unfinished non-wearing surfaces of elevator and equipment, exterior cab and hoistway, shall be painted three coats alkyd enamel (prime and 2 finish coats) manufacturers standard color as selected by the Commissioner.

B. Equipment and controls shall be of industrial quality and operate under indicated weather conditions and temperature extremes.

C. Elevator Machines and Equipment:

1. Provide manufacturer's AC gearless traction machine where indicated, especially designed and manufactured for this service. It shall include permanent magnet synchronous motor driving motor, direct current electro-mechanical disc brake, and integral traction drive sheave, mounted on a base or bed plate with sound isolation pads. The traction sheave shall be of heavy alloy iron, accurately turned and grooved for the hoist ropes.

    a. The hoisting motor shall be especially designed for elevator service, reversible alternating current type developing high starting torque, operated through Variable Voltage Variable Frequency drive with low starting current and shall be of horsepower for the duty specified. Motor speed shall not exceed 1800 RPM.
    b. Provide friction type over-speed governor rated for the duty of the elevator specified.

2. Power Control: Except as otherwise indicated, provide Solid State Control for the power control system (variable voltage and regenera-tive) in lieu of motor generator system.

    a. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system from solid-state converters.

3. The alternating current motor shall have rotary encoder mounted thereon and suitably coupled. Encoder shall have suitable resolution and shall be compatible with elevator controllers. Motors shall be reversible asynchronous or synchronous type of a design capable of developing the torque required to meet or exceed an acceleration rate of 2 ft/sec^2 for the elevator car. A means to protect the windings and bearings from airborne dust shall be provided.

4. Insulation of windings shall be impregnated and baked to prevent absorption of moisture and oil. The insulation resistance between motor frame and windings shall not be less than one megohm. The motor windings shall stand a dielectric test of twice the normal voltage plus 1000 RMS volts of 60 Hertz, alternating current for one minute. The windings shall have a minimum insulation temperature rating two ratings higher than the actual temperature rise of the motor, with a minimum rating of NEMA class F.

5. Motor leads in the conduit box shall have the same insulation class as the windings. Motor lead wire shall be rated 125 C and shall be sized for 105 C at the motor nameplate amperes at 1.0 power Factor per Electrical Apparatus Service Association (EASA) recommendations. Leads are to be numbered for clockwise rotation when facing opposite the shaft end.

6. The motor shall be designed to the ASME A17.1 rated load

requirements.

7. Inserts: Furnish required concrete inserts and similar anchorage devices for the installation of guide rails, machinery, and other components of elevator work where installation of devices is indicated as work of another specification section or Contract.

8. Cab Frame and Platform: Frame and platform shall be manufacturer's standard welded steel units.

9. Sheaves and Beams: Deflecting sheaves shall be of heavy alloy iron, accurately grooved to fit ropes, of suitable size according to conditions, and fitted with heavy steel shaft, accurately machined of semi-steel of hardness BHN 220-250. The sheaves shall be supported by machine beams furnished and set in place by the Elevator Contractor.

10. Buffers: Substantial spring buffers shall be installed under the cab and counterweight. Buffers in the pit shall be mounted on continuous channels which are fastened to the guide rails. Spring buffers or their equivalent to be permitted to be used where the rated speed is not in excess of 1 m/s (200 ft/min).

11. Brakes: The brake(s) shall be of the self-adjusting fail-safe (spring actuated, direct current and electrically released) type provided with an external manual brake release and of heavy duty construction with proper braking area for the load and speed specified. The brake shall be provided with sufficient power to stop and hold the car with full contract load. Disc or drum brake shall be securely mounted to the shaft and shall run concentric to the shaft. Disc or drum shall be machined to obtain a smooth and accurate face. Drum brakes shall have 2 shoes actuated by two separate compression springs. Disc brakes shall be of caliper or multiple disc design.

12. Ropes: Furnish and install suitable traction steel wire hoist ropes of size and number to insure proper wearing qualities (5 year service life). As a minimum, the number of ropes shall comply with the factor of safety requirements of the Code. Governor ropes shall be of iron or steel. Ropes shall consist of at least six strands of wire wound about a core center.

    a. Accessories attached to the ropes including but not limited to alignment blocks and load sensors shall meet the requirement of the Code. Accessories attached to the ropes shall not impede the individual rope tensioning. Accessories attached to the ropes shall not cause any damage to the ropes. Accessories attached to the ropes shall be specifically designed and manufactured for the elevator use.
    b. Rope alignment blocks and other elevator accessories shall not be made of wood.

13. Electric Wiring: Furnish and install complete necessary insulated wiring

to connect parts of the equipment in conformance with NEMA 4X requirements.

a. Insulated wiring shall have flame retarding and moisture resisting outer cover and shall be run in metal conduit, metallic tubing or wire duct.
b. Traveling cables between cab and hoistway way shall have flame retarding and moisture resisting outer cover. They shall be flexible and shall be suitably suspended to relieve strains in the individual conductors.
c. Insulated conduction and conduit or tubing as well as fittings, including metal boxes, troughs and ducts, shall comply with the requirements of the National Electric Code and applicable local codes.
d. Conduit shall be connected to junction boxes and devices such that moisture is not collected in junction box or device.
e. Connect motors and other components subject to movement or vibration, to the conduit systems with flexible conduit.
f. Provide necessary conduit and wiring.
g. Junction boxes in hoistway and on car shall be equipped with terminal blocks.
h. Cables shall be free from any possible contact with hoistway structure, car or other equipment. Furnish and install shields or pads to protect the cables.
i. Elevator car shall be prewired at the factory. Cab shall be designed to accept necessary wiring and conduit.
j. Traveling cables shall be connected to the cab wiring using military spec connectors. Connectors shall be waterproof, environmental resisting with strain relief, vibration resistant, Mil-DTL-5015, MIL-DTL-26482, MIL-DTL-22992, MIL-DTL-38999, MIL-DTL-28840, MIL-DTL-83723.
k. No exposed wires will be allowed.
l. Low voltage cables (i.e. door sensing bar) shall be routed such that they will not interfere with any moving parts. Low voltage cables shall be neatly routed and attached using vibration damping metal loop clamps
m. Electrical connections outside of electrical panels or junction boxes shall be made using military spec connectors. Connectors shall be waterproof, environmental resisting with strain relief, vibration resistant, Mil-DTL-5015, MIL-DTL-26482, MIL-DTL-22992, MIL-DTL-38999, MIL-DTL-28840, MIL-DTL-83723.

14. Guide Rails and Fastenings: Planed steel tees shall be provided as guides for cab and counterweight. These tees shall be erected plumb within 1/8 inch and fastened securely to the hoistway way framing by heavy steel brackets. They shall be properly located and supported so as to become distorted by eccentric loading. The guide rails shall be connected to steel splice plates. The rail contact surfaces of these plates and the backs of the guide rail ends shall be accurately machined to form smooth joints. The ends of guides shall be tongued and grooved to provide matched joints. Guide rails for the cab and

counterweight shall have sections and properties of which comply with the requirements of the Code. They shall be suitably bottomed in the pit and shall extend the full height of the hoistway.

15. Counterweights, Safeties and Counterweight Guards: Counterweights and safeties shall be located in the hoistway of the elevator which they serve or in a separate counterweight hoistway, subject to the limitations and requirements of the Code.

    a. Counterweight Guards: Unperforated metal guards shall be installed in the pit located underneath the hoistway on open sides of the counterweight runway.
    b. Guards shall extend from a point not more than 12 inches above the pit floor to a point not less than 7 feet nor more than 8 feet above such floor, and shall be fastened to a metal frame properly reinforced and braced to be at least equal in strength and stiffness to 0.0747 inch sheet metal.
    c. For guidelines governing separate counterweight hoistway ways reference the Code.

16. Roller guides shall be equipped with quiet, rubber tire, ball bearing rollers of ample diameter to run on dry unlubricated guide rails and each roller of respective guide shall be maintained in uniform contact with rail surfaces. The cab shall be properly balanced.

17. Bearings: Bearings shall be rated for an ABMA L10 life of 200,000 hours, under fluctuating bearing load. Bearings shall have basic dynamic load ratings housed in oil tight dust proof case and be provided with a sight glass or dipstick method of determining oil level within the case.

D. Elevator Drive System:

1. Non-Regenerative Variable Voltage Variable Frequency Drive. The drive shall be microprocessor and IGBT based using vector control algorithms. The algorithms shall incorporate a motor model to determine the electromagnetic state of the motor. The motor model shall also encompass a temperature compensation algorithm for speed accuracy.
2. Velocity shall be controlled by a feedback loop to within plus or minus 2 percent of contract speed.
3. Floor locations shall be stored in non-volatile memory and not be affected by a loss of power. Stopping accuracy shall be plus or minus 5 mm or less; re-leveling shall be automatic.
4. Resistors shall be provided to absorb the power regenerated by the motor. They shall dissipate power only when the motor is regenerating. Control shall be by IGBT.
5. Maximum total harmonic distortion shall not exceed IEEE Std. 519 to be measured at the elevator disconnect.

E. Inserts: Furnish required concrete inserts and similar anchorage devices for the installation of guide rails, machinery, and other components of elevator work where installation of devices is indicated as work of another specification section or contract.

F. Hanger Support: The hanger support shall be formed steel to provide for the operating equipment.

G. Fascia Plates: Galvanized steel fascia plates shall be provided as required by Code, extending full opening width, from the sill of one opening to the hanger support below.

H. Toe Guards and Dust Covers: Galvanized steel toe guards and dust covers shall be provided as required extending from sill or hanger to the wall to form a gradual slope.

I. Fasteners:

1. Fasteners shall be compatible with materials being fastened.
2. Fasteners shall be furnished with self locking nuts or retaining rings (spring washers, toothed disks).
3. Fasteners shall be equal to or of greater corrosion resistance than the most corrosion resistant metals being fastened.

2.05 CONTROL SYSTEMS

A. General: Provide manufacturer's standard microprocessor-based operation and control system with AC Drive for each elevator or group of elevators of the type indicated, including hardware required to govern starting and stopping; connect, transfer and interrupt power; and to protect the motor from overloading. The system shall also perform car and duplex operational control. The controller shall automatically cut off the motor current and bring the car to rest in the event any of the safety devices are activated. Switches shall be protected from freezing.

B. The controller shall be mounted in a vented, gasketed and heated and air conditioned NEMA 4X cabinet. Each controller cabinet containing memory equipment shall be properly shielded from line pollution. The microcomputer system shall be designed to accept reprogramming with minimum system down time.

1. High voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
2. Auto-transformer: Provide auto-transformer to adjust the main-line supply to the voltage required by the controller and drive.
3. Drive: Provide Variable Voltage Variable Frequency drive system to develop high starting torque with low starting current.
4. Controller Location: In the elevator machine room or as otherwise shown on the drawings.

C. Every elevator controller and electrical panel shall be clearly marked permanently on the controller or electrical panel with rated load and speed, manufacturer serial number, and the designated owner identification.

D. Single Elevator Control - Passenger: Provide microprocessor based "Selective Collective Automatic Operation" as defined in the Code. The elevator should have automatic operation with single automatic pushbutton control.

E. The microprocessor based regulator system shall incorporate linear and proportional amplifiers, precise reference etched circuit boards, and speed feedback provided by the small tachometer generator with output voltage and current proportional to the actual speed of the traction machine motor. Regulator action shall be by electronic comparison of reference signal to feedback signal currents, and when any difference is present, the amplifier shall adjust to reduce the difference. Regulator action shall be modified by a linear acceleration and deceleration etched circuit board to provide smooth and comfortable speed changes.

F. The microprocessor based power controller shall include interfacing pilot electro-mechanical devices as required for accepting the necessary elevator hoistway switches and operating switches. These include, as a minimum, terminal slowdown devices, over travel limit switches, solid state magnetic leveling switches, inspection operation pushbuttons, emergency stop switches and governor over-speed switch. Provide a keypad and software program for controller.

G. Electric Brake: The machine shall be equipped with an electrically released and spring applied direct current brake designed to insure smooth stopping under varying loads.

H. Automatic Leveling: The power unit shall be designed and coordinated with the control so that the cab shall slow down and stop automatically at the floor after transition from contract speed. Cab level shall be maintained automatically within one-quarter inch of the landing by an anti-creep leveling device regardless of any deviation that may be caused by the loading or unloading of the cab. Landing zone detection shall indicate to the control system the position of the cab with respect to the floor level.

1. Positioning system to consist of magnets and proximity switches.

I. Terminal and Final Limit Switches: Provide terminal limit switches designed to automatically stop the cab at the terminal landings, independent of the regular operating device in the cab. The final hoistway limit switches shall be designed to automatically stop the elevator, should the cab travel beyond the terminal landings.

J. Inspector's Operating Station: An inspector's operating station shall be provided on top of the elevator cab consisting of up and down constant pressure buttons and an emergency stop switch. Operating station to include a GFCI 120V duplex outlet and a work light.

K. Pit Emergency Stop Switch: An emergency stop switch shall be provided in the elevator pit, designed to cut off current supply to motor, apply brake and bring the cab to rest independent of the regular operating devices, NEMA 4X.

1. Provide terminal stopping switches.
2. Provide emergency stop switch on the machine.

L. Hoistway Access Switch: A constant pressure key switch shall be provided at the top and bottom terminal floor. Activation of the access switch shall move the cab away from the terminal floor at reduced speed with cab door and hoistway door in the open position for inspection and maintenance, NEMA 4X.

M. Safety and Governor: The safety shall be mounted on the bottom members of the frame and shall be operated by a centrifugal speed governor located in the pit. The safety shall be arranged to stop the cab whenever excessive descending speed is attained and means shall be provided to cut off power from the motor and apply the brake prior to application of the safety. Should the cab be released from the hoist ropes, the safety shall apply instantly and independently of the speed action of the governor. Provide access to governor without removal of equipment.

O. When the elevator is not in service for any reason, the elevator controller shall provide 4 auxiliary contact closures and simultaneous contact opens to operate the "Elevator/Not In Service" graphic and to operate remote equipment. Provide a backlit "Elevator/ Not In Service" sign at each landing.

P. Emergency Return Device: For each elevator provide battery emergency return device interfaced with the elevator control equipment. In the event of either a power failure or a single phase condition the elevator automatically returns to the kiosk level or floor designated by the Commissioner, where doors open to allow any passengers to exit. After expiration of the 2 minute door open interval, doors close and the elevator shuts down until normal power of the 3 phase condition is restored. Doors shall be opened by pressing the door open button from within the car. Other loads such as cab lighting, alarms, and fans shall be connected to the station emergency or standby power system. The elevator recall function shall be programmable.

1. Power Supply: Provide a separate battery powered unit that senses loss of power. Provide power supply units consisting of sealed nickel cadmium or solid gel construction, 12 volt minimum batteries and solid-state components that instantly sense an emergency situation. Furnish batteries that normally recharge to full capacity within 18 hours, which are rechargeable after use, or interim charged, by recycling energy from the elevator controller eliminating need for an independent 120 volt, AC source, battery operated lowering device. Every absorption means for systems designed to operate one elevator at a time, shall be located on the supply side of the elevator disconnecting means.
2. Testing: Furnish two lights and test button on outside of unit which

when illuminated, indicates the emergency return system is activated and the battery charger is functioning. Provide constant pressure button which allows manual activation of the system for test purposes.

3. Auxiliary Contact: Provide 1 normally open type auxiliary contact in the existing main line disconnect switch. Install 2 #18 wires from auxiliary contact to the elevator controller. The auxiliary contact opens mechanically when the main line disconnect switch is placed in the OFF position which allows the elevator to be shutdown without operation of the emergency return unit. The auxiliary contact is in the closed position when main line disconnect switch is in the ON position.
4. Emergency return device shall be a Reynolds & Reynolds Powervator TPVM-480INT-J or an approved equal.

Q. The elevator control system shall be microprocessor based or sealed electro-mechanical relay type. No open type relay controls or switches are acceptable.

R. The elevator control equipment shall contain diagnostic capabilities as required for the ease of complete maintenance.

1. The diagnostic system shall be an integral part of the controller and provide user-friendly interaction between the service person and the controls. Controller shall be mounted in a stainless steel NEMA 4X cabinet. The door of the cabinet shall have a sealed window placed over the fault indicator board within.

2. The main controller shall use an Allen Bradley 10” PanelView Programmable Logic Controller (PLC) or approved equal to control and monitor the status of the elevator. The elevator manufacturer shall provide the communication programming.

3. The PLC racks shall provide space for 2 future single slot modules.

4. The PLC in the remote control panel shall also have hardware and firmware provisions to communicate with interactive operator interface (monitor).

5. The PLC shall store the last 99 faults, accessible via laptop connection, panel view or remote communications.

6. A copy of working programs and software on approved computer medium, as well as in printed program listing shall be provided.

S. Elevator Cab and Hoistway Window Switch: Operable windows in the elevator cab and hoistway way shall be equipped with frame sensors which prevent operation of the cab when any window is in the open position. Provide cylinder cam locks equal to Best Lock Corp. 1E7E4, cam C229 and uncombinated removable core for CXT1 key.

T. Sill heaters shall be provided for openings at cab entrances. Heaters shall be 120 or 208 volts, single phase, controlled by thermostat. Thermostat shall be

provided with minimum ten foot capillary tubing having dry bulb temperature sensor at end thereby permitting thermostat case to be located indoor to prevent unauthorized adjustments.

U. The elevator controller shall monitor critical functions and in the event of a malfunction (which may cause the elevator to stop operating) the controller shall provide 2 contact closures and simultaneous contact opens to operate remote monitoring equipment.

V. The elevator controller shall accept a contact closure provided by the station Fire Alarm Control Panel (FACP). Receipt of the closure shall cause the cab to return to the Customer Assistant's Kiosk level. The operation of the cab shall conform to the requirements of Phase 1 Emergency Recall Operation.

W. Cab Roof Obstruction Detector: In any hoistway with limited over-run the elevator cab shall be equipped with multi beam array devices projecting light beams across the cab roof covering the cab roof entirely. At detection of any obstruction or personnel on the roof of the cab movement of the cab shall be prevented. Post signs in hoistways with limited overhead clearance (NO OVERHEAD CLEARANCE).

X. Provide embedded or standalone hour run time meters and trip meters. This data should be accessible from the main controller panel without the use of the additional software.

2.06 SIGNAL EQUIPMENT

A. General: Except as otherwise indicated, provide manufacturer's signal equipment for each elevator. Provide Hall Call Station Panel and box and Direction Indicators on each landing for each elevator or group of elevators. Provide Cab Call Station Panel and box and Car Position Indicator in each car. For elevator cabs with two doors, provide an additional Cab Call Station Panel and Car Position Indicator at the secondary door. Provide vandal resistant illuminated buttons and signals, which light-up when activated and remain lighted until call or other function has been fulfilled; Raised and Braille Tags; Tactile and Braille Plates; Alarm and Emergency buttons and key switches as required. Panels and components shall be Adams Elevator Equipment Company "Survivor/Plus" design or approved equal by the Commissioner. Fabricate equipment exposed surfaces of stainless steel with manufacturer's standard directional polish to match #4 finish.

B. Furnish and install a system to provide for 2-way communications between the Cab Call Station Panel in each Passenger Elevator cab or each Hall Call Station and the remote CTA Control Center in accordance with Accessibility Standard. Provide communications instrument with the following features:

1. Each instrument shall be fabricated and installed in such a manner that the instrument will appear to be an integral part (as opposed to an obvious "add-on") of the elevator cab control panel or each hall call station. Properly identify communication instrument with the same type of symbols as the cab operating station and hall

call station.

2. Each instrument shall be a heavy-duty hands-free speaker phone, FCC registered, DTMF signaling, telephone line powered. Each instrument shall provide automatic dialing of a preprogrammed telephone number consisting of from 1 to 12 digits, plus control digits for pause. The amount of time for pause shall be cumulative. Each time the pause digit is pressed, the amount of time shall increase for each pause sequence. Each instrument shall provide for pre-recorded message playback, which may be activated by the remote telephone by pressing 1 or 2 DTMF buttons. The instrument shall be equipped with non-volatile memory (no power or battery back-up required) to store the automated telephone number and the recorded message. Each instrument shall be capable of being programmed remotely, using a standard telephone instrument. Programming shall be password protected.
3. Each instrument shall be capable of auto answer allowing incoming calls to be received. (Pre-recorded message shall be available with incoming calls). Each instrument shall be equipped with vandal-resistant LED. (Light Emitting Diode) which shall indicate when a call has been connected (both automatic outgoing or incoming). Each unit shall disconnect automatically after a pre-set time duration. Time shall be programmable by remote telephone instruments and shall be password protected.
4. Instrument shall terminate in the associated elevator equipment room onto the binding posts of terminal blocks provided by the Elevator Contractor. The terminal blocks shall be model RPT12 as manufactured by Reliable Electric/Utility Products or approved equal. The Communications Contractor shall complete the termination of the instruments by splicing onto the jacketed stub.

C. Hall Call Station Panel and and Cab Call Station Panel components to be vandal resistant and waterproof. Mount panels and components as indicated, or scheduled, at height complying with Accessibility Requirements. Provide operating device symbols with markings as required by code, Commissioner, and Accessibility Requirements.

1. Hall Call Station Panel and Box and Indicator: Provide flush-mounted 10 gauge minimum stainless steel panel and box containing call button for each landing served.
2. Cab Call Station Panel and Box and Indicator: Provide flush-mounted heavy gauge stainless steel panel and box inside the cab and containing other buttons, switches and controls required for specified car operation and control. Provide an additional Cab Call Station Panel and Indicator at secondary doors for elevators with two doors.
3. Service panel door lock shall receive 6 pin Best cylinder. Other keyed switches shall be standard keys keyed alike. Cab Call Station panel and box to be factory mounted.

D. Provide the words “NO SMOKING CITY ORDINANCE” by engraving in stainless

steel and fill with red enamel paint. Engrave with 5/8" high Helvetica medium uppercase letters. Show location and spacing of words on elevator shop drawings.

E. Provide new vandal resistant illuminated buttons, size shall be a minimum of 3/4 inch in the smallest size, raised or flush.

F. Car Position Indicator: Provide illuminated-signal vandal resistant jewel Car Position Indicator equal to Adams "Survivor/Plus" design or approved equal by the Commissioner. Locate above car door opening or above Cab Call Station Panel, location in Cab Call Station Panel is not acceptable. Provide an audible signal in connection with an illuminated signal in accordance with Accessibility Standard as the car passes or stops at a floor served. Characters shall be minimum of 1/2 inch high.

G. Service Panel: Provide and coordinate with Cab Call Station Panel and box, components, location and communications.

1. Keyed fan switch.
2. Keyed light switch.
3. Keyed light ray switch.
4. Keyed inspection switch (cylinder).
5. Telephone jack.
6. No glass panel in door.
7. Lock in door to receive 6 pin Best cylinder.

H. Alarm Call Button and Two-way Communication Instrument and Function: Alarm Call Button and Two-way Communications Function shall activate communications instrument to allow passenger to talk to the Customer Assistant's Kiosk and the CTA Control Center. Alarm Call Button shall provide 2 contact closures and simultaneous contact opens to operate remote monitoring equipment. Provide red jewel button. For elevator cabs with two doors, provide an Alarm Call Button and Two-way Communications Function in the panel adjacent to each door.

I. Emergency Stop Key Switch and Bell: Best Lock Corp. Key Switch shall operate function designed to cut off current supply to motor, apply brake, and bring the car to rest independent of the regular operating devices. Turning Key Switch stops car and activates communications instrument to allow passenger to talk to the Customer Assistant's Kiosk and the CTA Control Center. Key Switch shall provide 2 contact closures and simultaneous contact opens to operate remote monitoring equipment. Turning Key Switch reactivates elevator indicator.

J. Hall Call Station: Provide panel and box equal to Adams "Survivor/Plus" with flat face plate and illuminated vandal resistant halo round buttons with visual

signal to indicate when call is registered and when call is answered, but provide single button where only one direction is possible. Provide Tactile/Braille Tags equal to Adams Series A-45l, modified with words and arrow symbol as indicated on the Drawings. Provide components in accordance with Accessibility Standard.

1. Provide "CTA ASSISTANCE" engraved at speaker and vandal resistant button as indicated on the Drawings, with Tactile/Braille Phone Symbol Tag equal to Adams Series A-451. Provide red jewel button.
2. In conjunction with hall lantern device, provide an audible signal in accordance with Accessibility Standard to indicate that a car is arriving in response to a hall call, sound once for the "UP" direction and twice for the "DOWN" direction.
3. Elevator key lockout switch control closes doors if they are open; disconnects power; leaves cab lighting on; operates only when car is at same level as switch.
4. Access Key Switch operates cab from hall station.
5. Provide Best cylinders.

K. Hall Lantern: Provide new Hall Lanterns and box with visible and audible signal in accordance with Accessibility Standard, equal to Adams "Survivor/Plus." New units shall match materials, finishes and mounting method similar to Hall Call Stations.

1. Audible signal shall sound once for the "UP" direction and twice for the "DOWN" direction.
2. Signal shall be visible from the vicinity of the Hall Call Station.
3. Visual elements shall be at least 2-1/2 inches in the smallest dimension, mounted so that their centerline is at least 72 inches above the floor.

L. Hoistway Entrance Door Jamb Tag Raised And Braille Characters: Elevator hoistway entrances shall have raised and Braille floor designations provided on both jambs, equal to Adams Series A-4500 modified 3 inches width by 4 inches height, stainless steel plate, brushed stainless finish characters with black background. The centerline of the characters shall be 60 inches above the finish floor. Characters shall be 2 inches high. Provide "Star" designation in addition to floor designation at landing of main egress indicated on the drawings.

M. Emergency Battery Unit: 12 volt sealed rechargeable battery for emergency cab lighting and alarm bell, duration of 4 hours when not connected to a "reliable source" of power.

N. Fireman's Key Box: Provide and install a fireman's key box, size and design as required and approved by the fire department. Position the box at the level with the Customer Assistant's Kiosk or as directed by the fire department.

O. Backlit/Illuminated "Elevator Not in Service" sign. When the elevator is not in service for any reason, the elevator controller shall provide normally closed and normally open contacts to operate the "Elevator/Not in Service" graphic sign located at each landing.

2.07 PASSENGER ELEVATOR CAR ENCLOSURES

A. General: Except as otherwise indicated, provide car enclosures, of the design and selections indicated on the drawings. Include ventilation, lighting, stainless steel, ceiling finish, stainless steel operable windows, stainless steel wall finish, access doors, doors, power door operators, nickel silver sills (threshold), trim, accessories, and floor finish.

1. Elevator car frame shall be of welded or bolted ASTM A123 galvanized steel channel uprights affixed to crosshead and plank channels with welded or bolted bracing members and gusset plates.
2. The car platform shall be designed to accommodate one-piece loads weighing up to 25 percent of the APTA rated load.

B. Provide stainless steel horizontal sliding doors of design indicated on the drawings, operation and number of panels as indicated. Provide manufacturer's standard protective edge trim system for door and wall panels, except as otherwise indicated.

C. Elevator cab and hoistway shall allow refuge space on top of the cab for personnel according to the applicable ASME/ANSI or other code. Provide the minimum space required from the top of the cab to the lowest point of the equipment at the top of the hoistway.

D. Elevator Car shall be prewired at the factory. Cab shall be designed to accept necessary wiring and conduit.

E. Materials and Fabrication: Provide selections as indicated for each enclosure surface; manufacturer's standards, but not less than the following:

1. Stainless Steel Return, Doors and Frames: 18 gauge doors, 14 gauge frames and return, UNS S31600 No. 4 finish.
2. Stainless Steel Wall Panels: Wall panels to allow for a recessed 4 inch high base consisting of same material as finished floor. Each side of elevator interior cab to be one piece of metal.
3. Stainless Steel Interior Elevator Door and Walls: As selected by the Commissioner, use patterned UNS S31600 Stainless Steel, satin finish, 18 gauge thickness, Pattern No. 5WL/LTH by Rigidized Metals Corp. or approved equal.
4. Nickel silver sills, extruded, ASTM B 151 (alloy UNS No. C74500), with grooved surface, 1/4 inch thickness, mill finish with slotted drains and sill heater.
6. Glass Panels: 9/16 inch thick laminated safety glass permanently

marked in gasket system. See Drawings for design and dimensions. Refer to Section 08 80 00 Glazing for Anti-Graffiti film.

7. Fabricate stainless steel car door frame integrally with front wall of car.
8. Fabricate car with recesses and cutouts for signal equipment.
9. Surround Lighting: LED light fixtures having ballasts rated for reliable lamp starting of -20 degrees Fahrenheit and lens panels of translucent polycarbonate complying with flammability requirements, unless otherwise indicated on drawings. Provide emergency cab lighting per the Code. One light fixture in each cab shall be equipped to provide emergency illumination when required as well as normal power illumination. This fixture shall be located over the cab control station. See Electrical Drawings for lighting fixture type, power supply and drivers, light temperature and intensity (minimum 20 foot-candles).
10. Provide inspection certificate in each cab, mounted under acrylic cover with frame made of polished stainless steel No. 8 finish.

F. Elevator Floor: Elevator cab platform sub-floor to be supported on and welded to metal channels integral with the cab structure. Elevator cab platform sub-floor to consist of one piece galvanized steel plate. A plywood subfloor is not acceptable. Thickness of plate, size and spacing of channels as required for design loads. Set height of platform to allow installation of the finish flooring and to meet and be flush with the top of the elevator door sill.

G. Alternative No. 1: MasterTop SRS Four Coat System Finish Floor:

1. Roughen the metal subfloor by blocking, grinding or other suitable means to achieve a rough, bright, metal surface. Vacuum up any loose dust produced by surface preparation techniques. Substrate to be left clean and dry.
2. Provide and install MasterTop SRS 40TC-102AP Primer strictly according to manufacturer's recommendations and instructions for preparation of the substrate, environmental conditions, mixing of the material, applying the material and curing the material after installation. Primer to be formulated to bond to the metal surface when applied. Unless specified or required otherwise, apply primer at approximately 100 sq. ft. per batch.
3. Provide and install MasterTop SRS 100 PAS Coving to match the floor system strictly according to manufacturer's recommendations and instructions for preparation of the substrate, environmental conditions, mixing of the material, applying the material and curing the material after installation. Cove shall form a tight, permanent attachment and complete seal to the elevator vertical wall substrate. The finish wall panel installation shall be detailed to extend beyond the vertical cove surface and form a "drip" type detail to shed any moisture away from the cove seal to the elevator wall surface.
4. If recommended by the manufacturer for the specific application, provide and install MasterTop SRS 61 BC/SL pigmented self-leveling topping or scratch coat strictly according to manufacturer's recommendations and instructions for preparation of the substrate, environmental conditions, mixing of the material, applying the material

and curing the material after installation. Color as selected by the Commissioner from manufacturer's standard colors. Apply at an even depth. "Porcupine Roll" to release any trapped air. Unless specified or required otherwise, apply overlay coat at approximately 40 sq. ft. per batch at 1/8" thickness.

5. Provide and install colored flakes or aggregate if selected and approved by the Commissioner by broadcasting, completely and evenly covering the overlay coat, to provide a skid and abrasion resistant floor. Apply strictly according to manufacturer's recommendations and instructions. After overlay coat cures, remove excess flakes by sweeping with a medium stiff broom and vacuuming.
6. Provide and install two floodcoats of MasterTop SRS 71TC or Mastertop SRS 53TC methylmethacrylate resin top coat strictly according to manufacturer's recommendations and instructions for preparation of the substrate, environmental conditions, mixing of the material, applying the material and curing the material after installation. Unless specified or required otherwise, apply first top coat at approximately 80-100 sq. ft. per batch. After first coat cures, apply second coat at approximately 100-120 sq. ft. per batch.
7. Flooring system shall be MasterTop 1841 SRS CF specialty resin system as manufactured by BASF Corporation or a similar system submitted to the Commissioner for review and written approval.
8. The resin flooring and cove base system shall be non-porus, self-leveling, flexible and designed to withstand chemicals; withstand moisture infiltration; withstand vibration, loading and impacts without cracking; tightly and permanently adhere and bond to the substrates (elevator subfloor, sill and cab walls) without separating and without allowing infiltration; not delaminate crack or separate; to create a non-slip floor finish; avoid shrinkage; be abrasion resistant; be not affected by extreme variations in temperature and to be capable of withstanding heavy duty usage without deterioration.

    a. The floor system shall have the following properties:

        (1) Tensile shear adhesion to steel minimum 2,200psi.
        (2) Compressive strength minimum 10,500psi.
        (3) Flexiural strength minimum 4,600psi.
        (4) Have heat resistance up to minimum 300 deg F and be self- extinguishing.

9. Color and pattern to be as selected by the Commissioner from manufacturer's standards.
10. Allow floor to cure as recommended by manufacturer of the floor material between coats and upon completion of the floor system.
11. Installation shall be performed by the floor material manufacturer or by an installer certified by the manufacturer to perform the work and experienced with the material.

H. Alternative No. 2: Metal Pan Floor:

1. Fabricate a continuous one piece metal pan floor and base combination

formed from a single stainless steel sheet. The base of the pan shall be 4" high around (except at elevator door sill). The corners and the transition between base and floor shall have a ½" radius. The walking surface shall have a diamond plate type embossed pattern or other surface to avoid slipping. Metal pan floor shall be entirely of one piece stainless steel with no seams, welds or connections.

2. Verify the exact size of the elevator cab and floor so the pan fits precisely over the steel plate elevation floor, up the elevator wall structure and tightly to the elevator door sill.
3. The metal pan, after set flat into place and prior to installation of the finished wall panels of the cab, shall be secured into place with recessed stainless steel screws set ½" from the top of the base.
4. The finished wall panels shall then be installed over (overlapping) the base; covering the top 1" of the base and covering the screws. Seal the joint between the floor and the elevator metal sill with a clear silicone sealant.

I. Car Ventilation: Air handling capacity shall provide one air change per minute based on net interior car volume. Provide one hour of emergency ventilation.

J. Handrails: Provide UNS S31600 stainless steel handrails, on side walls and back wall (unless otherwise indicated to be installed on side walls only); either continuous or one hand rail per wall.

K. Light-ray Protective Device: Provide electronic multi-beam array device projecting light beams across car entrance, which, when interrupted, will cause closing doors to stop and reopen. Provide keyed switch in car operating panel for disconnecting light-ray device without interrupting service.

1. Nudging Feature: After car doors are prevented from closing for a predetermined adjustable time period, through activation of light-ray protective device, a loud buzzer shall sound and doors shall begin to close at reduced rate of speed. Doors shall continue to close unless door light-ray protective device is activated, which shall cause doors to reopen. Process shall repeat continuously until obstruction is removed from entrance.
2. A loud buzzer shall sound if the "door open" button is held for a long period of time.

L. Passenger cab, call station, Customer Assistant intercom system to provide two-way communications between Customer Assistant and the elevator hoist and cab positions. Customer Assistant shall receive signal that communication is needed and shall enable two-way conservation. Provide head end equipment. Locate controls in Customer Assistant Shelter alarm panel.

M. Car-Operating Panel: A UNS S31600 stainless steel No. 4 vertical finish panel shall be provided with vandal resistant push buttons designed to bottom out

against the panel plate and not the contacts, key switches.

2.08 PASSENGER HOISTWAY ENTRANCES

A. General: Except as otherwise indicated, provide stainless steel and laminated glass sliding, door-and-frame hoistway entrances; complete with track systems, hardware, safeties, sills and accessories. Match car enclosure doors for size, number of door panels, glass size and alignment, and door panel movement. Provide frame-section size and profile to coordinate with hoistway wall construction as indicated.

B. Materials and Fabrication: Provide selections indicated; manufacturer's standard, but not less than the following:

1. Stainless Steel Door Panels and Frames: Flush stainless steel construction, 18 gauge doors, 14 gauge frames, UNS S31600 No. 4 finish. Transom shall be 16 gauge.
2. Glass Panels: 9/16 inch thick laminated safety glass permanently marked in gasket system. No glass within 12 inches of floor level; unless approved in writing by the Commissioner and approved by local codes.
3. Nickel Silver Sill with grooved surface 1/4 inch thickness, cast or extruded, mill finish and steel angle (ASTM A36 steel). Sill shall be through bolted to angle, allow for expansion to prevent sill from buckling. Provide nickel silver sills at hoistway openings with sill heater.
4. Switches, door operators and other electrical equipment exposed in the hoistways shall be of waterproof design such that water from floor cleaning operations, rain and snow do not affect equipment operation and be able to operate from minus 10 deg F to 120 deg F.

C. Provide loud alarm bell outside hoistway. Connect bell to emergency stop buttons in cab panels.

D. Door Hangers and Tracks: Furnish and install for each hoistway entrance, a total of two necessary hangers and tracks complete. Hangers shall be of sheave type arranged for two point suspension of the doors. Hanger brackets shall be integral with the door or applied. Sheaves and rollers shall be provided to take the up thrust of the doors. Tracks shall be cold drawn or cold rolled steel of smooth surface and the working section shall be cleaned and oiled with wick type lubricators.

1. Hangers shall be designed for power operation with provisions for vertical and lateral adjustment.
2. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.

E. Car and Hoistway Doors: Doors on the car and at each hoistway landing shall

be operated quietly and smoothly by an electric operator which shall open the car door and hoistway door simultaneously and close the car door and hoistway door simultaneously.

1. An electric contact for the car door shall be provided which shall prevent elevator movement away from the landing unless the door is in the closed position, as defined in the Code.
2. Each hoistway door shall be equipped with a water resistant, positive electromagnetic interlock and auxiliary door closing device so that the elevator can be operated only after the interlock circuit is established. The interlock operation shall comply with the Code and City of Chicago Codes.
3. The door shall open automatically as the elevator is leveling and close either after expiration of a time interval or the moment a car button call is registered. If desired it shall be possible to open the doors manually from within the car.
4. The electronic protective device shall extend the full height of the car door. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.
5. Provide to the Commissioner tools necessary to adjust and maintain the door operator.

2.09 ELECTRICAL COMPONENTS

A. Electrical components shall satisfy the City of Chicago Code.

B. Conduits used in elevator shaft and machine room shall be heavy wall rigid hot dipped galvanized steel except where specified or indicated otherwise.

C. Boxes and fittings in the shaft shall be cast metal or malleable iron. (NEMA 4X) and shall meet ANSI/NEMA FB 1. Threaded type material to match conduit. Electrical boxes exceeding 150 in^3 shall be supported independently.

D. Control equipment shall be mounted in 12 gauge NEMA 4X cabinet with hinged door and heat strip. Controller panel shall be of suitable size to fit required equipment. Equipment and wiring shall be attached to the control panel. There should not be any loose equipment in the control panel whether this equipment was supplied by the elevator controls manufacturer, elevator contractor, communications/signal or electrical contractors.

E. Wiring in the control panel shall be neatly installed and terminated in the terminal blocks. Terminals shall be clearly marked. Components in the control panel shall be identified and matched to components as indicated on the wiring diagram. Wiring shall meet the requirements of Division 26.

1. Each wire and each cable shall be labeled at terminals and at

accessible points in equipment, panelboards, control panels, motor control centers, manholes, handholes, and pull boxes. Labels shall be self-sticking wire markers.

2. Each cable run shall be assigned a circuit number and shall be recorded on a cable schedule showing from, to, purpose, number of conductors and length. Each wire shall be labeled according to the submitted shop drawings and wiring diagrams

3. Cable/wire markers shall be the wrap-around self-adhesive type, with factory or mechanical printed numbers, letters and symbols which shall be used to identify feeders, mains and branch circuit conductors.

4. Conductors shall be tagged on both ends at the time wires are pulled in and tested and markers shall not be removed for any reason.

5. Phase identification letters, in readily visible locations, shall be stamped into the main bus bars of switchboards and panelboards.

6. Cable/wire markers shall be installed on both ends of conductors, both for internal and external cables. The cable/wire markers for external connections shall comply with Section 26 19 50 Identification. The cable/wire markers for internal wires and cables shall be self-adhesive, self-laminating mechanically printed with a clear protective laminating over wrap or mechanically printed with a clear protective laminating over wrap or sleeve type tubing mechanically printed with permanent non smearing ink. Sleeve type wire markers shall be properly sized for the conductor they are being installed on.

F. Cab lighting, fan and alarms shall be connected to a reliable power panel. In case of a power outage, the reliable panel serving these loads shall be connected to the building emergency or standby power system.

G. Recessed lighting in the cab to be LED and ceiling of cab to be a diffuser with a stainless steel frame with prismatic polycarbonate lens, unless otherwise indicated on Drawings.

H. Provide at least 3 sets Auxiliary contacts in control panel for each remote alarms or indications.

1. Emergency alarm.
2. Emergency stop.
3. Elevator malfunctions.

I. Complete wiring diagram showing the electrical connections, functions and sequence of apparatus connected with the elevator (including door operators)

both in machine room and hoistway shall be furnished for review and record.

J. Elevator drive system power requirement to be 208 volts, 3 phase, 3 wire, 60 Hertz terminating in a disconnect switch within sight of the controller.

K. For lighting and GFCI receptacles: 120 volts, 1 phase, 3 wire, 60 Hertz terminating at the elevator controller location.

L. Provide separate disconnect for cab lighting and wiring to cab. Provide a separate disconnect for sill heaters.

M. Due to the probability of vibration at the transit station, cabinets containing motor drives, filter boxes, transformers and power reactors shall be supported on rails and isolated from the base building structure with elastomer pads having a minimum static deflection of 3/8". Connections to and from the cabinetry shall be flexible in order not to compromise the isolation system. Use flexible conduit for the final electrical connection, with other conduit supports and clamps provided on a neoprene sponge insert. Cabinets shall be NEMA 4X.

N. Supply, installation and connections of the main line circuit breaker to be of the lockable type for the elevator.

O. Signal to the controller to indicate special emergency condition due to lobby smoke detector activation; and smoke detectors in the elevator lobby and controller space in accordance with the ASME A17.1 code.

P. Car lighting and fan circuit for the elevators shall be located in the dedicated circuit breaker panel in the elevator machine room. The emergency power breaker to be located in a separate panel located outside the elevator machine room, at a location indicated by the drawings or indicated and approved by the Commissioner.

Q. Electric Heater for the elevator pit: Washdown duty corrosion resistant unit heater. The heating elements shall be corrosion resistant UNS S31600 stainless steel sheathed with UNS S31600 stainless steel fins for maximum heat dissipation. The elements are to be attached to junction box with leak resistant stainless steel fittings. Motor should be TEFC, epoxy coated for corrosion protection.

2.10 CONDUITS AND WIRING

A. Conduit fittings and connections shall be compression type. The use of set screw or indentations as a means of attachment is not permitted.

B. Connect motors and other components subject to movement or vibration, to the conduit systems with flexible conduit.

C. Furnish materials and completely wire parts of the electrical equipment of the

elevators including electrical devices on hatch doors.

D. Solid state and electrical components located on top of the car enclosure or in the hoistway shall be installed within NEMA 4X enclosures.

E. Conduits shall be brought and connected to suitable approved connection boxes at outlets, apparatus and panels.

F. Conduit Sizing, Arrangement, and Support

1. Size conduit per NEC for conductor type installed or for Type THW conductors, whichever is larger; 3/4-inch minimum size for conduit.
2. Conduits for small devices such as door switches, interlocks, etc. shall be permitted at ½ inch.
3. The total overall cross sectional area of the wires contained in any conduit shall not exceed 40 percent of the internal area of the conduit.
4. Arrange conduit to maintain headroom and present a neat appearance.
5. Route exposed conduit parallel and perpendicular to walls and adjacent piping.
6. Maintain minimum 6-inch clearance between conduit and piping.
7. Maintain 12-inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
8. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
9. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit on racks.
10. Do not fasten conduit with wire or perforated pipe straps. Remove wire used for temporary conduit support during construction, before conductors are pulled.
11. No conduit shall be attached to a cable tray or installed within 6 inches of a cable tray or light fitting except for termination.
12. Approved strain boxes shall be installed for vertical runs in accordance with Code.

G. Interlock, hall button and limit switch branch wiring shall be enclosed in flexible steel conduit with covering of liquid tight Type "EF" with connectors having nylon insulated throat.

H. Screws used for terminal connections of wiring (machine room, hoistway and pit) shall be provided with "star washers" of proper size and type.

I. Conductors

1. Unless otherwise specified, conductors, exclusive of traveling cables, shall be 98 percent conductivity copper, solid, for size 10 AWG and smaller, and stranded for size 8 AWG and larger shall be stranded or solid coated annealed copper in accordance with the NEC for Type THHW.

2. Where 16 and 18 AWG are permitted by Code, either single conductor cable in accordance with Code for Type TF, or multiple conductor cable may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant.

3. Insulation Voltage Rating: 600 volts.

4. Insulation: ANSI/NFPA 70, type THHN/THWN, XHHW or THW. e. 5.

5. The use of PVC insulation shall not be permitted.

6. Color Coding: Power conductors identified as to phase and voltage by means of color impregnated insulation, as follows:

Voltage	ØA	ØB	ØC	Neutral	Ground
120/208V	Black	Red	Blue	White	Green
277/480V	Brown	Orange	Yellow	White	Green

For wire sizes No. 8 AWG and larger, color banding tape, minimum 2 inches wide, may be used at accessible locations in lieu of colored insulation.

7. Multiple conductor cable shall have color coding or other suitable identification for each conductor. Conductors for control boards shall be in accordance with Code.

8. No joints or splices shall be permitted in wiring except at outlets.

9. Wiring shall test free from short circuits or grounds. Insulation resistance between individual external conductors and between conductors and ground shall be not less than one meg-ohm.

10. Where size of conductors is not given, capacity shall be such that maximum current shall not exceed limits prescribed by Code.

11. Equipment grounding shall be furnished and installed. Ground conduits, supports, controller enclosures, motors, platform and car frames, and other non-current conducting metal enclosures for electrical equipment in accordance with Code. The ground wires shall

be copper, green, insulated and sized as required.

12. Terminal connections for conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Code. The Contractor may at his option make these terminal connections on No. 10 or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.

13. Provide necessary conduit and wiring.

J. Traveling Cables

1. Traveling cables from junction box on car to junction box in hoistway shall consist of flexible traveling cables conforming to the requirements of Code.

2. Junction boxes in hoistway and on car shall be equipped with terminal blocks. Connections to terminal blocks shall be made with either terminal eyelet connections or pressure wire connectors of the clamp type that meet UL 486 requirements for stranded wire.

3. Terminal blocks shall have permanent indelible identifying numbers for each connection. The outer covering must remain intact between junction boxes. Abrupt bending or twisting producing distortion of cable is not permitted.

4. Cables shall be free from any possible contact with hoistway structure, car or other equipment. Furnish and install shields or pads to protect the cables.

5. Travel cables shall include, as a minimum:

   a. 2 coaxial cables shielded for the CCTV system.
   b. 4 twisted shielded pairs for security and telephone systems. Cables shall be 100 percent interchangeable and shall be compatible with the Nitek EL 1500CW Coax IP Extender or an approved equal.
   c. Provide separate traveling cables for car lighting and fan control circuits.
   d. Provide traveling cable for telephone in the elevator car. Cable shall extend from junction box in hoistway to car junction box.
   e. Provide traveling cable for car work lights. Cable shall extend from junction box in hoistway to car junction box.
   f. Provide 25 percent spare wires (control and shielded) in the traveling cable from the hoistway to the cabinet in the elevator cab.
   g. The traveling cable shall be wired directly from the controller to

the elevator with no hoistway junction box.

h. The emergency stop switch in the car shall be connected to alarm bells in a manner that will cause the bells to ring when the emergency stop switch is in the "On" position.

i. Cable supports that shall be located as to reduce to a minimum the possibility of damage due to the cables coming into contact with hoistway construction or equipment in the hoistway.

j. Traveling cable shall be Draka Superflex® Traveling Cable or an approved equal.

k. The traveling cable should be protected and covered to avoid damage to cable.

6. Car and hoistway junction boxes shall be provided for on the top of the elevator cab.

7. Cables shall include ten percent spare wires between each controller, selector, and hoistway junction box, spares to be properly tagged or otherwise identified with clear and indelible markings.

8. Insulated wiring, control wiring and wiring in traveling cables shall be tag coded at their terminals in the motor room, and hoistway junction box, elevator cab junction box, and push-button stations within the cab, and shall agree with the approved wiring diagrams.

9. The traveling cable shall be wired directly from the controller to the elevator with no hoistway junction box.

10. The emergency stop switch in the car shall be connected to alarm bells in a manner that will cause the bells to ring when the emergency stop switch is in the "On" position.

2.11 LUBRICATION

A. Provide grease fittings at bearings requiring periodic lubrication including automatic feed compression type grease cups. Lubrication points shall be visible and easily accessible.

2.12 INTERCOMMUNICATION SYSTEM AND OPERATION

A. The work shall include the furnishing and installation of a system to provide for 2-way communications between the cab control panel in each Passenger Elevator cab or each Hall Call Station and the Customer Assistant's Kiosk and the remote CTA Control Center in accordance with Accessibility Standard. The phones on the outside of the elevator should call the customer assistant booth and the phone inside the elevator should call the CTA control center. The call to the control center should also be recognized as an elevator call. Provide communications instrument with the following features:

1. Each instrument shall be fabricated and installed in such a manner that the instrument will appear to be an integral part (as opposed to an obvious "add-on") of the elevator cab control panel or each hall call station. Properly identify communication instrument with the same type of symbols as the car operating station and hall call station.
2. Each instrument shall be a heavy-duty hands-free speakerphone, FCC registered, dual tone multifrequency signaling, telephone line powered. Each instrument shall provide automatic dialing of preprogrammed telephone number(s) consisting of from 1 to 12 digits, plus control digits for pause. The amount of time for pause shall be cumulative. Each time the pause digit is pressed, the amount of time shall increase for each pause sequence. Each instrument shall provide for pre-recorded message playback, which may be activated by the remote telephone by pressing one or two DTMF buttons. The instrument shall be equipped with non-volatile memory (no power or battery back-up required) to store the automated telephone number and the recorded message. Each instrument shall be capable of being programmed remotely, using a standard telephone instrument. Programming shall be password protected.
3. Each instrument shall be capable of auto answer allowing incoming calls to be received. (Prerecorded message from INTERCOMMUNICATION SYSTEM AND OPERATION shall be available with incoming calls). Each instrument shall be equipped with vandal-resistant LED. (Light Emitting Diode) which shall indicate when a call has been connected (both automatic outgoing or incoming). Each unit shall disconnect automatically after a pre-set time duration. Time shall be programmable by remote telephone instruments and shall be password protected.
4. Instruments shall terminate in the associated elevator equipment room onto the binding posts of terminal blocks provided by the Elevator Contractor. The terminal blocks shall be model RPT12 as manufactured by Reliable Electric/Utility Products or approved equal. The Communications Contractor shall complete the termination of the instruments by splicing onto the jacketed stub.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to commencing elevator installation, examine hoistways, hoistway openings, pits, sumps, drainage, and machine room areas, as constructed; verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed. Notify the Commissioner in writing of any dimensional discrepancies or other conditions detrimental to the proper installation or performance of elevator work. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

1. Dimensional tolerance of hoistway from shop drawings: -0 inches +2

inches. Do not begin work until dimensions are within tolerances.

2. Verify projections greater than 2 inches are beveled not less than 75 degrees from horizontal.
3. Verify landings have been prepared for entrance sill installation.
4. Verify elevator pit has been constructed in accordance with requirements, is dry and reinforcement to sustain vertical forces, as indicated in approved submittal.
5. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.
6. Verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including sleeves and penetrations.
7. Verify installation of GFCI protected 15-amp in pit and adjacent to each signal control cabinet in control space.

3.02 PREPARATION

A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

B. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.

1. Ensure adequate support for entrance attachment points at landings.

C. Coordinate wall openings for hall push buttons, signal fixtures and sleeves.

D. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.

E. Coordinate interface of elevators and fire alarm system and smoke detectors.

F. Coordinate interface of dedicated telephone line, communication equipment, and security system.

G. Coordinate work with other trades, including electrical.

3.03 CONSTRUCTION OF ELEVATOR MACHINE ROOM

A. Construction of the elevator machine room to be completed prior to installation of the elevator.

3.04 INSTALLATION OF ELEVATOR SYSTEM

A. General: Comply with manufacturer’s instructions and specifications for work required during installation.

B. Welded Construction: Provide welded connections for installation of elevator

work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of won parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Coordination: Coordinate elevator work with work of other trades for proper time and sequence to avoid construction delays. Use established benchmarks, lines, and levels to ensure dimensional coordination of the Work.

D. Sound Isolation: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts designed to effectively prevent transmission of vibrations to structure and thereby, eliminate sources of structure-borne noise from elevator system.

E. Install equipment, guides, controls, car and accessories in accordance with manufacturer's installation methods and recommended practices.

F. Locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration structure.

G. securely fasten hoistway frames to fixing angles mounted in the hoistway.

H. Lubricate operating parts of systems, including ropes, in accordance with manufacturer's recommendations.

I. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

J. Leveling Tolerance: Leveling 1/4 inch, up or down, regardless of load and direction of travel. Guide rail alignment within 1/8 inch in 12 feet not to exceed 1/4 inch overall, plumb and parallel.

K. Set sills flush with finished floor surface at landings, use non-shrink, non-metallic grout, minimum 3,000 psi if required. Coordinate with other trades to facilitate and ensure proper grouting of sills.

3.05 ADJUSTMENTS

A. Perform final adjustments and necessary service prior to substantial completion.

B. Adjustments and changes to the elevator software shall be documented.

Provide the software revision log. Provide final version of the elevator program using media compatible with the elevator controllers.

3.06 FIELD QUALITY CONTROL

A. Acceptance Testing: Upon substantial completion of each elevator installation, and before permitting use of elevator (either temporary or permanent), perform acceptance tests as required and recommended by the Code and by governing regulations or agencies. Submit acceptance test certificates and forms to Commissioner for review and approval.

B. Operating Tests: Load each elevator to its rated capacity and operate continuously for 30 minutes over its full travel distance, stopping at each level and proceeding immediately to the next. Record failures of elevator to perform as required.

C. Advise the Commissioner at least 7 business days in advance of dates and times tests are to be performed on elevators.

3.07 PROTECTION AND CLEANING

A. Provide suitable protective coverings, barriers, devices, signs, or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout installation period.

B. Upon acceptance by the Commissioner or when directed, remove protection and clean exposed and finished surfaces.

C. During installations; and until elevator systems are fully operative, Contractor shall make necessary provisions to protect systems from damage, deterioration, injury to public and environmental conditions.

3.08 DEMONSTRATION

A. Instruct the CTA's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train the CTA's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions. Confer with the CTA on requirements for a complete elevator maintenance program. Provide manuals for material covered in the training program. The training shall take place at the discretion of the Commissioner at any time prior to the end of the warranty period.

1. Provide 3 –8 hour sessions.

2. Additionally, supply a 60 minute (minimum) video tape describing:

   a. Daily maintenance.
   b. Emergency procedures.
   c. Troubleshooting procedures for electrical and mechanical failures and malfunctions.

B. Make a final check of each elevator operation with the CTA's personnel present and just prior to date of Final Completion. Determine that control systems and operating devices are functioning properly.

1. Manufacturer, with CTA's personnel present, shall demonstrate and test the use of the diagnostic software and hardware to be supplied to the CTA with the elevator installation.

3.09 TESTING AND INSPECTIONS

A. Testing to be performed in accordance with the Code and nonmandatory appendices acceptance tests.

B. Submit testing and inspection plan for Commissioner's approval.

1. Plan shall include but is not limited to tests and inspections as described in the Code.
2. Describe the methods of inspection and testing.
3. Submit list of testing apparatus and equipment including calibration certificates.
4. Submit the list of measuring equipment. i.e. feeler gauges, micrometers etc. with the appropriate calibration certificates.
5. Submit drawings, schematics and written principles of operation of any non-standard or custom build apparatus used to perform the tests.
6. Submit the list of conformance parameters for the elevator.
7. Test pass and fail criteria.

C. Contractor to perform acceptance tests and inspections required by the Code, prior to scheduling inspections required by jurisdictional agencies.

1. Notify Commissioner to witness tests.

D. Contractor to notify the proper inspectors to witness required testing.
E. The elevator systems, including the emergency power return system shall be fully tested for operating conditions.

1. Emergency power return system to be tested under the conditions of a total power loss to the elevator system. In order to verify that the emergency return system is fully operational, this test shall be conducted in the manner of shutting off the main breaker to the elevator power panel. This test shall be conducted in the presence of the Commissioner.

F. The elevator software, including diagnostic software, shall be fully tested.

3.10 PROTECTION

A. Protection: Protect materials and finishes from damage until final acceptance of the work by the Commissioner. Provide protective coverings on surfaces, remove just prior to final inspection for acceptance of the Work.

3.11 WARRANTY INSPECTIONS AND TESTS

A. In addition to any warranty provisions covered by these specifications, the Contractor shall perform periodic inspections and tests of the elevators and associated systems and controls. Required inspections and tests shall be performed as outlined in the Code.

B. As part of the inspections, inspect and adjust machinery, and replace any parts showing undue wear, or tendencies toward malfunction, or any items indicating a need for modifications or design change. Adjustments and changes to the elevator software shall be documented. Contractor shall provide the software revision log. Contractor shall provide final version of the elevator program using media compatible with the elevator controllers. This shall be furnished as part of the guarantee obligation by the Contractor.

C. Prepare and submit a written report indicating the results of inspections and tests outlined in the latest version of the Code.

D. Submit a written report stating the condition of the equipment, outlining any modifications to the maintenance specifications or operational procedures and respond in writing to questions raised by the Commissioner.

E. The inspections and tests shall be performed by the Contractor’s service representative. Costs involved with each of these inspections and tests, such as travel, accommodations, international charges, fees, tools, equipment and part costs, shall be paid in full by the Contractor.

F. Notify the Commissioner in writing at least 2 weeks prior of the intent to conduct the elevator warranty inspections and tests.

G. The inspections shall be conducted Monday to Friday during non-rush hour periods. The inspections shall take place during the warranty period of each elevator installation. The Commissioner’s representative will accompany the Contractor on the inspections.

3.11 MAINTENANCE SERVICE

A. Initial Maintenance Service: Provide full maintenance service by skilled, competent employees of the elevator Installer for period of 12 months following date of acceptance from City inspector. Include monthly preventive maintenance, performed during normal working hours, for repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation in conformance with specified requirements. Copy of monthly inspection and maintenance reports are to be sent to the CTA's Elevator Department. Use parts and supplies as used in the manufacture and installation of original equipment. Perform maintenance, including emergency callback service, during normal working hours. Include 24-hour-per-day, 7-day-per week emergency callback service. Response time shall be 2 hours or less for normal callback service and 1 hour or less for emergency callback service. Exclude only repair or replacement due to misuse, abuse, accidents, or neglect caused by persons other than Installer's personnel.

ELEVATOR SCHEDULE - TRACTION PASSENGER UNITS

Elevator Type:	Gearless Electric Traction (Elevator 01) Underslung Geared Electric Traction (Elevator 02).
Elevator Quantities:	As indicated on drawings.
Capacity :	2,500 pounds min. (Elevator 01) 2,000 pounds min. (Elevator 02)
Rated Speed:	200 feet per minute (Elevator 01) 150 feet per minute (Elevator 02)
Travel Distance:	As indicated on drawings.
Number of Landings:	As indicated on drawings.
Openings:	As indicated on drawings.

Note: Travel distances are not guaranteed, verify measurements in the field.

Stops: Normal and Emergency Operation:

3 (Elevator 01)

2 (Elevator 02)

Machine:	A.C. motor.
Operation:	Simplex.
Control System:	Solid- state-microcomputer.
Auxiliary Operations:	Emergency power operation, all levels.
Signal Equipment:	As Specified.
Car Enclosures:	As indicated on Drawings and required by Accessibility Requirements.
Height:	8’-0” minimum ceiling height inside cab.
Door Type:	two speed, side slide, power operator (Elevator 01). two speed, side slide, power operator (Elevator 02).
Machine Location:	Inside the Machine Room.
Control Space Location:	Control Room (Elevator 01). Machine Room (Elevator 02).
Car Performance:	Car speed plus or minus 5 percent of contract speed under any loading condition or direction of travel.
Car Capacity:	Safely lower, stop and hold (per code) up to 125 percent of rated load.
System Performance:	Vertical Vibration (maximum): 15-17 mg. Horizontal Vibration (maximum): 10-12 mg. Jerk Rate (maximum): 3.3 – 5.25 ft/sec$^{2.}$ Acceleration (maximum): 1.6 – 2.6 ft/sec$^{2.}$ In Car Noise: = 55 dB(A). Leveling Accuracy: Plus or minus 3 mm. Starts per hour (maximum): 240.
Finish:	Stainless steel interior with glazing where shown (windows to open for cleaning), perimeter lighting soffit.
Hoistway Entrances:	Stainless steel frames, glazed stainless steel

doors.

Additional Requirements: Heat trace sills.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

The Work of ELECTRIC TRACTION ELEVATORS shall not be measured for payment.

4.02 PAYMENT

No separate payment shall be made for the work covered in this section. Payment for the Work of ELECTRIC TRACTION ELEVATORS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK

4.03 PAY ITEM ACCOUNT NUMBER

Architectural Work: 090000.

END OF SECTION

SECTION 14 30 00

TRANSIT SYSTEM ESCALATORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Provide labor, material, equipment, and services necessary to provide, commission, and maintain the heavy-duty transit system escalator, operable in exterior environment, as shown on the drawings, specified herein, and as otherwise required for a complete working system. Escalator shall meet APTA Heavy-Duty Escalator Design Guidelines and in compliance with Chicago Building Department standards.

B. Provide Escalator enclosure and support infrastructure as indicated on the drawings.

C. Related Work: Coordinate the work at the station in order to maintain the schedule and to ensure the orderly sequence of the work. Provide templates, sleeves, inserts, and anchoring devices to station contractors for installation under their contract.

D. Related Sections:

1. Cast-in-Place Concrete: Section 03 30 00.
2. Structural Steel: Section 05 10 30.
3. Plumbing: Division 22 00 00
4. Electrical: Division 26 00 00

1.03 APPLICABLE CODES, STANDARDS, AND PUBLICATIONS

A. Regulatory Agencies: Escalator design, materials, construction clearances, workmanship and tests shall conform to state and local codes and the requirements of regulatory agencies. Any additional requirements imposed by local agencies shall be incorporated into escalator installations and considered incidental to the contract.

B. Obtain and pay for necessary permits, inspections and perform such tests as may be required for acceptance and approval of escalators by jurisdictional agencies.

C. Escalator designs and installations shall be of the heavy-duty, transit-service type and shall be in accordance with:

1. American National Standards Institute: ANSI/ASME A 17.1, except sections 800 and 801; "National Electric Code (NFPA 70)."
2. USDOJ's "2010 ADA Standards for Accessible Design", Illinois Accessibility Code, and ICC A117.1.
3. Institute of Electrical and Electronic Engineers (IEEE) Standards.
4. National Electric Code.
5. Underwriters Laboratories, Incorporated (U.L.).
6. National Fire Protection Association (NFPA 70 "National Electrical Code", NFPA 80 "Fire Doors and Windows", NFPA 130 "Fixed Guideway Transit System").
7. Chicago Building Code: Conform to applicable codes for manufacture and installation of escalator system.

D. In case of a conflict between codes, regulations, or standards, the most stringent requirement shall take precedence.

E. Welding: Welding shall be performed in accordance with the requirements of AWS D.1.1. Welders shall produce evidence of current certification by the American Welding Society.

1.04 REFERENCES

A. ANSI/ASME A17.1 – Safety Code for Elevators and Escalators.

B. American Public Transportation Association (APTA) – Heavy-Duty Escalator Design Guidelines.

C. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.

D. ASTM A90 – Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles With Zinc or Zinc-Alloy Coatings.

E. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

F. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

G. ASTM A240/A240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

H. ASTM A264 – Standard Specification for Stainless Chromium-Nickel Steel-Clad Plate, Sheet, and Strip.

I. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

J. ASTM A385 – Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).

K. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

L. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

M. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.

N. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

O. SSPC-SP-6 - Surface Preparation Commentary for Steel and Concrete Substrates, Commercial Blast Cleaning, The Society for Protective Coatings.

1.05 DEFINITIONS

A. Manufacturer: The manufacturing firm responsible for furnishing, including but not limited to the fabrication, assembly, packaging, handling, storage, delivery and installation of the escalator.

B. Heavy-duty Transit Escalator: An escalator designed in substantial compliance with the APTA Heavy-Duty Escalator Design Guidelines, specifically for transit system usage. Substantially different from commercial units in the design of truss, machine, step chain, step chain tension device, steps, brake, and other components/equipment.

C. Flat Steps: Number of flat steps shall be measured from edge of comb plate in horizontal direction to first exposure of a riser, at upper and lower landings.

D. Working Points: Points of intersection of step nosing line and the horizontal line of the top and bottom landing plates at finish elevation.

E. Special Tools: Tools designed specifically for tasks associated with escalator examinations, maintenance, and repair, or those which are required for these tasks and are not readily available through normal purchasing channels.

F. Step Width: The horizontal distance between skirt panels.

G. Escalator Support: Supports provided at the upper, lower and intermediate supports needed to support the total loads of the escalator.

H. Slip Joints: A slip joint is a sliding joint required to support escalators in transit system applications.

I. Static Brake Load: The maximum accumulation for the total number of exposed steps on the incline.

J. Dynamic Brake Load: Minimum peak average load running in down direction on exposed steps on the incline.

K. Motor Duty: Continuous operations with a minimum average peak step load.

L. Operational Conditions Duty requires that the escalator be designed for usage of at least 140 hours continuous operation per week. During any 1/2 hour of any 3 hour

period the escalator shall be designed to carry a load reaching 100% of the dynamic brake load.

M. The Code: ANSI/ASME A17.1, Safety Code for Elevators and Escalators.

1.06 PERFORMANCE REQUIREMENTS

A. General: Escalators shall be designed with provisions for thermal expansion and construction of complete escalator assemblies due to changing ambient conditions as well as any movement of the facility caused by trains braking when fully loaded. Escalators shall be of the heavy-duty type for use in transit systems.

B. No wood nor wood products shall be permitted in escalator systems, except in the enclosure as noted.

C. Operational Requirements: Hours of operation shall be considered as 24 hours per day, 7 days per week. Direction of travel shall be considered as either direction, and unit shall be up and down reversible. Speed of operation shall be 90 or 100 FPM based on manufacturer's standard advertised rate. The no load to full load speed shall not exceed + 4% of the advertised speed.

D. Structural Requirements: Contractor shall provide escalator truss mounting angles and truss supports with attachments, sized as required to install escalators into wellway structural support system as indicated on the Drawings.

1. Loads Indicated: Shall be computed for heavy-duty transit system type escalators as described herein.

a. Escalator intermediate support points shall be provided by Contractor where required. Details and calculations shall be submitted by Contractor for approval by the Commissioner.
b. Loads were computed assuming escalators shall not require a separate machine room outside of truss envelope.

2. Static Brake Load: The Load per step, 40 inch wide step 674 lbs.
3. Dynamic Brake Load: 40 inch wide step 320 lbs.
4. Motor Duty: 40 inch wide step 320 lbs.
5. Step Chain Load: 40 inch wide step 320 lbs.

E. Temporary and Permanent Electrical Power Services:

1. For the escalator drive systems: 480 volts, 3 phase, 3 wire, 60 hertz terminating in a disconnect switch in the escalator pit.
2. For lighting and receptacles: 120 volts, 1 phase, 3 wire, 60 hertz terminating in the escalator pit.
3. Temporary power for installation will be made available to Contractor after setting of truss. Permanent power will be made available for testing.

F. Environmental Operations Requirements:

1. General: Escalators shall be capable of operating with full specified performance capability while exposed to climatic and environmental conditions. Escalators shall be designed to operate while exposed to the natural elements of weather, including sunlight, rain, slush, snow and ice; conditions of relative humidities while exposed to road salt, airborne dust, and debris; and in a dry bulb temperature range of minus 20 deg F to plus 120 deg F.
2. Temperature Control: The ambient temperature of the escalator equipment in equipment rooms or in the pit must be maintained at a temperature range recommended by the manufacturer. Contractor to provide auxiliary heat, air conditioning and/or ventilation, including equipment, fans, dampers, controls and electrical power, as required to maintain that range. Provide product data and shop drawings for Authority's approval. Provide data and calculations indicating the possible design temperature extremes based on location, environmental conditions and other factors. Coordinate work with other trades.
3. Sound Level: Escalators and equipment shall be designed to operate at or below 65 dBA taken at 5 feet above and 3 feet behind the comb area at each end, with the escalator operating normally, either free- running or under load. Transient noise shall not exceed 60 dBA measured using the fast meter response. An ambient level not to exceed 49 decibels shall be maintained prior to units being turned on.
4. Vibration: Escalator shall be factory tested for vibration levels. A maximum velocity reading of 0.4 of an inch per second shall not be exceeded. The metering device used to perform the test shall be a Bruel and Kjaer Model No. 2516 Integrating Vibration Meter. Readings shall be taken throughout the exposed travel of steps.

    a. Bearings shall be rated for an AFBMA L10 life as specified, under a fluctuating bearing load. Bearings shall have basic dynamic load ratings and a life of 200,000 hours.

5. Fire Protection: Fire protection shall comply with requirements as defined in the Code and NFPA No. 130, "Fixed Guideway Transit System." Provide escalators constructed of non-combustible materials throughout, with the exception of step side plates, handrails, handrail rollers, chain step wheels, and electrical equipment, as defined in ASTM E 136. Handrails shall have a flame spread rating of less than 200, when tested in accordance with ASTM E 84.

G. Manufacturer and installer of escalator shall have a minimum of 5 years of experience in the manufacturing and/or installation of equipment comparable to that specified, in the geographical area. Provide references upon the Commissioner's request.

1.07 ACTION SUBMITTALS

A. Shop Drawings:

1. Scale drawings of escalator truss in profile and plan, escalator balustrade, and vertical section through balustrade and truss midway between working points.
2. Indicate truss stanchions; track system and supports; drive system; step nosing radius at upper and lower ends; drive chains and gear train; step chain or step links (including chin pitch, step, and trailer wheels); step assembly (including axle, step tread, frame, and riser); handrail system (including profile,

guides, drive, and tension device); support details (including upper, lower, intermediate, and slip joint); balustrade deck cover; interior panels, skirt panels, and their moldings; safety switches and operating devices; motor and emergency brakes; floor plates; speed governor; metal gauges; radial, vertical, and horizontal dimensions required for manufacture, and positions of lower and upper working points; attachment of truss to structure; major mechanical and electrical components within truss; drainage and electrical interfaces; hand and finger guards; ceiling intersection guards; passenger instruction signs; emergency stop button; sump pit access panel and operating panel in upper and lower balustrades (including stop button, start and direction selection switches, and fault finder receptacle). Also, a complete schematic diagram shall be provided for the controller and electrical devices.

3. Wiring diagrams detailing locations and wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed wiring and station-contract-installed wiring. Indicate maximum and average power demands.
4. Such other drawings hereinafter specified or required.

B. Product Data:

1. Complete product data and technical literature of escalator, equipment and accessories.
2. Bearing ratings, identification and catalog numbers shall be provided.
3. Test certificates for step chain shall be provided for approval. Include test results for handrail drive chain and skirt/step clearances.

C. Samples: Submit samples of finish of materials, appliances, and accessories for exposed finished components. Label each sample with names of project, Contractor, and manufacturer.

1.08 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Engineer.

B. Escalator truss structural design calculations performed and sealed by a qualified Engineer.

C. Schedule: Coordinate the Work with the Commissioner and provide a written schedule for the Commissioner’s approval.

D. Within 30 calendar days after Notice To Proceed is received from the Commissioner, provide equipment layout plans, structural loadings, operating control locations, clearance dimensions, manuals and necessary information for the final station well ways for Commissioner review.

E. Maintenance Programs: Within 60 days after Notice To Proceed is received, and prior to installation, Contractor shall submit detailed interim and revenue service maintenance programs, showing functions to be performed and their scheduled frequency.

1. Provide training video on DVD format. Video shall include the assembly and disassembly of the escalator and components that are utilized in the escalator, lubrication points, location of control and any other areas of service or maintenance.

F. Submit a copy of checklist for use in testing to be performed in accordance with Code procedures and nonmandatory appendices acceptance tests with additions or adaptations.

1.09 CLOSEOUT SUBMITTALS

A. Manuals: furnish operating and maintenance data in accordance with the requirements of the Section 01 70 00, "Contract Closeout" and herein. Submit 2 complete sets of operation and maintenance manuals for approval. After Commissioner approval and prior to the beginning of acceptance testing, 5 sets of the approved manuals shall be provided. The manuals shall include the following:

1. Complete table of contents.
2. Complete instructions regarding operation and maintenance of equipment, including disassembly and assembly of drive system, handrail drive assembly, and track system. Included shall be complete illustrated, exploded views of assemblies, and a complete, illustrated, exploded view for identifying system parts.
3. Complete nomenclature of replaceable parts, part numbers, current cost, and warehouse location. If product source is another vendor, include name and address of other vendor.
4. Sample copies of a proposed preventative maintenance chart.
5. Descriptions of safety devices.
6. Safety rules, tests, and procedures, including testing of systems and sub-systems.
7. Procedures for adjusting brake, handrail tension, handrail chain drive tension, step chain tension, track system, and mechanical components, including pictorials.
8. Instructions for removing floor plate, replacing comb segments, and removing and installing steps and interior panels.
9. Troubleshooting techniques.
10. Detailed lubrication and cleaning schedule indicating weekly, monthly, quarterly, semi-annual and annual lubrication; and a description of each lubrication point, lubrication type, and specification.
11. Control and schematic electrical wiring diagrams of controller, including wiring of safety devices to connections with remote indication and control panels.
12. Electrical layout showing placement of lighting, light switches, receptacles, light fixtures, disconnect switches, and convenience outlets in machinery room, truss envelope, and pits.
13. Complete detailed drawings and wiring diagram of escalator fault-finding device and connection to annunciator panel.
14. The escalator manufacturer shall provide certification, in writing and signed by an officer of the organization, that the Commissioner shall be provided with copies of information, correspondence, bulletins, newsletters, manuals, techniques, procedures, drawings, sketches, and documents related to maintenance, safety, operations, design changes, modifications, retrofits, etc.,

which relate to any part, component, equipment, system, subsystem, or material and services applicable to the escalator provided.

15. The above referenced shall be provided as it pertains to the original installation and for a period of 10 years after final acceptance of the escalator provided under the contract.
16. The referenced material shall be provided within 30 days of publication or internal distribution by the escalator manufacturer. The material shall be delivered to the Commissioner without prejudice or delay.
17. Provide Manuals on 3 copies of a CDROM.
18. Submit copies of programs used to run any logic unit in the escalator controller.
19. Submit copies of software and interface cables used to program, troubleshoot and provide updates to the PLCs.

B. Certificates and Permits: Provide certificate signed by Manufacturer indicating conformance of furnished escalator with referenced codes and regulatory requirements. Provide Commissioner with copies of inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of escalator.

C. Submit warranties and bonds in accordance with the requirements of Contract Documents.

D. Record drawings: The Contractor shall furnish complete and legible field wiring diagrams and straight line diagrams showing the electrical connections, functions and sequence of operations of apparatus connected with the escalator both in machine space and in pit, together with oil and lubrication charts, photographs or cuts of controller repair parts with part numbers listed, furnished in duplicate. One set shall be suitably framed under plastic and mounted in machine space where directed and other shall be assembled in bound form and delivered to Commissioner.

1. Each device on wiring diagram shall be properly identified by name, letter or standard symbol identical with markings. A list of devices together with identifying markings shall be provided on the working diagrams.

E. Record Drawings: At the end of the project, as part of the close-out procedures, the Contractor is responsible to provide record drawings to reflect actual conditions including structural, architectural, electrical, mechanical, and plumbing connections to the escalators.

1.10 QUALITY ASSURANCE

A. Engineer Qualifications: Structural Engineer licensed in the State of Illinois and experienced in providing engineering services of the kind indicated that have resulted in the successful installations, similar in material, design, and extent to that indicated for this Project.

B. Installer Qualifications: Engage the escalator manufacturer or an installer approved by the escalator manufacturer and who has completed escalator installations similar in material, design, and extent to that indicated for Project which have resulted in installations with a record of successful in-service performance.

C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain and pay for necessary permits and perform such tests as may be required for acceptance and approval of escalators by jurisdictional agencies. Notify the proper inspectors to witness required testing.

D. Welding shall be performed in accordance with the requirements of AWS 5 D.1.1. Welders shall produce evidence of current certification by the American Welding Society.

E. Non-propriety computer system and software must be used in the PLC's.

F. Factory Inspections

1. Provide for the Commissioner's representatives to visit the factory a minimum of two times where the escalator is being manufactured.
2. One visit to be provided after the trusses are fabricated and a second visit to be provided once the escalator is assembled and ready for testing.
3. Do not ship the escalator without the written approval of the Commissioner after conclusion of the second factory visit.
4. Due to the long lead time for fabrication of the escalator, schedule the work to allow sufficient time for the factory visits and testing.

1.11 DELIVERY, STORAGE AND HANDLING

A. Packaged materials shall be delivered to the project in sealed containers bearing manufacturer's name and material identification. Materials shall be stored in strict accordance with the manufacturer's printed directions.

B. Protect stainless steel surfaces with pressure sensitive vinyl protective covering, which is to be removed after completion of installation.

C. Protection: Protect materials against damage from mechanical abuse, plaster, salts, acids, staining, and other foreign matter by an approved means during transportation, storage, and erection, and until completion of construction work. Unsatisfactory materials shall be removed from the premises, and damaged materials replaced with new materials.

1.12 PROJECT CONDITIONS

A. Protection: During installations, and until escalator systems are fully operative, make necessary provisions to protect systems from damage, deterioration, and environmental conditions.

B. Coordination Requirements:

1. Contractor shall coordinate alterations required to accommodate escalators with the Commissioner.
2. Cladding: Review and coordinate appropriate station and escalator drawings dealing with proposed methods of securing cladding to truss.

3. Coordinate floor finish at landing plates and newels.
4. Coordinate the installation of escalator pit heaters and ventilating fans where required.
5. Coordinate lock and key requirements with the Commissioner.

C. Tolerances:

1. Escalator nominal tread width shall be manufacturer's standard as shown on the Drawings, and designed for a maximum of 30 degree inclination and may only vary in accordance with the Code should the site conditions warrant.
2. Provide escalators to fit within structures as constructed.
3. Perform minor alterations as necessary.
4. In the event of a discrepancy, notify the Commissioner immediately, and do not proceed with installation in the areas of discrepancy, until the discrepancy has been fully resolved.

D. Labeling Requirements: clearly mark with rated load and speed, braking torque, manufacturer serial number, and designated Commissioner Identification.

E. Fabricate and furnish the escalators designed for installations within the spatial and support system characteristics and coordinate the following station characteristics with the escalator requirements:

1. Escalator enclosure shall contain adequate space, vertical and horizontal dimensions, required for the installation, operation, maintenance and repair of heavy-duty transit system escalator specified herein.
2. Escalator equipment space designed with control panel, conduit, cable, panel board and disconnect switch providing 480 volt, three-phase, 3-wire, 60 hertz service on a fused disconnect switch. Power distribution panel and fused disconnect switch, located remote from escalator equipment space, will be provided.
3. Provide power and control wiring, in conduit provided, from the escalator control cabinet to the fused disconnect switch and to the escalator machine. Make final terminations of escalator-related wiring and conduit.
4. A convenience outlet and a switched light fixture, including required conduit and wire, will be provided in the pit.
5. Escalator pit provided with floor sump for drainage of accumulated moisture and liquids to City of Chicago sewer system.

1.13 WARRANTY

A. Special Project Warranty: For each escalator installation, provide special project warranty, signed by Contractor, Installer, and Manufacturer, agreeing to replace, repair, or restore defective materials and workmanship of escalator work during warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Commissioner may have against the Contractor under the Contract Documents.

1. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below specified ratings, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions,

the need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected, and unsatisfactory conditions.

2. Warranty period shall be for 12 months starting on the date of acceptance by Commissioner after test period and Substantial Completion.
3. Test period may commence after acceptance by the City Inspector and will consist of 30 days of continuous operation of the escalator without any interruptions caused by the warrantable defects.

B. Warranties: Provide coincidental product warranties where available for major components of escalator work. Submit with maintenance manuals.

C. A warranty inspection shall be required.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Product: "TransitMaster 180" (Kone Corporation) or comparable products, as approved by Commissioner of:

1. Fujitec America Inc.

B. Installation of escalators shall be performed by Manufacturer-authorized and factory-trained persons in the direct employ of the Manufacturer.

C. Manufacturer shall meet the requirements for certification under ISO 9000.

D. Escalators, equipment, and accessories supplied under this contract shall be the product of a single manufacturer.

2.02 MATERIALS

A. Stainless Steel: UNS S31600.

1. Shapes and Bars: ASTM A 276.
2. Plate, Sheet, and Strip: ASTM A 240.

B. Fasteners: Provide nuts, bolts, washers, screws, nails, rivets and other fastenings necessary for proper erection and assembly of work. Fasteners shall be compatible with materials being fastened. Fasteners shall be furnished with self-locking nuts or retaining rings (spring washers, toothed disks).

2.03 FINISHES

A. Stainless Steel: Comply with ASTM A480/A480M. Remove or blend tool and die marks and stretch lines into finish. Directional Satin: No. 4 finish, average surface roughness (Ra) up to 25 microinches.

B. Aluminum Castings and Extrusions: Commercial mill finish.

C. Galvanizing: Sheet Steel, ASTM A 653/A 653M, as applicable. Coating designation G 185. Other galvanizing, ASTM A 123, ASTM A 153, ASTM A 385, as applicable.

D. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

E. Paint and Corrosion Protection: Each escalator shall have the following minimum corrosion protection:

1. Steel parts of the escalator shall be sandblasted in accordance with SSPC-SP-6.
2. After welding, the truss shall be hot-dipped galvanized with a coating in accordance with ASTM A 90.
3. Cast metal parts such as gear housings, chain sprockets and return station half circles, shall be painted with a rust-inhibitive primer coat after preparation by sandblasting.
4. Steel parts which are not specified to be galvanized shall be painted as follows:

    a. First finish coat: 2 mil (dry film thickness), minimum thickness.
    b. Second finish coat: 2 mil (dry film thickness), minimum thickness.

5. Bright or uncoated axles, shafts, etc., shall be protected by zinc chromate or chrome plating.
6. Screws, nuts, washers and lock washers shall be galvanized or zinc plated, with the exception of countersunk screws in cover panels which shall be chrome-plated brass screws and visible screws in the paneling which shall be stainless or approved, corrosion-resistant steel.
7. Handrail guides shall be of stainless steel.
8. Oil collector chutes and collection trays shall be fabricated of stainless steel.

2.04 ESCALATOR EQUIPMENT

A. Provide heavy-duty transit system escalators in conformance with the following requirements:

1. Vertical Rise: As indicated on Drawings and verified.
2. Horizontal Work Point Dimension: As indicated on Drawings and verified. The Commissioner reserves the right to modify, at no additional cost or delay to the Contract, the final elevations and work point dimensions for escalator within a range of plus or minus six inches prior to final approval of shop drawings and prior to fabrication of escalator components.
3. Inclination: 30 degrees.
4. Nominal Step Width: As per APTA standards, indicated on Drawings, manufacturer's standard.
5. Nominal Clear Opening Width for Escalator Installation: As indicated on Drawings and verified.
6. Speed: 100 feet per minute "Up;" 100 feet per minute "Down."
7. Number of Flat Steps: 3 upper landing steps pending rise, 3 lower landing steps pending rise.

8. Maintenance Speed: 10 feet per minute.
9. Minimum Safety Factor: In accordance with the Code, or as stated herein, whichever is greatest.

B. Operating Controls:

1. Escalators shall have key-operated switches, accessible at both upper and lower landings, located on the exterior deck above the newel base. Alternate locations may be used subject to approval by the Commissioner.
2. Each keyed switch shall be clearly and permanently labeled, including starting and direction selection.
3. Interlocks shall be provided to bring the escalator to a smooth stop, in either direction of travel, before a change of direction may be made.

C. Safety Devices:

1. Provide safety devices required by the Code.
2. Safety devices depending upon interruption of electric circuit for their operation shall be interlocked with electric power supply to motor to apply brakes, and bring escalator to a smooth, safe stop in either direction of travel.
3. An interlock shall be provided to prevent operation of escalator until safety hazard or malfunction has been corrected if escalator stops because of malfunction, or actuation of one or more of the safety devices. Escalator shall be restarted by use of keyed switch only.
4. Safety devices shall be mounted in locations accessible for maintenance within escalators, and these devices shall be designed for ease of adjustment or reset. Devices shall be located so that operation is not affected by direct moisture and debris.
5. Provide a permanent magnet braking system without spring actuation. The use of weights or self-excitation of the brake release shall not be allowed.
6. Disconnect switches capable of being locked in the "off" position shall be provided in both escalator pits, and at the drive of each escalator to prevent the starting of escalator from any other location.
7. Provide each pit access cover with a safety stop switch. The safety stop switch will prevent the escalator from operating if the cover is not in its proper position.
8. Step safety side brushes:

    a. Contractor shall provide escalator safety strips (brushes), as manufactured by Escalator Handrail Company or approved equal.
    b. The escalator safety strip shall run continuously between the comb plate lights on each side of the escalator steps.
    c. The safety strip shall be attached to the top of the skirt panels at the intersection of the skirt and balustrade panels and below the continuous strip light on the balustrade. Safety strip shall not hinder operation of skirt safety switches.
    d. The step nose shall pass below the ends of the bristles of the brush with clearance per manufacturer’s installation instructions.
    e. The length shall be the same as skirt panel sections for the straight segments to allow the skirt panel to be removed without disassembling the entire brush. Top and bottom radial segments with end caps and fittings for a complete installation shall be provided.

f. Fasteners for attaching the strips to the skirt panels will be selected to be appropriate and match the skirt panel construction.

9. At each escalator, provide the following minimum additional safety devices that shall interrupt electric power within escalator, and automatically apply brakes and bring escalator to a smooth stop in either direction of travel:

a. Device to stop escalator should escalator have misalignment of steps or linkages. This device, 1 at top, 1 at bottom, shall monitor steps before entry into comb as well as on return side and shall be manually reset.
b. Device or devices incorporating single operation to stop escalator should 1 or both step linkages have significant amount of wear, experience breakage, change in length, change in strain, or should adjustable carriage move more than predetermined distance in any direction.
c. Device shall be employed to remove power if the escalator speed varies more than plus or minus 20 percent.
d. Device shall remove power from escalator and apply brakes should an object become wedged between step tread of 1 step and riser of another step during the formation of a landing.
e. Newel bases shall have device to preclude a passenger's hand from being carried into the handrail entrance of the newel. Should entrance of a foreign object accidentally occur, a device shall automatically apply brakes and bring escalator to a smooth stop in either direction of travel.
f. Device shall be provided to remove power and stop escalator should handrail break, lose motion, or stretch beyond a preset amount. The time between the stopping of the handrail and the removal of power to the drive unit will be adjustable from 0.5 seconds to 10 seconds.
g. Devices shall be installed behind and through skirt panels at upper and lower landings of each escalator to remove power from escalator and apply brakes and bring escalator to a smooth stop, in either direction of travel, should the skirt panels be forced away from steps or if any object should become wedged between step and skirt panel.
h. Safety devices shall be incorporated at both the upper and lower comb plates which shall disconnect electrical power to the driving machine and activate the brake to bring the unit to a smooth stop in either direction of travel should any object become wedged between the comb and the step in either a horizontal (225 pounds) or vertical (150 pounds) lifting direction.
i. Protection shall be provided to prevent accidental or sudden reversal of escalator direction from designated direction of travel.
j. A disconnect switch shall be provided in the top and bottom escalator pits which will, when used, stop the escalator or prevent starting.
k. In addition, a fault-finding device (diagnostic equipment) shall be provided, capable of producing indications of the following data:

1) Date, time, and cause of escalator stoppages and failures.
2) A monitoring of drive motor temperature.

D. Emergency Stop Button:

1. 1 emergency stop button shall be located at each landing, accessible on the exterior deck cover. Location shall be in the upper quadrant, 45 degrees above horizontal of newels, as required by the Code.
2. Stop buttons shall be momentary contact push buttons, red in color, shall bear the U.L. label, and be constructed in accordance with U.L. standards.
3. Stop buttons shall be housed under clear, high-impact resistant plastic cover, which shall be self-closing by means of spring-loaded hinge at upper edge. Cover shall have clearly printed upon it, the words "EMERGENCY STOP" in 1/2 inch high letters. When the cover is lifted an audible alarm shall sound at, or near, the top and bottom button locations until cover is returned to the closed position.

E. Balustrades, Skirt Panels:

1. Balustrade panels shall be a minimum of 14 gauge stainless steel. Provide non-combustible backing panels of a material subject to the Commissioner's approval. Stiffeners, brackets, attachment angles and other concealed ferrous metal framework shall be galvanized or constructed of equivalent, corrosion-resistant materials.
2. Skirt panels with rounded joints shall be of 12 gauge stainless steel, solid construction, and shall be in conformance with the Code. There shall be no laminations nor square joints allowed. Provide non-combustible backing panels of a material subject to the Commissioner's approval.
3. Panels shall have edges sealed against moisture.
4. Panels shall be designed to achieve equal lengths for interchangeability.
5. Panels shall be attached to permit easy removal for inspection, lubrication and adjustment of safety devices.
6. Panels shall be sized so that not more than 2 persons shall be required to remove a panel, and without the aid of special handling equipment.
7. Panel fastener requirements: Panels shall be fastened to their respective supports or mating portions with tamper-proof, flathead stainless steel machine screws.
8. When framework to which panels are fastened is less than 1/4 inch thick, steel back-up plates with a minimum 1/4 inch thickness shall be added which have tapped holes or clearance holes where necessary.

F. Decking:

1. Stainless steel, identical to balustrade, with minimum of 14 gauge thickness.
2. Decking shall be designed to support a live load of 175 pounds per square foot, without permanent surface deflection.
3. Paneling, decking and other enclosures shall be supported on steel framework.
4. Provide anti-slide devices required by the Code.

2.05 ELECTRICAL EQUIPMENT

A. Motors:

1. The driving motors shall be A.C. induction motors with starters. Voltage: 480 V.A.C., 3 phase, Frequency: 60 Hertz.
2. The motors shall be totally enclosed with external cooling fans.

3. The motor protection class shall be equivalent to IP 65.
4. Provide type F motor insulation per APTA.
5. The motor shall be flange-mounted to the main drive gear case and separated from worm shaft by a non-metallic, energy-absorbing coupling.
6. Driving motors and motor switch gear shall be designed in such a way so as to provide a smooth start, which shall prevent possible passenger accidents as well as undue strain on drive components.
7. The rated efficiency shall be designed for continuous operation(s) under a load minimum average peak step as follows: 40 inch wide step, 320 lbs.
8. The motor horsepower rating, starting torque and efficiency should be based on a design load of 350 lbs. per step.

B. Controller:

1. The escalator control equipment shall contain diagnostic capabilities for ease of complete maintenance. The diagnostic system shall be an integral part of the controller and provide user friendly interaction between the service person and the controls. Systems shall be free decaying circuits that must be periodically reprogrammed by the manufacturer.
2. Controller shall be mounted in freestanding NEMA 250, Type 3 cabinets with strip heaters and labeled terminal strips. Equip each controller with heating pads capable of maintaining controller performance when room temperature is 0 deg F. Provide a remote switch for the heating pads.
3. The main control controller of an escalator shall contain at least the following devices: lockable main switch thermal and magnetic motor protection starter for up and down travel, hour counter, auxiliary contractors, phase failure device, phase sequence monitor, and ground fault monitor.
4. The controller cabinet shall furthermore contain a permanently mounted fault indicator board with indicator lights. Each group of safety devices shall be connected to 1 signal lamp.
5. The indication shall be locked automatically. Reset shall be done by a separate switch installed in the controller. The emergency stop shall not be locked.
6. Wiring in the control panel shall be neatly installed and terminated in the terminal blocks. Terminals shall be clearly marked. Components in the control panel shall be identified and matched to components as indicated on the wiring diagram.
7. The controller shall be equipped with an AC induction motor reduced-voltage starter, installed in line between the standard type contactor and the drive motor. The starter shall be solid state, capable of starting motors smoothly and gradually, reducing inrush current and mechanical shock upon start-up. Adjustable settings for accelerating time and starting torque shall be provided. The starter shall also contain auxiliary contacts and a thermal overload relay for motor protection. An acceptable starter is the Payne Engineering Series 18EM3, or approved equal.

2.06 ESCALATOR CONTROLLER

A. The escalator control equipment shall contain diagnostic capabilities as required for the ease of complete maintenance.

1. The diagnostic system shall be an integral part of the controller and provide user- friendly interaction between the service person and the controls. Controller shall be mounted in a stainless steel NEMA 4X cabinet. The door of the cabinet shall have a sealed window placed over the fault indicator board within.
2. The main controller shall use an Allen Bradley SLC5/03 Programmable Logic Controller (PLC) or approved equal to control and monitor the status of the escalator. A 1761-NET-AIC shall be provided to communicate between the escalator control PLC and Oculus Network® RTU over Ethernet. The SLC 5/03 processor shall be programmed using Genysys® and a copy of the PLC program and the Genysys® software will be given to the Commissioner including documentation. The escalator manufacturer shall provide the communication programming in the 5/03 to send the information that is defined by the Commissioner to the Oculus Network® RTU over the Ethernet network.
3. The PLC racks shall provide space for 2 future single slot modules.
4. The PLC in the remote control panel shall also have hardware and firmware provisions to communicate with interactive operator interface (monitor).
5. The PLC shall store the last 99 faults, accessible via laptop connection, panel view or remote communications.
6. Escalator manufacturers may not supply their standard escalator controller for this project.

2.07 ESCALATOR CONTROL SYSTEM PROGRAMMING

A. The Escalator Control System PLC program must be designed in such a way that it can easily pass data to the Remote Data Collection Unit in the Oculus Network®. This information must be provided in contiguous data files in the PLC Data Table. Faults must be provided with time and date stamp with day, month, year for date and hour, minute, second for time. The time and date stamp shall come from Real Time Clock in the PLC. The program must store 99 historical fault entries with the time and date stamp in a table format approved by the Commissioner.

1. The following data needs to be passed to the Oculus Network:

    a. Safety Device Trips w/Time and Date Stamps
    b. SMC Dialog Plus info:

        1) Three-Phase Current in Amps
        2) Three-Phase Voltage in Volts
        3) Power in KW
        4) Power usage in KWH
        5) Power Factor
        6) Motor thermal capacity
        7) Elapse time

    c. Handrail speed left and right in ft/sec.
    d. Step speed in ft/sec.
    e. General faults w/ time and date stamp including but not limited to:

        1) Emergency Stop Switch
        2) Pit Stop Switch

3) Broken Handrail
4) Broken Step Chain
5) Comb Impact-Upper
6) Comb Impact-Lower
7) Handrail Entry Upper
8) Handrail Entry Lower
9) Broken Drive Chain
10) Missing Step Upper
11) Missing Step Lower
12) Skirt Obstruction Upper
13) Skirt Obstruction Lower
14) Step Level Upper
15) Step Level Lower
16) Step Upthrust Upper
17) Step Upthrust Lower
18) Brake Wear
19) Drive Motor Temp.
20) Over/Under Speed
21) Handrail Speed
22) Reversal Stop Device

B. Deceleration Rate of the escalator during any stops.

1. The fault data will need to be sent to the OCULUS NETWORK® data collector on a report by exception basis. Non-fault data will need to be sent on a cyclic basis. The Operator Interface Terminal and PLC real time clocks will need to be synchronized.
2. The fault codes shall be developed by the escalator manufacturer in a 3 digit format, i.e. Emergency Stop Switch-Fault 001, Broken Step Chain- Fault 002, etc.

2.08 ESCALATOR CONTROL SYSTEM PROGRAMMING

A. A. The Escalator Control System PLC program must be designed in such a way that it can easily pass data to the Remote Data Collection Unit.. This information must be provided in contiguous data files in the PLC Data Table. All faults must be provided with time and date stamp with day, month, year for date and hour, minute, second for time. The time and date stamp shall come from Real Time Clock in the PLC. The program must store 99 historical fault entries with the time and date stamp in a table format approved by the Authority.

1. The following data needs to be captured:

a. All Safety Device Trips w/Time and Date Stamps
b. SMC Dialog Plus info:
- Three-Phase Current in Amps
- Three-Phase Voltage in Volts
- Power in KW
- Power usage in KWH
- Power Factor
- Motor thermal capacity
- Elapse time

c. Handrail speed left and right in ft/sec.

d. Step speed in ft/sec.

e. All General faults w/ time and date stamp including but not limited to:
- Emergency Stop Switch
- Pit Stop Switch
- Broken Handrail
- Broken Step Chain
- Comb Impact-Upper
- Comb Impact-Lower
- Handrail Entry Upper
- Handrail Entry Lower
- Broken Drive Chain
- Missing Step Upper
- Missing Step Lower
- Skirt Obstruction Upper
- Skirt Obstruction Lower
- Step Level Upper
- Step Level Lower
- Step Upthrust Upper
- Step Upthrust Lower
- Brake Wear
- Drive Motor Temp.
- Over/Under Speed
- Handrail Speed
- Reversal Stop Device

B. Deceleration Rate of the escalator during any stops.

1. Provide HMI shall gather all fault data on the panel. The Operator Interface Terminal and PLC real time clocks will need to be synchronized at all times.

2. The fault codes shall be developed by the escalator manufacturer in a 3 digit format, i.e. Emergency Stop Switch-Fault 001, Broken Step Chain-Fault 002, etc..

3. All PLC program shall have description of the run inside the program.

4. A copy of all working programs and software on approved computer medium, as well as in printed program listing shall be provided.

5. The escalator manufacturer for each escalator location shall provide the Authority with a laptop computer Windows based with latest operating system with the program and software installed with required cables to plug into the PLC and all other accessories to use for diagnostic purposes of the escalator system. Manufacturer shall provide non-proprietary diagnostic software, Escalator program with all input/outputs descriptions showing each rung and other required software installed in the computer for use by the Authority's escalator technicians..

2.09 MECHANICAL EQUIPMENT

A. Tracks:

1. Design and fabrication of tracks shall retain steps and running gear safely under load requirements and at the highest design speeds specified.
2. Assemble and secure sections of track together for easy removal and replacement of defective sections. The system shall be adjustable, and welding of the tracks is not acceptable unless approved in writing by the Commissioner.
3. Design of the mechanical components shall provide for easy installation and removal without the dismantling of parts of the structure.
4. Tracks shall be properly supported on trusses to provide correct alignment and smooth transition to return stations. The rolling surface of the track shall have a minimum thickness of 0.12 inch.
5. The track radius shall be determined in conformance with the Code and the following constraints:

    a. The requirement for requisite number of flat steps shall be met.
    b. Track loading and wheel size shall be such that interaction force between each wheel and track shall permit escalator to meet requirements specified.

6. The guiding system for the step chains and step wheels shall be of hot-dipped galvanized steel profiles with smooth and even running surfaces, and with the joints cut diagonally to the running direction. The profiles shall not be welded together at the joints.
7. A second, continuous guiding profile shall be provided above the step chain rollers so that the step chains are positively guided in the area of the escalator open to passengers.
8. The step guides shall be designed to ensure that the gap between the step side plate skirt panel does not exceed 1/32 inch at 1 side or 1/16 inch in total at both sides. Provide the Commissioner with a printout of the readout of the step/skirt clearance per The Code.

B. Steps:

1. Step assemblies shall be 1 piece, die-cast aluminum or Commissioner approved equal. Step treads shall have 1/8 inch wide cleats on 3/8 inch centers, not less than 3/8 inch in depth, and shall be designed to mesh with the comb plates.
2. Step ends shall be square in order to minimize step to skirt clearances. The entire step assembly shall be treated with not less than 1 coat of zinc chromate primer and 1 coat of aluminum enamel for corrosion-resistance.
3. Steps and their various attachments shall permit removal of steps without disturbing balustrades.
4. The design shall permit the running of the drive without steps for convenience in cleaning and inspection.
5. Step rollers shall have polyurethane tires on hubs, sealed roller bearings, and a diameter of no less than 4 inches. Step rollers shall not require any additional lubrication and must be rated for severe, heavy-duty service.
6. Steps shall be constructed so as to be driven by step linkages to step or step rollers.
7. Contractor shall provide washers and nuts as follows:

a. Tap bolts: Lock washers.
b. Through bolts: Lock nuts or Commissioner approved equal.

8. Rated Loads:

a. In addition to the minimum requirements given in the Codes, Contractor shall design the steps for a minimum load of 650 lbs. per 40 inch step with a safety factor of 8.
b. The steps shall carry the load under maximum concentric and eccentric loading conditions without distortion.
c. Contractor shall perform dynamic testing, witnessed by Commissioner's representatives, to verify the structural strength and serviceability requirements.

9. Step treads and risers shall not end with a groove at the edge.
10. Provide safety side plates as specified herein.
11. Steps shall have 2 inch wide, yellow demarcation lines, as required per Accessibility Requirements.
12. Testing: Step assemblies shall be tested in accordance with the Code, as a minimum.
13. Provide the Commissioner's Maintenance Department with 10 additional steps for each escalator and for each different width of steps used in the escalators for this project. Deliver steps to the Commissioner's Escalator Maintenance Department, 3900 West Maypole, Chicago, IL, or as directed by the Commissioner. Steps remaining from the maintenance period may be applied to this requirement.

C. Step Chain:

1. Provide endless, roller-type step chains; 1 on each side of step.
2. Step chains shall be of heat-treated steel construction, supported at intervals by linkage wheels.
3. A means to prevent steps from coming into physical contact with each other, and to prevent chains from sagging or buckling shall be provided.
4. A means to maintain constant distance between step axles shall be provided.
5. An automatic tension device to maintain tension under load and to compensate for wear shall be provided. The device shall be located within the truss at the lower end.
6. A means for individual fine adjustment of tension for each linkage shall be provided.
7. Step chains shall be constructed to permit removal of segments as may be required for replacement purposes.
8. Support wheels spaced to distribute load and to guide linkage throughout run shall be provided. Rollers shall be constructed of polyurethane material, with diameter sufficient to provide reliability, maintainability, smoothness of motion, and to operate within noise level requirements specified. The chain rollers shall have polyurethane tires on hubs, hermetically sealed bearings, a diameter of not less than 4 inches, shall require no additional lubrication, and be mounted outside the chain link.
9. Wheels shall be affixed to permit rapid replacement.
10. Each pair of step chains shall be a matched set within manufacturing tolerances.

11. Only precision, roller-fish-plate chains of high grade, heat-treated steel shall be used as step chains. The pins, axles, bushing, and rollers shall be hardened and ground.
12. Both left and right step chain sections shall be secured together by means of a solid steel axle assembly every 16", either as an integral part of the step chain or, as an independent assembly to which the step is attached or, built into the step assembly itself, and not subject the step itself as a means of securing the left and right step chain sections together.
13. Step chain and chain pins shall have a minimal diameter of at least 5/8 inch. In addition, the diameter will be of a size so that the surface pressure at engaging points will not exceed 2,900 lbs/sq.in. This is to be based on the peak average step loads as follows: 40 inch wide step 320 lbs. per step.
14. The safety breaking factor of a step chain as defined as a ratio of chain breaking load to chain traction force, while assuming the maximum operating load of 320 pounds per step for 40 inch steps.
15. A test certificate for the chain breaking load shall be provided.
16. A shielding device shall be provided to protect chain, track guides, and rollers against water, dirt, and debris.

D. Risers:

1. Risers shall be furnished with full height vertical cleats and shall form an interlocking unit with the step tread of the adjacent step.

E. Treads:

1. Treads shall be cleat type, designed to assure foothold with a comfortable tread surface and shall have chamfered or radiused nosings of 1/8 of an inch at rise edge of tread.

F. Step Frames:

1. The step frame shall be reinforced and braced to carry the step treads.

G. Comb plate Assemblies:

1. Comb plate assemblies of wear resisting, non-corrosive metal material, with exposed anti-slip surfaces shall be fabricated.
2. Comb plate sections meeting the following requirements shall be provided:

    a. Removable to permit ease of replacement without aid of special tools or equipment.
    b. Yellow color for safety/demarcation.
    c. Have not less than 3 nor more than 7 comb plate sections per comb plate assembly.
    d. Provide for lateral and vertical fine adjustments so that cleats of step treads pass between comb teeth with minimum clearances.
    e. Comb teeth meeting the following requirements shall be provided:

        1) Teeth shall penetrate the treads on escalator steps in such a manner as to reduce to a minimum the danger of injury to passengers, and

to prevent breakage and wear of teeth caused by interference with step treads.

2) Teeth shall be designed so as to withstand a load of 250 pounds applied in an upward direction at the tip of any 1 tooth.
3) Teeth shall not have any sharp edges.

H. Floor Plates:

1. Shall have extruded aluminum frames at floor openings, designed to be supported on truss heads.
2. Shall be designed to cover entire area of upper and lower landings as indicated.
3. Shall be reinforced, as necessary, to be rigid and able to withstand a live load of 250 pounds per square foot with 0 deflection.
4. Shall be extruded of die cast aluminum in a ribbed pattern transverse to the escalator axis. Ribs shall be designed to provide maximum traction, and will be finished in the same manner as comb plates.
5. Shall have exposed portions constructed of material and finish to harmonize with steps and comb plates.
6. Shall be light weight and removable for ease of access to machinery and maintenance areas below. Shall be fabricated in sections of a size and weight capable of being handled easily by 1 person.

I. Drive Machinery:

1. Motor and drive mechanism shall be mounted within the truss envelope and step bank at the upper end. The motor shall be flange-mounted directly to the driving machine, connected by a non-metallic coupling.
2. Carriage Requirements: Carriages for tension drive chain shall move on tracks. Such movement shall be accomplished by use of precision ground rollers and horizontal guides to prevent slewing while adjusting carriage. Carriages with spring operated device to aid in adjustment of tension along with mechanical adjustment shall be provided. Carriages with scale and pointer on accessible section of carriage frame to indicate movement and amount of adjustment available shall be provided. Position scale and pointer to indicate zero for initial position of carriage prior to placing in service.
3. Shafts shall be designed for ease of assembly or disassembly using square keyways of proper sizing.
4. Provide Gear Box Design to be Planetary Gear or Worm Gear to meet the following:

a. Planetary Gear Requirements: "TransVario" with integrated handrail drive.
b. Worm Gear Requirements:

1) Single-stage type, with positive engagement shall be provided.
2) Worm gear bearings shall be housed in an oil-tight, dust-proof case provided with a sight glass or dipstick method of determining oil level in the case. The case shall provide a convenient method of draining the oil.
3) Lubricant compartment shall contain lubricant heaters for street level or above ground installations unless synthetic lubricants, subject to Commissioner's approval are used.

4) Gear assembly shall be coupled to motor by worm shaft, brake unit, non- metallic coupling, and motor flange fastened to gear case. The assembly shall have no openings in order to minimize accumulation of dust and debris.

5. Rotating parts shall be provided with a means for lubrication and retention of lubricants. Sealed bearings shall be used in those environmental conditions where entry of water or dust may adversely affect bearing performance. Exposed, moving drive elements shall be protected by sealed metal housings which shall provide continuous lubrication to components.
6. Provide oil level sensors and escalator shut off mechanism to shut off the escalator when the oil level is below minimum oil level as recommended by APTA where oil lubrication is provided.
7. V-belt and tooth belt drives shall not be considered acceptable. If chain drives are used, they shall be protected against dirt and water by sealed housings, and shall have an automatic lubricating device and a means of taking up any slack in the chain.
8. Provide electric heaters with integral thermostats in escalator truss space to maintain temperature above 40 deg F.
9. Equip comb plates with 400-W electric heaters to prevent ice and snow accumulation.

J. Drip Pans:

1. Galvanized, 14 gauge welded, water-tight drip pans for the entire length and width of trusses shall be provided. Drip pans shall be of sufficient strength to support a concentrated weight of 500 pounds at any place in the drip pan. They shall also be sloped for proper drainage and collection of spent lubricants as well as any moisture or water which may enter the escalator.
2. Drip pans of sufficient size to collect and maintain, within truss areas, oil and grease drippings from step linkage and loose debris that may be deposited in drip pans from steps at turn-around points at upper and lower portions of truss shall be provided. This system shall be separate from the water drain in order to prevent the discharge of spent lubricants into sewer system.
3. Provide an access plate/hatch through the drip pan at the lower pit of the escalator for the purpose of cleaning drain catch basin or sump pump.

K. Handrails:

1. Provide traction drive handrails having a minimum contact of 180 degrees around a drive wheel and a minimum positive drive contact of 48 inches or a contact of 31.78 inches at 60 degrees in combination.
2. Handrails shall receive their motion from main escalator drive through direct gearing and drive shaft or drive chains, so that handrail and steps operate at the same speed in each direction of travel. Driving and guiding wheels shall have a groove to accept the wedge on the underside of the handrail.
3. For chain drive handrail drive system, provide a chain composing of heavy duty #80 or greater for the chain drive.
4. A means to take up handrail slack using a tensioning device, where required, shall be located within escalators. In addition, an approved method of releasing the device for repair or removal of handrails shall be provided. Pre-tensioning of handrail shall be considered unacceptable.

5. Newels meeting the following requirements shall be provided:

    a. Surface of newel bases, adjacent to where handrail enters or leaves, shall be at an angle of 90 degrees with surface handrail.
    b. Newels shall be designed and constructed so that handrail shall return into newel end at a point inconspicuous and difficult for passengers to reach.
    c. Newel wheels shall be provided at upper and lower newels.
    d. Handrails, handrail drive system, and guides shall be so designed and installed that handrail cannot be thrown off or disengaged while running, and special design attention shall be given to area where handrail passes from drive system to guides. Stationary guides at the newel return shall not be considered acceptable. A method of guiding the handrail and reducing friction, either by a large diameter newel wheel or a set of smaller cluster rollers, shall be provided.
    e. Handrail wheels shall have sealed bearings that have provision for retention of lubricant to ensure satisfactory lubrication and operation. Additional lubrication shall not be required.
    f. Friction drive wheels and idlers shall be designed and positioned so that lubricant cannot reach surface of handrail. Marking and spotting of handrail by drive equipment shall not be permitted.
    g. Handrails shall be constructed of laminated, steel, wire mesh, or steel cable reinforced, flexible elastomer material vulcanized into an integral, non-separating, seamless, smooth handrail resistant to environmental conditions. A V-shaped underside design shall be used, providing a more positive drive. No cotton fabric shall be used.
    h. Handrail color shall be black with 3/4 inch diameter, white markers inlaid into the handrail material at 24 inch intervals.
    i. Handrail guides shall be continuous on exposed portion of handrails, constructed of material which shall not be subject to corrosion nor pitting, and shall have a polished or specially coated, permanent finish to minimize frictional wear to undersurface of handrail. On the unexposed portion, guiding shall be by adjustable rollers having sealed bearings, and set in a way so as not to cause wear on the handrail.

L. Brakes: Each escalator shall be provided with the following brakes for stopping and locking of movable drive components:

1. Motor brake shall be located on the motor shaft. Brake shall safely stop escalator upon activation of normal stop control, local or remote EMERGENCY STOP buttons, activation of any safety device, or upon loss of power.
2. Operational Sequence: Motor Brake.

    a. Brake shall be mechanically applied (fail safe) and electrically released.
    b. Brake shall be capable of stopping and holding a descending escalator with a peak average load on the exposed steps in the incline area of: 40 inch wide step 320 lbs. per step.
    c. Minimum stopping distance for an up or down traveling escalator under any load shall be no less than 6 inches. Stopping distances shall be adjustable and set to the Commissioner's approved distance. Stops shall be gradual and not abrupt.

d. Deceleration shall be smooth, gradual, and with no sudden stop at a rate not to exceed 3 feet per second squared.
e. Brake shall be reset by safety fault switch that may require manual reset.
f. Design of brake shall provide ease of access to brake equipment for inspection and maintenance.
g. The brake operating temperature shall not exceed 195 deg F above ambient. A monitor shall be provided, and if brake lining becomes insufficient for safe usage, restart of escalator shall be prevented.

3. Step Band Lock

a. Transit escalators shall be provided with a step band lock to prevent movement of linkages, while the escalator is disconnected from its power supply.
b. The step band lock must be capable of preventing the movement of the escalator step band while holding a peak average load on the exposed steps in the incline area of: 40 inch wide step 320 lbs. per step.
c. The step band lock shall be manually applied and mechanically engaged to the step band.
d. Provide an electrical interlock that will prevent escalator drive motors from starting when the step band lock is engaged.

M. Truss: Hot-dipped galvanized.

1. Trusses shall be sufficient total length to provide minimum number of flat steps listed in the specification. The truss shall span the distance between the support points as indicated. The working points as indicated shall not be moved. The truss extension method shall be used to size the truss.
2. Trusses shall be sufficient width to accommodate the width of the finished escalator.
3. Trusses shall be designed to rest on the top and bottom support beams, and intermediate supports provided for in this facility.
4. Trusses shall be of ample strength to maintain alignment of tracks and moving parts, and so designed that they shall safely retain steps and running gear, and in case of failure to track systems, retain step mechanism within guides and envelope of the truss.
5. The truss shall be designed to support the dead weight of the escalator and a full passenger load.
6. The deflection of the loaded truss shall not exceed 1/1000 of the free supporting distance of not less than 50 feet under full load.
7. The truss shall not vibrate when the escalator is in use.
8. The slip joint slide bearings shall be fabricated using 3/32 inch thick glass-filled TFE bearing surface, one sliding on the other. The expansion joint filler shall be rubber cork composition or neoprene strip or isolation pad.
9. Escalator truss shall be manufactured in sufficient number of parts to allow delivery to well-way through existing structure without modification to the existing structure.

N. Field Splices and Connections: Rigid, non-deforming, and maintaining alignment. Holes for attaching balustrade securing brackets shall be punched. Field modifications and/or burning shall not be permitted.

O. Access Panels: Access panels for access to escalator parts for inspection and maintenance shall be provided.

P. Intermediate Supports: Shall be stub column and beam type bolted to well-way structure. Stub columns may be welded or bolted to the truss.

1. Support trusses using intermediate supports described above shall be provided. No other attachments to structure shall be permitted. Truss mounts, including bolts, angles, shims, bearing pads, and spring supports, as required to align and install escalators shall be provided.

Q. Step Chain Tensioning Device: The step chain tensioning device shall be of a design that keeps the step chains at the correct tension.

1. The tensioning device shall be located at the lower end of the escalator, within the truss, with the adjusting screws easily accessible and adjustable.
2. The tensioning device shall consist of 2 chain sprockets for step chain return and shall be fitted on a common shaft by means of roller bearings.
3. The tensioning shaft shall run on roller or precision ground roller bearings and guides in such a way that exact parallelism of the chain sprockets in the tensioning direction is ensured. Sleeve bearing (steel on steel) shall not be allowed.
4. The tensioning shaft shall be tensioned by compression springs at both sides.
5. The return guides for the step rollers shall form an integral unit with the tensioning device and shall be connected to the rest of the step guiding system by means of sliding attachments.
6. A pointer and scale shall be provided to gauge step chain tensioning and wear.

R. Lubrication System Requirements:

1. Parts, other than sealed items, requiring lubrication shall be designed for an automatic or remote lubricating system. The system shall operate only when escalator is running and the amount of lubrication shall be fully adjustable. A reservoir with a low oil signal to the controller, and a minimum capacity of 2-1/2 gallons shall be provided. The oil reservoir shall be equipped with a dipstick or a sight glass. The case shall be provided with a convenient method of draining the oil.
2. System shall be positive acting, located in escalator pit.
3. Reservoir level indications shall be provided where lubricants are contained within housings, supply tanks, and larger filler cups.
4. Electric heaters installed and connected to panel shall be employed to maintain lubricant viscosity where required.
5. Lubricants of the various assemblies shall be as applicable to that assembly.
6. Contractor shall furnish and mount, near the lubricating system in the escalator pit, a framed lubrication chart for each escalator. The chart shall show the location of each lubrication point, type of lubricant to be used, and the frequency of lubrication.
7. Bearings: Bearings shall be rated for severe, heavy-duty service, and shall be of the best quality available. Sealed bearings shall be used where accessibility or manual lubrication is impractical in escalator design. Bearings requiring manual lubrication shall be furnished with fittings to accommodate the use of a pressure gun for lubrication. Contractor shall furnish appropriate pressure

gun. Self- lubricating bearings or material other than ball or roller type bearings may be used where practical.

8. Manual Lubrication: Location of manual lubrication points shall be easily accessible and available.

S. Indicators: Escalator users shall be informed by means of indicator lights of the pre-determined running direction of the escalator. 2 circular cut-outs, minimum diameter 2-3/4 inches, shall be provided in the upper and lower right-hand balustrade newels, in the handrail return side paneling, each containing an inset red and green light. The green light shall be illuminated at the entrance for escalator running direction and the red lamp shall be illuminated at the exiting end.

T. Maintenance Drive Unit: Means shall be provided for reduced speed maintenance operation that shall be controlled by a manual handset. When operated, the escalator shall run in the direction selected, at a speed of not more than 10 feet per minute. This speed shall be maintained when steps are removed for servicing. The running shall be continuous so long as an "up" or "down" button on the handset is being pressed. The handset shall have a 30 foot retractile type cord with a plug connector. When plugged into receptacle, there shall be no means of operating or running the escalator except by the service handset. Receptacles shall be located in both the top and bottom pits.

U. Room Storage Cabinet: Provide a stainless steel cabinet of not less than 52 inches high x 36 inches wide x 18 inches deep for installation in the Escalator/Meter area at the location indicated. The Cabinet shall have lockable doors and be mounted on legs, a minimum of 4 inches above the finish floor. Cabinet shall be labeled for escalator control purposes, as directed by the Commissioner, and Contractor shall store small parts, supplies, tools, and other materials within.

V. Lock Cylinders: Locks and keys shall be as per Commissioner approval. Verify with the Commissioner that the requirements for hardware have not been amended or superseded. Provide the Commissioner with length, finish, and keying requirements of each cylinder required.

W. Demarcation Lights: Step demarcation lights shall be provided at both upper and lower landings. Each landing shall have a minimum of 3 fixtures, green in color, and U.L. labeled "suitable for outdoor locations."

PART 3 - EXECUTION

3.01 INSTALLATION

A. Contractor shall install complete and operating escalator in accordance with manufacturer's written instructions, the Code, and approved shop drawings.

B. Contractor shall install special tools in the room storage cabinet as specified above.

3.02 FIELD TESTING

A. General: Contractor shall notify the Commissioner 7 days prior to each scheduled test. Contractor shall perform testing in the presence of Commissioner. Notify the appropriate local authorities having jurisdiction a minimum of 7 days in advance of final acceptance tests. Provide instruments, materials, and labor required for tests specified herein.

B. Acceptance Testing Requirements:

1. Testing shall be performed after installation and before the approved date of start of interim maintenance service for each station.
2. Testing shall be performed in accordance with the Code procedures and nonmandatory appendices acceptance tests with the following additions or adaptations.
3. Perform the following tests on each escalator without load:

a. Overspeed protection device: Test by operating escalator at rated speed and tripping overspeed device manually. Device shall have been separately tested and set in factory to operate at escalator speed as specified herein.
b. Comb plate cut-off switch: Test using an object jammed against the comb plate.
c. Handrail tension malfunction device: Test manually.
d. Broken chain protection: Test by operating escalator at rated speed and tripping broken chain device by hand.
e. Device providing protection against sudden and unusual strains on step chains: Test by operating device by hand.
f. Push buttons, starting switches, starts, relays, interlocks, and controls required in connection with work: Inspect and test to prove that complete escalator functions properly under conditions of operation within limits specified.
g. Brakes and driving machinery: Test for operating efficiency, ease of adjustment, and minimum 6 inch slide distances in the up and down directions.
h. Conductors for power and control wiring before being connected: Test as required by the Commissioner.
i. Escalator shall produce no noise louder than 55 decibels measured 3 feet above the floor or stair level at the entrance combs at both ends with the escalator operating normally, either free running or under load. For multiple escalator installations, the noise measurement at each group shall be made with only the 1 escalator unit under evaluation in operation. Transient noise level shall not exceed 60 decibels.
j. Each escalator shall have the static (breakaway) torque tested. The torque value shall be equal to, or greater than, the brake label identified requirement.

4. Contractor shall perform the following tests on each escalator under full load:

a. Each escalator shall have a full field load brake test performed on it. The braking distance versus load curve shall be plotted and presented to the Commissioner for approval. The test and load curve shall be plotted for

both 90 feet per minute and 120 feet per minute, as required. The stopping distance in the down direction shall meet all requirements of the Code.

b. 24 hour test: The escalator shall operate continuously for 24 hours after the acceptance test with no faults. If any fault occurs that shuts the escalator down, the fault must be corrected and a new 24 hour test begun.

c. A full load truss test shall be performed on the escalator.

3.03 PROTECTION

A. Protection: Protect materials and finishes from damage until final acceptance of the work by the Commissioner. Provide protective coverings on surfaces, remove just prior to final inspection for acceptance of the Work.

3.04 WARRANTY INSPECTIONS

A. In addition to any warranty provisions covered by these specifications, the Contractor shall perform complete inspections of the escalator and all associated systems and controls. The inspections shall be no less than 8 hours each escalator and be conducted Monday to Friday, normal daytime hours. The warranty inspections shall take place 11 months from the date of final acceptance by the Commissioner of each escalator installation. The Commissioner's representative will accompany the Contractor on the inspections.

B. The Contractor shall prepare and submit to the Commissioner a written report with 2 copies, stating the condition of the equipment outlining any modifications to the maintenance specifications or operational procedures and respond in writing to questions raised by the Commissioner or maintenance personnel during the inspection periods.

C. As part of the inspections, inspect and adjust machinery, and replace parts showing undue wear, or tendencies toward malfunction, or items indicating a need for modifications or design change. Furnish this as part of the guarantee obligation.

D. The inspections shall be performed by the Contractor's service representative. Costs involved with each of these inspections such as travel, accommodations, international charges, fees, tools, equipment, and parts costs, shall be paid in full by the Contractor.

E. Contractor shall notify the Commissioner’s Escalator Maintenance Department in writing at least 2 weeks prior of the intent to conduct the escalator warranty inspections.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of TRANSIT SYSTEM ESCALTOR shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of TRANSIT SYSTEM ESCALTOR shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural work: 090000.

END OF SECTION