BOOK 3
DETAIL SPECIFICATIONS FOR SEWER CONSTRUCTION

ROGERS AND GREENVIEW SEWER IMPROVEMENT

DWM PROJECT NO.: 7439

SPECIFICATION NO.: 1196812

CITY OF CHICAGO

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BOOK 3 - SPECIFICATIONS
TABLE OF CONTENTS
ROGERS AND GREENVIEW SEWER IMPROVEMENT
DWM PROJECT NO: 7439

DIVISION I – GENERAL INFORMATION

SECTION 101	EMERGENCIES	GI-2
SECTION 102	RIGHT TO OCCUPY AND USE BEFORE ACCEPTANCE	GI-2
SECTION 103	GUARANTEE	GI-2
SECTION 104	LINES AND GRADES	GI-2
SECTION 105	DATUM	GI-3
SECTION 106	CONSTRUCTION PROCEDURE	GI-3
SECTION 107	STORAGE OF CONCRETE PIPE AND STRUCTURES	GI-3
SECTION 108	DISPOSAL OF EXCAVATED MATERIAL	GI-4
SECTION 109	CONTROL OF DUST	GI-4
SECTION 110	TREES	GI-4
SECTION 111	PIPE AND STRUCTURE EXCAVATION AND BACKFILL	GI-7
SECTION 112	PUMPING, BAILING, AND DIVERSION	GI-16
SECTION 113	REPAIRING PAVED STREETS AND SIDEWALKS	GI-18
SECTION 114	NEW PAVEMENTS, GUTTERS, CURBS AND WALKS	GI-18
SECTION 115	CONCRETE FOR SEWERS AND SEWER STRUCTURES	GI-18
SECTION 116	PRECAST CONCRETE MASONRY	GI-24
SECTION 117	BRICK MASONRY	GI-25
SECTION 118	IRON CASTINGS AND MICELLANEOUS METALS	GI-26
SECTION 119	SEWER PERMIT	GI-27
SECTION 120	ABANDONDED STREETCAR TRACKS	GI-27
SECTION 121	CHICAGO DEPARTMENT OF TRANSPORTATION REQUIREMENTS	GI-28
SECTION 122	ILLINOIS DEPARTMENT OF TRANSPORTATION PERMIT	GI-28
SECTION 123	PARKING METERS AND STREET SIGNS	GI-28
SECTION 124	TELEVISED INSPECTION OF SEWERS AND SEWER STRUCTURES	GI-29
SECTION 125	SALVAGE EXISTING ITEMS	GI-30
SECTION 126	PARTIAL REMOVAL OF SEWERS AND STRUCTURES	GI-31
SECTION 127	WATER USE PERMITTING	GI-31
SECTION 128	MATERIAL QC/QA	GI-31
SECTION 129	IEPA ASIR REQUIREMENTS	GI-32
SECTION 130	EARTH RETENTION SYSTEM SUBMITTAL	GI-39

DIVISION II - DETAILED SPECIFICATIONS

ITEM NO.	DWM OR IDOT	ITEM DESCRIPTION	PAGE
1	DWM	ENGINEER'S FIELD OFFICE	DS-1
2	DWM	MOBILIZATION	DS-3
3	DWM	PROJECT SIGNS	DS-6
4	DWM	TRAFFIC CONTROL AND PROTECTION	DS-7
5	DWM	CHANGEABLE MESSAGE SIGN	DS-11
6	DWM	MAINTAIN EXISTING LIGHTING SYSTEM	DS-12
7	DWM	TEMPORARY PAVEMENT MARKING – LINE 4"	DS-16
8	DWM	PAVEMENT MARKING REMOVAL	DS-17
9	IDOT	TEMPORARY CONCRETE BARRIER	DS-0
10	IDOT	RELOCATE TEMPORARY CONCRETE BARRIER	DS-0
11	IDOT	IMPACT ATTENUATORS, TEMPORARY (NON-REDIRECTIVE, NARROW) TEST LEVEL 2	DS-0
12	IDOT	IMPACT ATTENUATORS, RELOCATE (NON-REDIRECTIVE, NARROW) TEST LEVEL 2	DS-0
13	DWM	SEWER, 24", DUCTILE IRON PIPE, CLASS 52, IN OPEN CUT	DS-18
14	DWM	SEWER, 36", DUCTILE IRON PIPE, CLASS 52, IN OPEN CUT	DS-18
15	DWM	SEWER, 24", CLASS III, REINFORCED CONCRETE PIPE, IN OPEN CUT	DS-21
16	DWM	SEWER, 36", CLASS III, REINFORCED CONCRETE PIPE, IN OPEN CUT	DS-21
17	DWM	SEWER, PRECAST WYE 60" x 36", REINFORCED CONCRETE, CLASS III, IN OPEN CUT	DS-21
18	DWM	DRAIN CONNECTION, 6", VITRIFIED CLAY PIPE	DS-25
19	DWM	DRAIN CONNECTION, 6", DUCTILE IRON PIPE	DS-25
20	DWM	DRAIN CONNECTION, 8", VITRIFIED CLAY PIPE	DS-25
21	DWM	DRAIN CONNECTION, 8", DUCTILE IRON PIPE	DS-25
22	DWM	DRAIN CONNECTION, 12", VITRIFIED CLAY PIPE	DS-25
23	DWM	DRAIN CONNECTION, 15", VITRIFIED CLAY PIPE	DS-25
24	DWM	DRAIN CONNECTION, 16", DUCTILE IRON PIPE	DS-25
25	DWM	DRAIN CONNECTION, 24", REINFORCED CONCRETE PIPE	DS-25
26	DWM	DRAIN CONNECTION, 24", DUCTILE IRON PIPE	DS-25
27	DWM	DRAIN CONNECTION, 36", REINFORCED CONCRETE PIPE	DS-25
28	DWM	DRAIN CONNECTION, 36", DUCTILE IRON PIPE	DS-25
29	DWM	DRAIN CONNECTION, 60", REINFORCED CONCRETE PIPE	DS-25
30	DWM	MANHOLES, TYPE A, 3' DIAMETER	DS-29
31	DWM	MANHOLES, TYPE B, 3' DIAMETER	DS-29
32	DWM	MANHOLES, TYPE B MODIFIED, 3' DIAMETER	DS-29
33	IDOT	CONCRETE COLLAR	DS-0
34	IDOT	REINFORCEMENT BARS, EPOXY COATED	DS-0
35	DWM	DRILL AND GROUT DOWEL AND TIE BARS	DS-30
36	DWM	CATCH BASIN 3' DIAMETER	DS-31
37	DWM	CATCH BASIN 4' DIAMETER	DS 31
38	DWM	CHICAGO STANDARD FRAME	DS-32
39	DWM	CHICAGO STANDARD LID	DS-32
40	DWM	STANDARD INLETS	DS-34

ITEM NO.	DWM OR IDOT	ITEM DESCRIPTION	PAGE
41	IDOT	TRENCH BACKFILL	DS-0
42	DWM	EARTH EXCAVATION	DS-35
43	DWM	STABILIZATION STONE	DS-37
44	DWM	TEMPORARY STONE	DS-38
45	DWM	TEMPORARY COLD PATCH	DS-39
46	DWM	PORTLAND CEMENT CONCRETE BASE COURSE, VARIABLE DEPTH	DS-40
47	DWM	PORTLAND CEMENT CONCRETE BASE COURSE, HES, VARIABLE DEPTH	DS-40
48	DWM	BITUMINOUS PAVEMENT SURFACE REMOVAL, 2" AND LESS	DS-41
49	DWM	CONCRETE PAVEMENT SURFACE REMOVAL, 2” AND LESS	DS-41
50	DWM	SUBBASE GRANULAR MATERIAL, TYPE B 4”	DS-42
51	DWM	SUBBASE GRANULAR MATERIAL, TYPE B 6”	DS-42
52	DWM	PAVEMENT REMOVAL	DS-43
53	DWM	CURB REMOVAL	DS-44
54	DWM	COMBINATION CURB AND GUTTER REMOVAL	DS-44
55	DWM	SIDEWALK AND ADA RAMP REMOVAL	DS-45
56	DWM	COMBINATION CURB AND GUTTER, TYPE B-V.12	DS-46
57	DWM	CONCRETE CURB, TYPE B	DS-46
58	DWM	PORTLAND CEMENT CONCRETE SIDEWALK - 5-INCH	DS-48
59	DWM	PORTLAND CEMENT CONCRETE ADA RAMP - 5-INCH	DS-49
60	DWM	PROTECTIVE CONCRETE COAT	DS-50
61	DWM	DETECTABLE ADA WARNING TILES, LINEAR	DS-51
62	IDOT	HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N70	DS-0
63	CDOT	HOT-MIX ASPHALT SURFACE COURSE, IL-9.5L, MIX "C", N30 (CDOT)	DS-52
64	IDOT	HOT-MIX ASPHALT SURFACE COURSE, MIX “D”, N70	DS-0
65	DWM	BITUMINOUS SPEED HUMPS	DS-55
66	IDOT	BITUMINOUS MATERIALS (TACK COAT)	DS-0
67	IDOT	THERMOPLASTIC PAVEMENT MARKING – LINE 4”	DS-0
68	IDOT	THERMOPLASTIC PAVEMENT MARKING – LINE 6”	DS-0
69	IDOT	THERMOPLASTIC PAVEMENT MARKING – LINE 12”	DS-0
70	IDOT	THERMOPLASTIC PAVEMENT MARKING – LINE 24”	DS-0
71	IDOT	THERMOPLASTIC PAVEMENT MARKING – LETTERS AND SYMBOLS	DS-0
72	CDOT	PREFORMED THERMOPLASTIC PAVEMENT MARKING – GREEN	DS-57
73	CDOT	CROSSWALK SURFACING SYSTEM	DS-58
74	DWM	SODDING, SALT TOLERANT	DS-62
75	DWM	TOP SOIL	DS-64
76	DWM	MANHOLES TO BE ADJUSTED	DS-69
77	DWM	VALVE VAULTS TO BE ADJUSTED	DS-69
78	DWM	CATCH BASINS TO BE CLEANED	DS-70
79	DWM	VALVE VAULTS TO BE CLEANED	DS-70
80	DWM	REMOVING MANHOLES	DS-71
81	IDOT	FILLING MANHOLES	DS-0
82	IDOT	FILLING CATCH BASINS	DS-0
83	DWM	TEMPORARY WATER MAIN SUPPORT STRUCTURE - TYPE III, 12" AND SMALLER	DS-72
84	DWM	CONTROLLED LOW STRENGTH MATERIAL (CLSM)	DS-73

ITEM NO.	DWM OR IDOT	ITEM DESCRIPTION	PAGE
85	DWM	WATER MAIN INSTALLED IN OPEN CUT – 6-INCH	DS-74
86	DWM	WATER MAIN INSTALLED IN OPEN CUT – 8-INCH	DS-74
87	DWM	WATER MAIN INSTALLED IN OPEN CUT – 12-INCH	DS-74
88	DWM	CUT, CAP, AND REPLACE EXISTING WATER MAIN FOR UTILITY INSTALLATION -6 INCH	DS-76
89	DWM	CUT, CAP, AND REPLACE EXISTING WATER MAIN FOR UTILITY INSTALLATION -8 INCH	DS-76
90	DWM	CUT, CAP, AND REPLACE EXISTING WATER MAIN FOR UTILITY INSTALLATION -12 INCH	DS-76
91	DWM	CUT, CAP, AND REPLACE EXISTING WATER MAIN AND TEE FOR UTILITY INSTALLATION -8 INCH	DS-76
92	DWM	CUT, CAP, AND REPLACE EXISTING WATER MAIN AND TEE FOR UTILITY INSTALLATION -12 INCH	DS-76
93	DWM	VALVE INSTALLATION – 8-INCH	DS-78

DIVISION III – APPENDICIES

APPENDIX I
CITY OF CHICAGO DEPARTMENT OF TRANSPORATION STANDARD DETAILS

APPENDIX II
CITY OF CHICAGO DEPARTMENT OF WATER MANAGEMENT STANDARD SPECIFICATIONS AND DETAILS FOR WATER MAIN CONSTRUCTION

APPENDIX III
EXAMPLE OUC EFP SUBMITTAL FOR EXCAVATION OVER 12 FEET DEEP

APPENDIX IV
GEOTECHNICAL REPORT

APPENDIX V
USE OF AMERICAN IRON AND STEEL

ILLINOIS DEPARTMENT OF TRANSPORTATION SPECIFICATIONS

2020 SUPPLEMENTAL SPECIFICATIONS INDEX
2020 RECURRING SPECIAL PROVISIONS CHECK SHEET
2020 RECURRING LOCAL ROADS AND STREETS SPECIAL PROVISIONS CHECK SHEET
5/24/20 BDE SPECIAL PROVISIONS CHECK SHEET
08/9/19 DISTRICT ONE SPECIAL PROVISIONS CHECK SHEET

DIVISION I

GENERAL INFORMATION

General Information
For
DWM Sewer Improvement Program
Project No.: 7439 (Rogers and Greenview Sewer Improvement)

The following Detailed Specifications supplement the IDOT "Standard Specification for Road and Bridge Construction", adopted April 1, 2016 (hereinafter referred to as the Standard Specifications or the SSRBC); the "Supplemental Specifications and Recurring Special Provisions", adopted January 1, 2020; the latest edition of the "Illinois Manual on Uniform Traffic Control Devices for Streets and Highways" in effect on date of invitation for bids; the City of Chicago Department of Transportation Regulations for Openings, Construction and Repair in the Public Way (including Appendix B - ADA Standards) in effect on date of invitation for bids; and the City of Chicago Street Restoration Requirements in effect on date of invitation for bids. The latter two documents are available on the City of Chicago Department of Transportation's web site. In case of conflict with any part or parts of said specifications, these Detailed Specifications will take precedence and will govern.

Unless otherwise specified, the Description, General Requirements, Method of Measurements and Basis of Payment for the following items shall be as stated in the appropriate Sections of the Standard Specifications.

DESCRIPTION OF PROJECT

This project consists of sewer improvements in the area of 2460 lineal feet. This includes but is not limited to 1293 lineal feet of 24-inch reinforced concrete sewer pipe; 727 lineal feet of 36-inch reinforced concrete sewer pipe; 380 lineal feet of 24-inch ductile iron sewer pipe; 52 lineal feet of 36-inch ductile iron sewer pipe; installation of manholes and catch basins; construction of junction structures; construction of new connections to existing sewers, construction of concrete collar connections, and installation of drain connections. Additionally the work of this contract includes site mobilization, providing traffic control and protection for the duration of the contract; capping and/or abandonment of existing water mains; all required excavation, trenching, grading, backfilling and compaction of excavations; restoration of pavements, curbs, walkways, landscaped areas, and removal of all construction debris; as described in Detailed Specifications, including all appurtenant work and accessories, to the complete satisfaction of, approval and acceptance by the City.

MAINTENANCE OF TRAFFIC

The Contractor must, at all times, conduct the work in such a manner as to insure the least obstruction to vehicular and pedestrian traffic. The Contractor must provide all temporary facilities necessary to maintain vehicular and pedestrian traffic and access to all property to the satisfaction of the Commissioner. Traffic control devices, conforming to Illinois Department of Transportation Standards, must be placed as shown on the Standard Drawings at the end of the plans entitled Traffic Control Standards. This work will be included in "Traffic Control and Protection".

LEAD WATER SERVICES

Should any lead water services be physically impacted by construction, then the DWM Notification Requirements to Homeowners During Construction protocol must be followed.

SECTION 101. EMERGENCIES

In an emergency affecting the safety of life, work or adjoining property, the Contractor, without special instruction or authorization from the Commissioner, may act as necessary to prevent loss or injury. In such emergencies, if the Contractor is instructed or authorized by the Commissioner to act to prevent loss or injury, he must so act without appeal. The amount to be paid to the Contractor for such emergency work will be determined in the same manner as the amounts to be paid for alterations as determined under “Payment for Changes” in BOOK 1, TERMS AND CONDITIONS FOR CONSTRUCTION.

SECTION 102. RIGHT TO OCCUPY AND USE BEFORE ACCEPTANCE

Before final acceptance, the City may occupy any part of the work and the Contractor may, under the direction of the Commissioner, divert water or sewage into and through the completed portions of the work provided such diversion does not hinder the progress of the work. Such use or occupancy will not constitute acceptance and will not relieve the Contractor of any liability due to damage to adjacent property nor lessen the responsibility of the Contractor to repair or replace any materials or work found to be defective. The Contractor will not be entitled to an extension of time or extra compensation because of such use of the completed portion of the work.

SECTION 103. GUARANTEE

All Work furnished under this Contract will be guaranteed against defective materials and workmanship, improper performance and noncompliance with the Contract Documents for a period of one year after final completion and acceptance of the Project. The Contractor must comply with the requirements of “Warranties” in BOOK 1, TERMS AND CONDITIONS FOR CONSTRUCTION.

SECTION 104. LINES AND GRADES

The Contractor must check such lines and grades by such means as are deemed necessary and, before using them, must call the Commissioner's attention to any inaccuracies. Also, the Contractor has sole responsibility for the accuracy of the working or construction lines and grades. The Contractor, however, is subject to the check and review of the Commissioner.

The Contractor must keep the Commissioner informed a reasonable time in advance as to the Contractor’s need for line and grade reference marks in order that they may be furnished, and all necessary measurements made for record and payment with the minimum inconvenience to the Commissioner and minimum delay to the Contractor.

The Contractor must verify all distances and angles of deflection prior to ordering any pipe. The distances and angles shown on the drawings are for information only. The City makes no guarantees as to the accuracy of the measurements shown.

It is essential that the structures to be built under the Contract be constructed accurately to the lines, grades, shapes and dimensions shown on the Plans or ordered by the Commissioner, in order that said structures when completed may function as intended. Any portion of any structure which varies materially from the line, grade, shape and dimensions shown on the Plans or ordered by the Commissioner must be removed and replaced without additional expense to the City. The Contractor must exercise

extreme care in constructing the work under the Contract so that the finished structures will conform accurately to the required lines, grades, shapes and dimensions.

The Contractor must safeguard all points, stakes, grade marks, monuments, and bench marks made or established on the Work, reestablish them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining, protecting, or removing without authorization such established points, stakes, and marks.

SECTION 105. DATUM

All elevations shown on the Plans or cited in the Specifications are based on Chicago City Datum (CCD) as established by ordinance which is elevation 579.88 above mean sea level, 1935 adjustment.

SECTION 106. CONSTRUCTION PROCEDURE

The Contractor must use care to prevent damage to portions of the sewers and structures which are to remain in place. Any portions of said sewers and structures which are outside of the limits of removal, as shown on the Plans or ordered by the Commissioner, and which are damaged by the Contractor, must be repaired or replaced by the Contractor without cost to the City.

The Contractor's attention is called to the fact that flows in the existing sewers could flood the work under this Contract, especially in the event of heavy rains. He must be prepared at all times to safeguard workmen and protect the work under this Contract from damage by flooding and must also install a suitable screen to keep debris from the sewer system, all as specified under Book 3, Division I, Section 112, Pumping, Bailing, and Diversion. The Contractor must maintain flow at all times in the existing sewers. Any temporary dams or bulkheads installed by the Contractor must be removed after completion of the work.

The Department of Water Management requires that the Contractor televise all existing sewers outside of the trench limits prior to construction to confirm the locations of all connections to be made to and from the existing sewers. See Specifications, Book 3, Division 1, Section 124, Televised Inspection of Sewers and Sewer Structures.

The Contractor must construct and complete the sewer and structures as indicated on the Plans and all necessary items of permanent surface restoration, so as to complete the entire work under this contract within the timeframes stated in the Book 2, Instructions and Execution Documents, of these Specifications. These restoration items include, but are not limited to pavements, curb and gutters, driveways and sidewalks.

The Department of Water Management requires all structural work, including but not limited to reinforced concrete collars, cast in place concrete connection structures, modification of structures, and temporary bracing, temporary water main supports earth retention systems to have design and shop drawing submittals. All structural submittals must be prepared, signed, and sealed by a Licensed Structural Engineer registered in the State of Illinois prior to being submitted to the Commissioner for approval.

SECTION 107. STORAGE OF CONCRETE PIPE AND STRUCTURES

In order to minimize inconvenience to adjacent property owners, the Contractor must not store concrete pipe or structures on the job site for a distance of more than 600 feet ahead of the trench excavation and concrete pipe must not be stacked.

SECTION 108. DISPOSAL OF EXCAVATED MATERIAL

The Contractor must procure sites for the disposal of all excess excavated material in conformity with current laws and ordinances per 35Ill. Adm. Code 1100 and will furnish the Commissioner a copy of any permits for disposal sites. The Contractor must perform a historical analysis of the project site to determine areas with possible contaminants. The Contractor will be required to provide soil borings and laboratory testing of specimens as needed to fulfill the above requirements.

If contaminated areas are identified, the Contractor will be directed to provide additional soil borings and laboratory testing of specimens as determined by the Commissioner to accurately determine the limits of the area. The Contractor will be compensated for the costs of these additional tests and the additional costs to haul and dispose of the material.

Any material identified as contaminated must be transported and disposed of per current IEPA rules and regulations. The Contractor must furnish the Commissioner a copy of any permit or manifest documents required for hauling and disposing of contaminated material.

All excavated material, except that material suitable for backfilling in open cut and required for historical and scientific specimens, must be removed immediately from the site of the work and disposed of by the Contractor. Excavated material must not be stockpiled along the route of the work except at specified locations as authorized in writing by the Commissioner.

The Contractor will submit such information as may be required by the Commissioner concerning the method of disposal of materials excavated under this Contract. If material is to be hauled by trucks the Contractor will submit information regarding the loading and the methods proposed to prevent overloading and spilling of material during transit, the routes to be used between the points of loading and disposal and any additional information required. See Book 3, Division I, Section 109, Control of Dust for additional provisions regarding hauling operations. He must arrange to transport and dispose of excess material with a reasonable minimum of interference with street use and the conduct of business.

SECTION 109. CONTROL OF DUST

The Contractor's operations, including hauling of materials and backfill, and mixing of concrete, must be constructed in such a way as to keep dust to a minimum. In the event that the Contractor's operations create a nuisance due to the presence of excessive dirt and dust, at the work site or along the route of his hauling operations, he must upon orders from the Commissioner, immediately dispel the dust nuisance by removing the cause or by applying a suitable dust- reducing agent. No additional payment will be made to the Contractor resulting from any expenses incurred by him while eliminating dust as specified.

SECTION 110. TREES

The Contractor must arrange his construction operations and use the necessary equipment required, so as not to remove or damage existing trees due to construction work to be performed under this Contract. Tree trimming may be required prior to the start of construction in order to avoid irreparable tree damage inflicted by movement of equipment and materials. Also, if during actual construction there are additional conflicts with trees, the Contractor must immediately contact the Bureau of Forestry, Plans and Permits Section, 2352 S Ashland Avenue, Chicago, Illinois 60608, telephone number (312) 746-5254. All work must conform to the requirements of Section 201 of the Standard Specifications for Road and Bridge Construction (SSRBC), except as herein specified or directed by the Bureau of Forestry.

All catch basin and sewer connections installation and removal operations should be completed with care, minimizing damage to the trees or roots. When digging around any tree, there should be a minimum of six (6) feet from the base of the tree to the edge of the excavation. Should any roots be severed during the installation and removal of catch basin and sewer connections the damaged roots should be pruned cleanly to aid in the healing process. If it becomes necessary to remove a tree to perform any operations, the Bureau of Forestry must be contacted to issue a permit for its removal and replacement. If during actual construction there are conflicts with trees, the Contractor should immediately contact the Bureau of Forestry.

Where the proposed back of curb, driveway, or sidewalk is located five (5) feet or less from the face of existing parkway trees, root pruning by an approved mechanical root pruning saw must be done prior to the excavation where noted on the plans or directed by the Commissioner. Dimensions for root pruning are as follows:

Small Trees (< 10” D.B.H.)

Unless noted otherwise, the root pruning trench shall offset no more than one foot from the back of the proposed curb line or sidewalk. The length of the root pruning shall not be less than five (5) feet on each side of the centerline of the tree.

Medium Trees (10” – 15” D.B.H.)

Unless noted otherwise, the root pruning trench shall offset no more than one foot from the back of the proposed curb line or sidewalk. The length of the root pruning shall not be less than ten (10) feet on each side of the centerline of the tree.

Large Trees (> 15” D.B.H.)

Unless noted otherwise, the root pruning trench shall offset no more than one foot from the back of the proposed curb line or sidewalk. The length of the root pruning shall not be less than fifteen (15) feet on each side of the centerline of the tree.

Permission for root pruning on more than one side of an existing tree must be obtained from the Bureau of Forestry. Depth of root pruning shall be at minimum equal to, but not exceeding the depth required for the installation of sewers, sewer structures, sidewalk, curb, or driveway.

Due caution is to be taken on or around existing utility lines. The Contractor shall be responsible for locating all utilities prior to root pruning. The Contractor shall notify Chicago’s Utility Alert Network

(DIGGER) at (312) 744-7000 regarding all root pruning locations. No root pruning shall proceed within two feet of an existing utility or where an existing utility crosses the root pruning trench unless authorized by the Commissioner.

The Contractor will be accountable for any crown, trunk or root damage to trees that occurs within the project area and will be required to replace any damaged trees. If the Contractor damages or modifies any tree(s) that has not been approved for trimming, pruning or removal, the Contractor will be subject to providing and installing a replacement tree to the satisfaction of the Bureau of Forestry. In instances where a tree must be replaced that was not approved for trimming, pruning or removal, it will be done at no additional cost to the City.

Only insured tree service companies will be issued permits to work on trees. Tree trimming must be performed prior to construction start to minimize damage. Tree trimming must be performed as to maintain natural tree form. CLEAR CUTTING LIMBS DIRECTLY ABOVE THE CURBLINE IS PROHIBITED. Placement and storage of construction material on grass medians and parkways is prohibited.

The Contractor is not permitted to remove trees beyond the limits of the trench excavation except as shown on the Project Drawings or as ordered by the Commissioner. The Contractor must arrange his construction operations and use the necessary equipment required, so as not to remove or damage any existing trees due to construction work to be performed under this Contract. The Contractor, before starting work, must submit to the Commissioner for approval, a layout of his construction procedures and the equipment to be used in maintaining the trees in place without damage. Furthermore, in order to protect tree trunks from damage, the Contractor must place 2" x 4" boards, six (6) feet long, vertically and about 6 inches apart around all trees located in the parkways along the route of the work. The boards must be held in place by wire looped around the circumference of the tree trunk. After completion of all work, the protective boards and wires must be carefully removed.

If ordered by the Commissioner, each tree removed by the Contractor due to construction operations must be replaced in accordance with the City of Chicago Standard Tree Protection Guidelines issued by the Bureau of Forestry. All work must conform to the requirements of Section 201 of the Standard Specifications for Road and Bridge Construction (SSRBC), except as herein specified. All trees must be balled and burlapped, and the work must include the furnishing and placing of topsoil, fertilizer nutrient, peat moss and all incidental material.

Exact location of replacement trees must be obtained by the Contractor from the Bureau of Forestry, Plans and Permits Section.

The Contractor must employ an insured tree service company, approved by the City, to perform all tree planting work. Assigning of the work to said tree expert must not relieve the Contractor of responsibility for the material used or the work performed.

Any pruning of trees required to permit the operation of the Contractor's equipment must be kept to a minimum, subject to the approval of the Commissioner, and must be done symmetrically by a licensed tree expert. This tree expert will be required to obtain a permit from the Bureau of Forestry, Plans and Permits Section of the Department of Streets and Sanitation to trim and spray or in any way affect the general health or structure of trees in the public way. Prior to this approval, the Bureau will conduct an investigation at the sites of the proposed sewer. They will work with the Resident Engineer and the Contractor, and request 48-hour notice prior to starting any tree work. All costs to Contractor for

preserving, protecting and pruning trees, as specified, must be included in the prices bid for sewers and sewer structures.

The Contractor must furnish a maintenance bond to the City in the amount of $10,000.00 to insure fulfillment of the obligations assumed under this work. Said bond must be issued by a Surety in a form satisfactory to the Commissioner and approved by the City. Trees planted by the Contractor must be guaranteed for a period of two (2) years from the date of final acceptance of all work performed under this Contract. Dead or partially dead trees due to faulty materials, workmanship or any damage resulting from the work under this contract must be replaced by the Contractor at no cost to the City.

All costs to the Contractor resulting from the conditions of this work must be included in the prices for sewer and sewer structures.

SECTION 111. PIPE AND STRUCTURE EXCAVATION AND BACKFILL

111.1 Description.

Pipe and structure excavation and backfill includes providing material, equipment, and labor associated with excavation and backfill, bedding, and removal of surface features for the installation of sewers, pipes, junctions, connections, special structures and water main supports; excavations, hand excavations, all necessary sheeting, bracing, shoring and removal of surface materials, disposal of excavated materials, providing and installing backfill materials, and compaction, and diverting sewer and water flow.

Earth work in open cut or tunnel includes loosening, loading, removing and disposing in the specified manner of all materials, wet or dry, necessary to be removed for the purpose of construction, furnishing, placing, maintaining and removing all sheeting, bracing and lining, backfilling, pumping, bailing and cleaning, care of existing structures and utilities, and the incidental work necessary thereto.

All costs to the Contractor resulting from the conditions of this work must be included in the prices for sewers and sewer structures, except that the backfilling of sewers installed in open cut will be paid for at the contract unit price for “TRENCH BACKFILL”

111.2 General.

During construction of the sewer, it is the Contractor’s responsibility to keep the sewer trench dry, control seepage from the surrounding earth, and prevent loss of ground from the excavation sides until the backfilling is completed to the required subgrade level. Water pumped from trenches or other excavations must be routed to settling basins before entering the City of Chicago sewer system. See Book 3, Division I, Section 112, Pumping, Bailing and Diversion. The Contractor must submit a means and methods of dewatering to the Commissioner for OUC review and approval. Include locations of all well points if required, as well as supporting calculations indicating the extent of drawdown and settlement. See Book 3, Division I, Section 121, Chicago Department of Transportation Requirements, for additional CDOT-QAD submittal requirements.

To keep the trench sides from caving and to allow no water inflow towards the trench excavation, the Contractor must design, provide, and install an earth retention system suitable to field conditions. If the Contractor decides trench box methods are to be used, they must determine the arrangement, sizes,

types, and construction sequence for all components of the trench box supports. The Contractor must submit design computations and details of the trench box supports and construction staging, for the Commissioner's approval prior to the installation of the trench box supports.

Submitted design computation items shall include, but not be limited to, borings logs and associated field test data, geotechnical reports, any design assumptions used in the calculations, any relevant pages of reference used in the calculations, data of material properties used in the calculations, sketches of soil layering, cross sections and plan views supporting the calculations, soil parameters, water level, all pertinent structure and ground elevation points, existing adjacent foundations within influence zone, cut slopes and set-backs, list of all formulas used, calculation steps and procedures, any computer-assisted design analysis data, utilities within the zone of influence, groundwater control plan with dewatering calculations, manufacturer data showing serial numbers and loading capacities of support system components, and installation and dismantling procedures.

All structural design work, including design calculations, must be prepared, signed and sealed by a Licensed Structural Engineer registered in the State of Illinois prior to being submitted to the Commissioner for approval.

All excavations must be properly protected to furnish safe working conditions, to prevent shifting of materials, to prevent damage to structures or other work, to avoid delay of the work, all in accordance with applicable safety and health regulations.

111.3 Excavation in Open Cut.

In the construction of monolithic sewers and structures, the Contractor must, unless otherwise ordered by the Commissioner, brace the trench or pits from the surface down so that the excavation will be of sufficient width and only sufficient width to permit the work to be constructed as specified.

In the construction of pipe sewers, the Contractor must restrict the width of the trench as computed by using the maximum permitted as shown on the typical section for trench. If soil conditions are unfavorable, or the depth of cut is excessive, the Contractor must partially or completely support the trench to maintain this specified maximum width of the trench.

When the depth of a trench exceeds the reach of the Contractor's equipment and excavation is made in two stages, the first stage may be left un-sheeted to a depth and width to be determined by the Contractor according to the stability of the ground. Otherwise, the first stage of excavation must be supported before the second stage of excavation is started.

In streets having permanent pavements, the Contractor must saw-cut the pavement before excavating for the sewer on such lines that the sheeting will not be in contact with the pavement but will bear uniformly against the sides of the excavation, unless otherwise ordered by the Commissioner. The actual thickness and materials used in the construction of the existing pavement must be verified by the Contractor for himself. The plan and profile sheets indicate type of surfacing only and not the type of base.

Wherever the nature of the ground will permit, the bottom of the excavation for the sewers must have the shape and dimensions of their outside invert and for pipe sewers the shape and dimensions of the outside of their lower quarter.

If the bottom of the trench cannot be shaped to the required form and maintained until a section of the sewer is safely constructed, then the bottom of the trench must be made to conform as nearly as possible to the external shape and dimensions of the sewer, and the space between the outer surface of the sewer and the bottom and sides of the trench must be made to conform as nearly as possible to the external shape and dimensions of the sewer, and the space between the outer surface of the sewer and the bottom and sides of the trench must be filled with suitable material for stabilization of the trench bottom.

All material unsuitable for backfill must be removed from the site as soon as excavated.

The length of a trench excavated ahead of the completed sewer is subject to the approval of the Commissioner.

111.4 Excavation in Tunnel.

The tunnel must be excavated and trimmed to such size and shape as will allow the placing of the full section of the sewer as shown on the plans after all lining is in place.

The Contractor must excavate the tunnel and support the surrounding earth so there is no movement of the earth over or adjacent to the work at any time.

The Contractor must use extreme care in excavating and trimming to ensure that a full section will be placed without materially deviating from the correct lines and grades of the finished structure. In case, due to bad soil conditions, the Contractor requests that the outside outline of the sewer be changed to a minor extent to accommodate his method of construction, such a change will be allowed provided the strength of the structure is not impaired. Any such modification will not alter the price per foot specified to be paid for the completed sewer, whether such minor modification results in a minor addition or subtraction from the theoretical quantity for the section herein specified.

If permission is given the Contractor to excavate the tunnel for a specified distance without immediately placing the concrete lining, the proposed method of bracing the tunnel and the extra bracing necessary must be submitted for approval.

No additional payment or allowance of any nature will be made for timber cants, steel plates or other forms of tunnel lining used for supporting the earth during construction. All such tunnel lining must be left in place.

111.5 Sheeting, Bracing and Lining.

When the Contractor chooses to use sheeting for sewer construction, the Contractor must furnish, place and maintain all sheeting, bracing and lining required to properly maintain trenches and other excavations in open cut, to support the sides, floors and headings of excavations in tunnel and keep to a minimum any movements of the soil, pavement, utilities, or other structures outside the trench, pit or tunnel. Steel sheeting, when specified, must be driven and must remain toed into undisturbed earth until the sewer is built and backfill placed within one foot of the top of sheeting. Sheeting, bracing and lining must be so placed as to allow the work to be constructed to the lines and grades shown on the Plans or established by the Commissioner.

The Contractor must limit the width of his sewer trench at the ground surface to a maximum dimension as shown on the plans.

The Contractor's attention is called to the fact that in driving the steel sheeting, he will cut off existing catch basin drains, house drains and other existing drains and sewers now connected to the sewers to be replaced. Prior to connecting these drains to the new sewers, the Contractor must take the necessary measures to assure proper drainage from the live drains encountered and thereby prevent the backing up of sewage and/or the flooding of adjacent basements of property.

As soon as possible after the pipe is laid and drain connections are made, the sewer trench must be backfilled with trench backfill. No attempt must be made to pull the sheeting until the trench has been backfilled to within a foot of the top of the sheeting after the trench has been water jetted.

The Contractor must exercise special care during the progress of his work, and when so directed by the Commissioner must leave in place such sheeting and bracing as may be necessary to protect existing utilities and structures.

In general, all other sheeting and bracing must be removed as the trench or excavation is backfilled, provided such removal does not cause damage to adjacent structures or property, or to the work performed under this Contract.

Sheeting will not be left in place unless prior approval from the Commissioner is received. Sheeting left in place must be cut off, no lower than three (3) feet below finished street grade, after the trench is backfilled to that level.

If at any time the method used by the Contractor for supporting any material or structure in or adjacent to any excavation is not reasonably safe, in the opinion of the Commissioner, the Commissioner may require and the Contractor must provide at his expense, additional bracing and support necessary to furnish the added degree of safety required, but the taking of such added precautions will in no way relieve the Contractor of his sole and final responsibility for the safety of lives, work and structures.

111.6 Backfilling in open cut.

As soon as the condition of the pipe will permit, the entire width of the trench shall be backfilled with aggregate to a height of at least the center of the pipe. The remainder of the trench shall be backfilled to the natural line or finished surface as rapidly as the condition of the sewer will permit. The Contractor will completely fill all trenches and excavations with trench backfill. The material to be used as trench backfill must be sand, crushed concrete sand or stone sand having an FA6 gradation and conforming to the applicable portions of Article 1003.01 of the Standard Specifications for Road and Bridge Construction (SSRBC).

On monolithic concrete sewers and structures poured in place, trench backfill must not be placed until the concrete has attained the compressive strength of 2,800 psi.

The Contractor must not stockpile trench backfill along the route of the work.

The trench backfill is to be placed as compactly as possible and settlement must be secured by water jetting to the depth of approximately two feet above top of pipe. The distance between jetting

holes must not exceed 6-foot along the length and width of the trench, or as directed by the Commissioner. Water jetting of the trench backfill must proceed as not to delay the restoration of the project, as determined by the Commissioner. The Contractor, in this manner, must place and compact the trench backfill to the level of the sub-grade and then proceed with the permanent pavement as specified.

The water used for water jetting will be provided by the Contractor and the cost thereof must be incidental to the appropriate items of the Contract.

All concrete pipe sewers, vitrified clay pipe sewers, and drain connections which are located outside the neat lines of the sewer trench, must be embedded in a firm even bed of granular material. This embedment must have a minimum thickness of six (6) inches below the bottom of the pipe except in the event that rock is encountered in this zone. The granular embedment must be placed at least to the spring line of the pipe, and as shown on the Plans or ordered by the Commissioner. The same embedment, as specified, must be placed beneath all precast integral manhole bases and the Contractor must use special care in placing each base to obtain the proper and maximum bearing on the granular embedment in order to minimize future settlement.

The work includes the removing and disposing of material replaced by the granular embedment, the furnishing, transporting and placing of the granular embedment and all incidental and appurtenant work.

Where the soil present in the trench bottom is too soft and/or wet to permit the proper laying and support of the sewer, the Contractor must remove the unstable material for a suitable depth and must stabilize the trench bottom by placing a minimum depth of twelve (12) inches of crushed stone having a CA 1 gradation beneath the sewer pipe bedding. The bedding beneath the pipe must have a minimum thickness of six (6) inches and must extend up to the spring line of the pipe on both sides. Coarse aggregate having a CA 11 gradation must be used for sewer bedding. Where stabilization is required under manholes and structures not inside the sewer trench, a depth of twelve (12) inches of crushed stone must be placed. The Commissioner must be the sole judge as to the need for stabilizing where not specified and must also determine the depth of excavation required to do so. Coarse aggregate having a CA 6 gradation must be used for the temporary stone for a temporary access.

111.7 Utilities.

Where utilities cross a sewer trench and must remain in place, the Contractor must coordinate with the utility agency. The Contractor must exercise extreme caution when digging by all existing utilities.

The Contractor must contact the following Utility representatives at least 2 weeks prior to construction starting:

Water: Jason McCubbin (Tel. 312-217-7928)
People's Gas: Eric Stall (Tel. 312-240-7394)
AT&T: Stan Plodzien (Tel. 630-573-5453)
Comcast: Nikola Barbir (Tel. 773-394-8579)
MWRD: David Tang (Tel. 773-256-3663)
ComEd: Carla Strunga (South) (Tel. 630-576-7237)
Michelle Ho (North) (Tel. 331-481-9108)

Emily Craven (Central) (Tel. 312-718-8391)

111.8 Rules Concerning Utilities.

Utilities will be defined as any line, wire, cable, pipe, conduit, vault, pole or other structure of any corporation, firm or individual owning or operating any public utility, including the wires, cables, conduits, vaults and poles of the Chicago Transit Authority, but not including the water supply system, the sewerage system or the electrical equipment of the City of Chicago or of any other municipality, or the tracks of the Chicago Transit Authority and tracks and equipment of other railroad companies.

1. The alteration of any utility which is in the space to be occupied by sewers will be done without expense to the Contractor.

2. When excavating machines of the power shovel type are used to excavate for sewers 3 feet or larger in internal diameters, except as hereinafter provided, any utility crossing the sewer trench will be abandoned, removed and replaced, or supported without expense to the Contractor.

3. When excavating machines of the power shovel type are used to excavate for sewers less than 3 feet in internal diameters, all utilities crossing the sewer trench will be left in place. Hand excavation under and around said utilities must be performed by the Contractor at his expense, unless otherwise specified by the Commissioner. Support of said utilities when required will be completed by the individual utilities.

4. When sewer trenches are excavated in rock, each utility company will take care of its structures without expense to the Contractor. This rule will apply to any utility that is parallel to or crossing the sewer trenches.

5. Where a utility is parallel to a sewer trench and the centerline of the utility is located at a horizontal distance from the center line of the sewer less than the internal diameter of the sewer plus 4 feet, the utility will be abandoned or maintained without expense to the Contractor. When the utility is outside of the lines of the sewer trench and is left in place, the Contractor must exercise special care during the progress of this work.

6. When sewer trenches are excavated without the use of excavating machinery, except in rock, all utilities crossing the sewer trench will be left in place. Hand excavation under and around said utilities must be performed by the Contractor at his expense. Support of said utilities when required will be done prior to sewer construction and without expense to the Contractor, unless otherwise specified by the Commissioner.

7. Where sewers are constructed by means of excavating machinery all service lines from private utilities to buildings will be removed without expense to the Contractor, provided the Contractor has given sufficient advance notice.

8. Where any excavating machine is used to excavate for a sewer, all aerial equipment belonging to any utility company, which interferes with the operation of the excavating machinery, will be removed or altered without expense to the Contractor unless otherwise noted on the Plans or specified in the Contract items.

9. Aerial equipment which does not interfere with the use of excavating machinery will not be removed to accommodate backfilling machinery, except at the expense of the Contractor.

111.9 Rules Concerning Water Pipes.

The existing water mains which are located adjacent to the proposed sewer must be maintained in place by the Contractor during the life of the Contract and he is liable for any damage done to the water mains. Contractor to provide support of water mains as indicated on the Plans or ordered by the Commissioner. The following rules must apply in regard to existing water mains:

1. The alteration of water mains in space which is to be occupied by sewers will be performed without expense to the Contractor except as otherwise specified in the Contract items or shown on the Plans.

2. Water mains less than 16 inches in diameter that cross the sewer trench, which are allowed to be cut and capped, will be paid for under the water main cut and cap items. All other water mains must be temporarily supported.

3. When sewer trenches are excavated in rock, water mains will be maintained at the expense of the City. This rule applies to water mains that are parallel to or crossing the sewer trenches.

4. Unless otherwise specified, water mains parallel with the sewer trench and located a horizontal distance from the center of the sewer not greater than the external diameter of the sewer plus 4 feet will be maintained. The Contractor must exercise special care during the progress of the work and when so directed by the Commissioner, must leave in place such sheeting and bracing as may be necessary to protect the water mains. The Contractor will be paid for such sheeting and bracing in accordance with the unit prices as set forth in the Contract proposal. Where water mains are parallel with the sewer trench and are located a horizontal distance from the center of the sewer greater than the external diameter of the sewer plus 4 feet, the Contractor will be liable for any damage done to the water mains.

5. Where sewers are constructed in paved streets and it is necessary under the foregoing rules to remove, alter, or repair water mains at the expense of the City, the maintenance of temporary surface restoration and the permanent replacement of pavements, curbs, gutters and sidewalks disturbed by such alterations outside of the limits of the sewer trench will be done by the Contractor and payment will be made in accordance with appropriate items of the Contract.

6. The Contractor must ascertain the existence and location of all water service pipes and their appurtenances, including shut-off boxes, which may be encountered during the construction of this improvement. All water service pipes that are larger than 2 inches in diameter will remain in place. When water service pipes and their appurtenances, including shut-off boxes, are removed, cut or damaged on account of the construction of this sewer, the Contractor at his expense must cause the water service pipes and their appurtenances, including shut-off boxes, to be immediately replaced or repaired. The Contractor will receive no extra compensation in any form, for the removal, maintenance, lengthening, repairing or replacing, or extra labor involved due to the presence of water service pipes and their appurtenances, including shut-off boxes. The Contractor must not shut off the water service pipe from any consumer for any reason whatever for a period exceeding six hours. The Contractor must notify the individual

consumer at least eight hours prior to the shutdown. Violation of this rule by the Contractor will result in the water supply being reestablished at his expense.

7. All the replacement or repair work of water services must be done by a plumbing Contractor, licensed and bonded in the City of Chicago. A permit for this work must be obtained from the Department of Water Management prior to commencing work. Where water service replacement or repair work will be necessary, the Contractor is required to notify the Department's Water, Plumbing Inspection Division (312-744-7017), at the onset of construction. Whenever a water service is cut and removed, to allow for the installation of the new sewer, it must be replaced with Type "K" copper tubing, seamless annealed (soft) conforming to A.S.T.M. B88-83. The removed portion of the service one inch (1") and smaller must be replaced with one inch (1") copper tubing and service 1 inch through 2 inches must be replaced with the same size as the existing service. A minimum of six inch (6") slack of the copper tubing is to be provided for the replacement portion of the service.

8. The copper tubing must be connected to the existing lead pipe using appropriate lead-pack fittings. For up to one inch (1") service, copper-flare to a lead-pack fitting is to be used. For one and one-half inch (1-1/2") and two inch (2") services, a copper-pack to lead-pack fitting is to be used. All lead-pack and copper-pack joint compression couplings are to be as per Ford Meter Box Company catalog or approved equal. Couplings must be composed of composition bronze or ounce metal alloy conforming to the chemical and physical requirements of standard specifications A.S.T.M. B-62 and A.W.W.A. C800-84. Castings must be high grade, smooth and free from sand or blow holes, shrinkage or other foundry defects. Coupling must not be plugged or filled in any manner. All treads must be cut full and perfect. Couplings will be equipped with clamp or set screws to engage the pipe and act as a locking device. Screws must be of silicone bronze or stainless-steel material.

9. Water service pipes, two inch (2") and under, which are determined to be live at the water main, but not being used, must not be reconnected, but are to be sealed at the cut using a brass lead-pack fitting and brass plug or a clamping device approved by the Department of Water, Plumbing Inspection Division. The location of any active, but unused, water services that are found by the plumbing Contractor are to be recorded and brought to the attention of the City's resident engineer for the project.

   When temporary hose connections are necessary during construction, the Contractor must proceed as follows:

   a. The hoses must be high quality and made of plastic or comparable material of a type that can be easily flushed.

   b. The hoses must be labeled "For Use of Potable Water Only."

   c. The hoses must be capped, coiled neatly and stored in an area free from sanitary hazards when not in use.

   d. All hoses must be flushed prior to use and before making final connections.

10. Should the Contractor require clarification and/or additional instructions as to proper sanitary procedure, the Resident Engineer will contact the Water Quality Section of the Department's Bureau of Water Supply.

111.10 Water Main Crossings

At some locations, the water main must be cut and capped by the Contractor prior to sewer construction and replaced by the Contractor once sewer construction is complete at each location. The maintenance of temporary surface restoration and the permanent replacement of pavements, curbs, gutters and sidewalks disturbed by said water main revisions outside the limits of the Contractor's excavations must be performed by the Contractor.

Water mains must remain in place in accordance with the provisions as described in Section 111.9. The Contractor must exercise special care during the progress of the work to prevent any damage to water mains adjacent to the proposed sewer and located outside the limits as specified in this section.

Where water mains cross the proposed sewer, in accordance with the Plans and Specifications, the Department will cooperate with the Contractor and reduce the flow in these water mains as it deems necessary, but the Contractor will be required to support, protect and use special care in the area of said mains, and all costs incurred by reason of such work must be included in the appropriate prices bid for sewers and sewer structures.

The Contractor must notify Mr. Michael Wong of the Department of Water Management at (312) 217- 1636, two (2) weeks prior to the start of the water main work so that an Inspector can be assigned to supervise the installation. The Contractor must also obtain a "B-Permit" prior to construction from the City of Chicago, City Hall, Plumbing and Permits Section, 121 N. LaSalle Street, Room 906, Chicago, IL 60602. The Contractor must also submit five (5) copies of the as-built drawings for all water main work performed under this contract to the Department of Water Management, Bureau of Engineering Services, Jardine Water Purification Plant, 1000 E. Ohio Street, Office 306, Chicago, Illinois 60611.

As-built plans of new or replaced sewers in the public right-of-way must be submitted to the Department of Water Management Sewer Design Section within 30 days after completion of the project. The as-built plans must be sealed by a Professional Engineer or Registered Land Surveyor. Plan and profile drawings of the sewers and sewer structures must be submitted on a compact disk in TIF format. All electronic files must be submitted in a file folder with one file reflecting the address of the project, with street name first. A hard copy of the as-built plans must also be submitted.

111.11 Rules Concerning City, Office of Emergency Management and Communications, and Park District Electric Facilities

All work required to maintain, remove and replace or relocate any underground electric wires and conduits owned by the City of Chicago, Office of Emergency Management and Communications (OEMC), or the Chicago Park District will be done at the expense of the Contractor. The Contractor will be liable for any damage to such wires and conduits. All work required to repair, maintain, remove and replace or relocate such wires and conduits will be done at the expense of the Contractor.

Where any excavating machine is used to excavate for a sewer, all facilities belonging to the City of Chicago, OEMC, or to the Chicago Park District, which, in the judgment of the Commissioner, interferes

with the operation of the excavating machinery shall be removed or altered at the expense of the Contractor.

111.12 Utility and Water Main Crossings - Hand Excavation

All pipes and conduits of any kind crossing the line of the sewers and not coming within the provisions of Rule No. 1 of the Rules Concerning Water Mains and the Rules Concerning Utilities, as described in the provisions of Section 111.7 and Section 111.9, will be left in place. The cost of hand excavation under and around utilities including water mains and water services, wires and conduits owned by the City, OEMC, or the Chicago Park District must be included in the bid price for sewers and sewer structures.

Where water mains 16 inches in diameter or larger cross the sewer trench, the Contractor must provide and install the water main support structures as detailed on the Contract Plans, in order to anchor the water mains in place and prevent any movement during and after sewer construction.

The Contractor must place the support structure prior to sewer excavation reaching the immediate area of the water main in such a manner as to protect the water main from damage.

111.13 Junctions, Connections, and Special Structures

The construction of connections, junctions and special structures are shown on the Project Drawings. Utilities are shown approximately. The Contractor must notify the utility companies involved with enough lead time for said companies to take precautionary measures for the protection and maintenance of their facilities.

Support of said utilities when required will be done prior to sewer construction and without expenses to the Contractor. The exact location of the existing utilities must be determined by the Contractor. Structural drawings for the support and protection of the existing utilities must be prepared, signed, and sealed by a structural engineer registered in the State of Illinois.

The Contractor must include in his construction procedure, provisions for maintaining flows in these sewers at all times. During heavy rains, water may rise rapidly in the existing City sewers and the Contractor must be prepared at all times to safeguard workmen and protect the work under this Contract from damage by flooding. All temporary dams, flumes, and/or bulkheads must be removed by the Contractor after completion of the work.

The Contractor must use care to prevent damage to the existing sewer and any damage outside the limits of removal must be repaired or replaced by the Contractor without cost to the City. The Contractor must install a suitable screen to inhibit debris from entering the sewer system, as specified in the Specifications, Book, 3, Division I, Section 112, Pumping, Bailing, and Diversion.

Any debris deposited in the City sewer due to this construction must be removed.

The pay quantity for a given structure must be the excavated volume of the maximum dimension as shown on the plans.

SECTION 112. PUMPING, BAILING, AND DIVERSION

112.1 Description

The Contractor must at all times during construction provide and maintain ample means and devices for the temporary diversion of flow in existing sewers and drains and the prompt removal and proper disposal of all water or sewage entering the tunnels, trenches or other parts of the work, and must keep said excavations as dry as practicable until the structures to be built therein is completed. All water pumped or drained from the work and from existing sewers must be disposed of in a suitable manner without damage to adjacent property, or to sewers, pavements, electrical conduits or other work or property. The Contractor must provide all temporary flumes or pipe lines and pumping equipment required for the proper diversion of sewage and removal of drainage from the work.

Whenever the Contractor removes a bulkhead, he must install a screen suitable for the purpose of preventing his construction debris from floating into the other portions of the sewer system. As his work progresses, he must also clean the completed portions of the sewer by removing rails, jacks, lumber, sandbags and all other construction equipment, excess material and debris.

The Contractor must place and maintain all temporary dams, flumes, bulkheads or other structures necessary to prevent water from adjacent sections of the sewer system from entering the work under this Contract in such a manner as to injure it, and must completely remove all such temporary structures from the completed portion of the work as rapidly as practicable. The Contractor must not place a dam, flume or bulkhead in any sewer without first obtaining the approval of the Commissioner. The Contractor must ascertain the possibility of sewage backing up into basements and causing damage and he will be held responsible for any such damage.

The City does not assume responsibility for providing the Contractor with an outlet for any storm water or sewage which must be disposed of during the construction work under this Contract. Until the acceptance of the work, the Contractor will, if so ordered by the Commissioner, keep the entire work pumped free of water and sewage and before the acceptance of any part of the work, must clean the entire length of such finished part of the work to the satisfaction of the Commissioner.

Water must not be allowed to flow over or stand on the invert in such a manner as to cause scouring of the concrete surface.

Water pumped from trenches or other excavations must be routed to settling basins before entering the City of Chicago sewer system. The settling basins will be 5' by 10' with three compartments or baffles having a minimum depth of 2 feet. Discharge from the settling basin must be by gravity to the catch basin.

All costs due to the provisions of this section or by interruption of the work incidental thereto, will be paid for under sewers and sewer structures.

112.2 Bypass Pumping

During heavy rains, additional water may enter the sewer and the Contractor must be prepared to take care of this added flow and protect the work under this Contract from flooding and also maintain the existing sewers in service at all times during construction. No open pumping or discharging on City streets will be permitted. The existing flow must be discharged via pumping through pipelines and the

Contractor must submit a bypass plan to the Commissioner for approval. Contractor must remove any temporarily-installed dams or bulkheads after completion of the work.

Existing sewers and sewer structures not shown to be replaced or relocated which are damaged in the course of the work must be repaired at the Contractor's expense.

112.3 Dewatering

The Contractor must submit a means and methods of dewatering to the Commissioner for OUC review and approval. Include locations of all well points, if needed, as well as supporting calculations indicating the extent of drawdown and settlement. See Book 3, Division I, Section 121, Chicago Department of Transportation Requirements for OUC submittal requirements. All costs to the Contractor resulting from the conditions of this work must be included in the prices for sewer and sewer structures.

SECTION 113. REPAIRING PAVED STREETS AND SIDEWALKS

Roads or pavements, gutters, curbs, crosswalks destroyed or damaged by the Contractor, either in the construction of the work under this Contract or by hauling and storing of material on public streets and highways, and which are outside the limits of any new pavements, gutters, curbs and sidewalks which may be required to be constructed as part of certain items of the Contract, must be repaired by the Contractor without extra charge therefore and such repairs will conform to the requirements and specifications of the governmental authority having jurisdiction and must be subject to the approval of the Commissioner.

Before any section of public street or alley along the route of the sewer is reopened to public use, the Contractor must restore the surface to a safe condition. This includes maintaining surfaces over trenches which were constructed for the revision or relocation of City-owned utilities. The surface must be maintained in a safe condition until the completion of the Contract and the fulfillment of the provisions of the Contractor's guarantee. Where additional surface materials are added to properly maintain the street surface, payment will be made for such additional materials under appropriate items of the Contract.

SECTION 114. NEW PAVEMENTS, GUTTERS, CURBS, AND WALKS

The Contractor must obtain the consent of the Commissioner and the governmental authority having jurisdiction before constructing permanent pavements, gutters, curbs, crosswalks and sidewalks in place of those destroyed or damaged. The Contractor must construct new pavements, gutters, curbs, crosswalks and sidewalks as directed by the Commissioner. The use of old materials that have been removed from the work is subject to the approval of the Commissioner. Old materials rejected by the Commissioner must be replaced with new material of approved quality.

SECTION 115. CONCRETE FOR SEWERS AND SEWER STRUCTURES

115.1 - General

All concrete used in sewers and sewer structures must conform to the requirements of Sections 503 and 504 of the Standard Specifications for Road and Bridge Construction (SSRBC) except as herein modified

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115.2 - Portland Cement

All cement used in concrete for sewers and sewer structures must be a blend of Type I Portland cement and Fly Ash. Type I cement and Fly Ash must not be less than 4 3/4 bags of Type I cement and 100 pounds of Fly Ash per cubic yard of concrete. Type I Portland cement must conform to the requirements of "Standard Specifications for Portland Cement," ASTM Designation C 150.

115.3 - Fly Ash

Fly Ash will conform to the requirements of "Tentative Specifications for Fly Ash for use as an Admixture in Portland Cement Concrete," ASTM Designation C 618, except that the Free Carbon will not exceed 3.0 percent.

115.4 - Admixtures and Air Entrainment

The use of admixtures in the concrete for any purpose other than for air entrainment will not be permitted.

All concrete used in the work must contain entrained air obtained by adding an air-entraining agent at the mixer with a mechanical measuring device attached to the mixer and approved by the Commissioner. The air-entraining agents must be in accordance with Article 1020 of the SSRBC and as approved by the Commissioner

.

115.5 - Fine Aggregate

The fine aggregate for concrete must conform to grade FA2 per Section 1003 of the SSRBC.

115.6 - Compressive Strength

The concrete for sewers and sewer structures must have a compressive strength of not less than 2,800 pounds per square inch at the age of seven (7) days and not less than 4,000 pounds per square inch at the age of 28 days when tested by standard methods.

115.7 - Water

Water for mortar and concrete will be provided by the Contractor from the water distribution system of the City. The cost of water will be included in the various appropriate items of the Contract.

115.8 - Concrete Using High Early Strength Cement

Concrete using high early strength cement may be required in the restoration of pavement, base course, curbs, driveways, or concrete bus pads as shown on the Project Drawings, or as directed by the Commissioner. The cost of high early strength concrete for pavement, base course, and concrete bus

pads under the designated High Early Strength concrete items. The cost of such high early strength concrete for curbs and driveways will be included in the prices bid for curb and driveway

115.9 - Forms

The Contractor must submit the design of all forms to the Commissioner for approval before the forms are used. Prior to approval the Commissioner may order the Contractor to erect a complete section of the proposed forms for inspection either in the shop where fabricated, or on the site. Forms must be neatly and accurately made with all similar parts in each longitudinal section interchangeable. Bent plates required to fit must be rolled and fabricated to correct curves before being assembled.

Wooden forms must be built of clean, sound lumber, reasonably free from knots and dressed on all sides.

The forms, either of steel or wood, must be watertight, with smooth surfaces, and of ample strength and rigidity. Bracing for forms must be adequate to prevent deviation from the correct lines. The forms must be coated with oil or other suitable substance that is satisfactory to the Commissioner to obtain a smooth concrete surface. The coating must be carefully applied and so none is deposited on the reinforcement steel.

All forms must be thoroughly cleaned after each use with any broken, warped or defective parts removed. Minor repairs of forms will be permitted, but any form that requires more than minor repairs in order to obtain first-class work as herein above specified must not be reused. The Commissioner may condemn any form which fails to comply in all respects with these Specifications, and the Contractor must at once correct the defective form or remove it from the site of the work, whichever the Commissioner may order.

Forms for concrete must remain in place until the concrete has properly set, but in no case less than 18 hours, and must be removed in such a manner that the concrete will not be damaged. Forms supporting slabs, walls and beams must remain in place until tests show the concrete has obtained a compressive strength of 2,800 pounds per square inch or at least seven (7) days have elapsed from the time pouring is completed. No superimposed dead or live loads will be allowed during the period the false work is required to remain in place. All lagging must be taken down immediately after the removal of its supports.

115.10 - Placing Concrete

The Contractor must notify the Commissioner a sufficient time in advance of placing concrete for any part of the work to permit a thorough inspection of the forms and reinforcement steel. Concrete must not be placed except in the presence of the Commissioner or his representative.

Before placing any concrete, all surfaces upon which or against which the concrete is to be placed must be cleaned of mud and debris.

Where, in the opinion of the Commissioner, it is impracticable to keep the bottom of the trench free of water the Contractor must use sumps and pumps or other means of removing the water. The proportion of water in the concrete, in such case, must be as directed by the Commissioner.

The concrete must be placed immediately after being mixed, and must be carried up level along the whole length of the section under construction.

Care must be taken in depositing concrete to prevent segregation of concrete materials. When chuting is employed, the chute must be arranged so as to insure a continuous flow without increasing the water over that specified. The discharge end of the chute must be provided with a baffle plate to prevent segregation. Slopes of chutes are not to be flatter than 1 vertical to 3 horizontal nor steeper than 1 vertical to 2 horizontal. Concrete must not be dropped into place a distance greater than 3 feet. Elephant trunks may be used to reach places that are otherwise inaccessible.

All concrete must be thoroughly worked into place and consolidated around reinforcement, ladder rungs, pipes or other shapes by internal or external vibrators, or both, of types acceptable to the Commissioner. Such vibration must be continuous with the placing of the concrete and must continue until no further settlement of the concrete mass is observed. Other means of consolidating the concrete, acceptable to the Commissioner, may be substituted for vibrators in places for which vibration is not suitable. The Contractor must keep on hand, sufficient extra vibrators to insure their use during the entire operation of concreting.

Once started, the placing of concrete in any unit must be a continuous operation. Any unavoidable break in the operation occur before the completion of a unit, a construction joint must be formed at the proper location, either by bulkheading, or in case of a vertical, by leveling off. The joint must be properly keyed, as specified in Section 115.14 herein, and if required, additional reinforcement bars must be placed as directed by the Commissioner, without additional cost to the City.

115.11 - Surfaces

On walls and interior surfaces of structures, the concrete must be thoroughly worked to force all coarse aggregate from the surface and to bring mortar to the face. If for any reason the surfaces are unduly rough, they must be smoothed to the satisfaction of the Commissioner.

The inverts of all monolithic concrete sewers must be screeded, floated and steel troweled to a smooth true uniform surface. The inverts of all sewers must be protected during the progress of the work and kept free from all construction debris during the life of this Contract.

The cost of performing all work necessary to obtain satisfactory surfaces for the interior of the sewer and appurtenances must be included in the unit or lump sum prices to be paid for work under appropriate items of the Contract and no additional payment will be made by the City to the Contractor for performing said work.

115.12 - Grouting

All voids between the masonry and the outside of the excavation must be completely filled with grout consisting of one part Portland cement and three parts fine clean sand. The Contractor must stop all leaks through the walls or construction joints of the sewers or other structures by grouting all voids in the masonry or by other means approved by the Commissioner. All grout for stopping leaks must be composed of either a one to one (1:1) mixture of cement and fine clean sand or a neat cement grout and must be applied by drilling completely through the masonry at the point of leakage and forcing the grout under pressure into all voids in the masonry and between the earth and the masonry until the leaks are

completely stopped. Portland cement must conform to the requirements of Section 115.2 of these Specifications. The grout must be forced to refusal through pipes, set as herein specified, under a pressure of not less than 60 pounds per square inch. A 1 ½ inch pipe with threaded coupling must be set in each quarter of the arch at intervals of not more than 10 feet. The inner edge of the coupling must be kept tightly against the form. If liner plates are used, provision must be made for threaded openings to permit the placing of said grouting pipes. If wood lagging and steel ribs are used to support the surrounding earth, holes must be drilled in the lagging to permit the placing of said grouting pipes. The Contractor, at his option, may drill holes through the concrete and tunnel lining in lieu of placing grout pipes. Such holes must not be less than 1 ½ inches in diameter and located and spaced as specified for the grout pipes. If drilled holes are used, they must be filled with mortar and finished flush with the inner surface of the masonry upon completion of the grouting operations. Grouting operations must follow within a reasonable time after the placing of the masonry unless otherwise ordered. After grouting is completed, all pipes must be filled with mortar and plugged with cast-iron plugs screwed flush with the inner surface of the masonry.

115.13 - Deficient Thickness

In case it is found at the time of placing concrete that due to interference encountered during construction, the section will be deficient in thickness, through no fault of the Contractor, and such deficiency is not of large extent and can be corrected by the addition of reinforcement steel, provided outer wall clearance requirements are met. The Contractor then must place such additional reinforcement steel as the Commissioner may order. All reinforcement steel so placed by the Contractor will be paid for at the price stated in the proposal for "Reinforcement Bars, Epoxy Coated."

115.14 - Construction Joints

Horizontal and vertical construction joints must be made only as shown on the Plans or as approved by the Commissioner. The top and end surfaces of the concrete first placed must be grooved or stepped. Upon resuming the placing of concrete, these surfaces must be thoroughly cleaned of latence and debris by the use of wire brushes or air under high pressure. At vertical surfaces, the freshly placed concrete must be worked sufficiently to obtain an excess of mortar against the joint. Horizontal or near horizontal surfaces, after being cleaned, must be completely coated with not less than a ½ inch of mortar, composed of equal parts of Portland cement and sand.

115.15 - Parts Set in Concrete

Before concreting, the Contractor must carefully place all pipe, castings, ladder rungs and other miscellaneous parts in the work as shown on the Plans or as directed by the Commissioner.

115.16 - Curing and Protection

Whenever necessary, in the opinion of the Commissioner, the Contractor must keep the surfaces of concrete moist by sprinkling with water at short intervals or by other means previously approved, until a permanent covering is in place or until, in the opinion of the Commissioner, the concrete is sufficiently hardened. Concrete must not be placed during rain storms and freshly placed concrete must be protected against loss of mortar during storms.

115.17 - Concreting in Cold Weather

The Contractor must not place concrete in sewers and sewer structures in open cut when the air temperature is or is forecast by the U.S. Weather Bureau to be less than a high of 35 degrees Fahrenheit, unless otherwise approved by the Commissioner. Concrete may be placed when the air temperature is above 35 degrees Fahrenheit and rising, and concrete placement shall stop when the falling air temperature reaches 40 degrees Fahrenheit or below, unless otherwise directed by the Commissioner. Whenever the temperature is or is forecast by the U.S. Weather Bureau to be higher than 35 degrees Fahrenheit but below 45 degrees Fahrenheit, the following provisions for the protection of concrete must be employed:

1. Mixing water must be heated, however, the mixing water temperature must not exceed 150 degrees Fahrenheit.

2. Aggregates must be heated, either by steam jet, steam coils or other approved means prior to being placed in the mixer. Aggregate containing frozen lumps, snow or ice must not be allowed to enter the mixer.

3. Concrete must be mixed as dry as practicable for the class or work and must reach the forms at a temperature not lower than 50 degrees Fahrenheit, nor higher than 90 degrees Fahrenheit. Freshly placed concrete and the surrounding air must be maintained at a temperature of not less than 50 degrees Fahrenheit, for a period of five (5) days after placement in the work. If necessary, the Contractor must house the section being concreted, by placing canvas or other suitable covering, so that the specified temperature will be maintained.
   When placing a concrete arch or roof slab, as soon as hardening of concrete will permit, the upper surface of the concrete must be covered with loose, dry straw or hay to a depth of at least 12 inches. Such covering must remain in place until it is replaced by at least one foot of unfrozen backfill material. Whenever necessary, to maintain the required temperature, the Contractor must provide continuous and sufficient circulating, artificial heat inside the structure. Heating appliances must not be placed in such a manner as to endanger formwork or centering or expose any area of concrete to drying out or other injury due to temperatures in excess of those specified above.

4. Before placing concrete in any form or on any surface, heat must be applied in such a manner that all ice or snow is completely removed. Concrete must not be placed on or against forms, other concrete, earth or rock containing frost.

All concrete or mortar damaged by freezing must be removed and replaced with new concrete or mortar as directed by the Commissioner.

All additional cost to the Contractor for the protection of concrete during cold weather or the removal and replacement of frozen concrete or mortar must be included in the unit or lump sum prices to be paid for the work necessary under the appropriate items, and no additional payment therefore will be made to the contractor.

115.18 - Concreting in Hot Weather

The Contractor must provide a method to ensure that concrete placement in hot weather does not result in concrete temperature exceeding 90 degrees Fahrenheit at the time of placement. During

instances when the air temperature is above 90 degrees Fahrenheit, the following provisions for the protection of concrete must be employed:

1. The method implemented shall adequately reduce the mixture temperature to accommodate the anticipated transportation and testing time resulting in a placement temperature of 90 degrees Fahrenheit or less.

2. If the concrete supplier is not capable of providing chilled water, ice, or other means to reduce the concrete temperature, then production of mixture shall not begin.

3. When chilled water is used, the amount of chilled water shall be clearly detailed on the batch sheet using units consistent with the non-chilled water source.

4. When ice is used, the total amount of ice in the batch shall be detailed on the batch sheet in weight or volume, to be determined by the method of measurement utilized by the plant batching system. If a weight needs to be converted to a volume, the conversion calculations shall also be clearly shown on the batch sheet.

5. At no time shall any mixture be batched exceeding the water cement ratio of the design after all sources of water have been accounted for properly.

6. The method utilized and the procedure for implementation and documentation shall be acceptable to the Commissioner.

7. The use of chilled water, ice, or other means does not guarantee acceptance. Concrete mixtures arriving on site in excess of 90 degrees Fahrenheit or material placements delayed for any reason, resulting in the concrete mixture temperature exceeding 90 degrees Fahrenheit, shall be subject to rejection.

SECTION 116. PRECAST CONCRETE MASONRY

116.1 - General

All precast concrete masonry used in the construction of manholes, catch basins and appurtenances must be furnished and placed in accordance with the following specifications, supplemented by the specifications given under other headings. All Portland cement used in the concrete must conform to the requirements of Sections 115.1 and 115.2.

116.2 - Concrete Rings

Precast concrete rings for manholes and catch basins must conform to the A.S.T.M. specifications for "Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, C76, Table II, Wall B." The rings must be furnished in various lengths, including an offset, tapered section, all as shown on the Plans or ordered by the Commissioner.

116.3 - Mortar

Mortar must conform to the requirements of Section 117.3 herein.

116.4 - Laying Brick Masonry

Brick masonry must be constructed in horizontal courses with vertical joints broken. Bricks must be thoroughly wet immediately before being laid, and each brick must be laid separately in full and close joints of mortar at one operation. Each joint must not exceed one-half of an inch in thickness and all joints on the interior face must be trowel-struck. The refuse mortar must be scraped off before it has time to harden.

If precast masonry units are laid where rock is encountered, a granular embedment as described in Book 3, Section 111, Pipe and Structure Excavation and Backfill, must be provided.

116.5 - Protection of Work

Protection of work must conform to the requirements of Section 117.5 herein for protection of brick masonry.

SECTION 117. BRICK MASONRY

117.1 - General

All brick masonry used in the construction of sewers, bulkheads, weirs, and in the repair of sewers, manholes and catch basins must be furnished, laid and placed in accordance with the following specifications, supplemented by the specifications given under other headings.

117.2 - Brick

All clay brick must be best quality solid brick, conforming to the qualifications of brick for sewer or drainage structures for the specified Grades SS or SM as established in Table I of the current A.S.T.M. Designation C 32. All brick must be uniform, sound, hard burning, of compact texture, free from lime and cracks, with a clear ringing sound when struck, whole and with edges full and square, and of standard dimensions. Brick, when thoroughly dried and immersed in water for 24 hours, must not absorb more than 15 percent by weight of water.

Concrete brick may be used with the written permission of the Commissioner.

If in any load of brick, more than 10 percent are inferior, the whole load will be rejected. If less than 10 percent are inferior, the brick may be accepted, provided the Contractor will at his expense cull out all inferior bricks and remove them from the site of the work at once.

117.3 - Mortar

Mortar for brick work must be composed of one part Portland cement and two parts screened sand. Portland cement must conform to the requirements of Section 115.2 of these Specifications. The cement and sand must be proportioned by volume and thoroughly mixed in a tight box. After the initial mixing, water must be added gradually and the ingredients mixed until the mortar is of the proper consistency.

Only sufficient mortar must be prepared for immediate use, and any mortar that has begun to set must not be re-tempered or used in any way in the work. Sand must be of the quality specified in Article 1003.02 of the Standard Specifications for Road and Bridge Construction (SSRBC).

117.4 - Laying Brick - Repair of Manholes and Catch Basins

All brick must be thoroughly wet immediately before being laid. Old brickwork must be thoroughly cleaned and wet before new work is joined thereto. Brick courses must be laid to line, kept straight and parallel and have breaking joints with those in adjacent courses. Brick must be laid radially as headers in a full bed of mortar with joints not exceeding three-eighths of an inch (3/8") in thickness. All joints must be filled with mortar and interior joints must be trowel-struck.

117.5 - Protection of Work

All fresh masonry must be protected from injury of all kinds. All new work, unless immediately covered with earth or brick backing must be kept moist until the mortar has hardened.

Masonry work must not be done without the permission of the Commissioner when the temperature is below 33 degrees Fahrenheit and then only under conditions for protecting it from frost approved by the Commissioner.

SECTION 118. IRON CASTINGS AND MISCELLANEOUS METALS

118.1 - General

Manhole, catch basin and inlet frames and lids, ladder rungs and miscellaneous metal parts used in the construction of sewers, connections and appurtenances must be furnished and placed in accordance with the following specifications.

118.2 - Materials and Workmanship

All castings must be of tough, close-grained gray iron, free form blowholes, shrinkage cracks and cold shuts. They must conform to "Standard Specifications for Gray Iron Castings," A.S.T.M. Designation A48. They must be sound, smooth, clean and free from blisters and other defects. All castings are to be made by the cupola process. Plugging of defective castings will not be permitted.

Ductile iron must conform to A.S.T.M. A536, "Specifications for Ductile Iron Castings," Grade 60-40-18.

Where malleable castings are required, they must be furnished and installed as herein specified and must conform to "Standard Specification for Cupola Malleable Iron," A.S.T.M. Designation A197.

All castings must be made accurately to dimensions shown and must be planed, chipped, filed or ground where marked or where otherwise necessary to secure perfectly flat and true surfaces. Allowances for shrinkage must be made in the patterns so that the specified thickness will not be reduced. Manhole and catch basin lids must be true and must seat at all points. All drilling and tapping must be carefully and accurately done.

Steel parts must be structural steel of quality conforming to "Standard Specification for Structural Steel," A.S.T.M. Designation A36.

All aluminum parts must conform to "Standard Specifications for Factory-Made Wrought Aluminum and Aluminum-Alloy Welding Fittings," A.S.T.M. Designation B361, Alloy WP 6061 or WP 6063.

Aluminum ladder rungs must be coated with asphalt paint applied by dipping or brushing on the portions of the rungs to be embedded in concrete. The coating must extend beyond the embedment at least two inches.

All inserts to be embedded in concrete must be a heavily galvanized malleable casting suitably normalized and of a type approved by the Commissioner.

Bronze bushings must be made of good quality phosphor bronze.

All parts designated as "chrome-nickel steel" must be made of a ferrous alloy approved by the Commissioner.

All parts designated on the Plans as "galvanized" must be coated with an average coating of 2 ounces of zinc per square foot of surface as specified for in "Specifications for Zinc (Hot-Galvanized Coatings on Products from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip, “) A.A.S.H.T.O. Designation M111.

SECTION 119. SEWER PERMIT

The following supplements the requirements stated in Book 1, Article IX, Permits and Licenses: The Contractor must apply to the Department of Buildings, Sewer Permit Section, City Hall, 121 N. LaSalle Street, Room 804, Chicago, IL 60602 for the necessary sewer permit.

The inspection fee associated with this permit shall be waived. The costs associated with the General Permit fee shall be the sole responsibility of the Contractor. Restrictors required for Catch Basin construction will be provided at no cost to the Contractor by the Department of Water Management’s Central District, located at 3901 S. Ashland Avenue. The Contractor must arrange for the pick-up by contacting John Welsh, at (312) 747-1777 (7:00 a.m. to 3:00 p.m., M-F), 48 hours in advance.

SECTION 120. ABANDONED STREETCAR TRACKS

If abandoned streetcar rails are encountered during construction, it may be necessary to cut and/or remove some or all of the streetcar rails in order to construct the proposed sewer.

Wherever it is necessary to cut or remove these streetcar rails and/or pavement in order to perform the work, the Contractor’s operations must be performed in a manner so as to maintain safe and uninterrupted vehicular traffic as specified in “Traffic Control and Protection.”

The Contractor must coordinate with the Chicago Area Joint Electrolysis Committee to determine if the rails are being used by the CTA as a negative ground return for their traction power system.

SECTION 121. CHICAGO DEPARTMENT OF TRANSPORTATION REQUIREMENTS

All excavations equal to or greater than 12 feet deep require a Geotechnical Review through the Chicago Department of Transportation (CDOT) Office of Underground Coordination (OUC) Existing Facility Protection (EFP). The Contractor is required to submit calculations and procedures for Earth Retention Systems (ERS), including dewatering plans and calculations as required, for OUC-EFP review. ERS submittals are due to the DWM within the timeframe noted in Specifications Book 2, "Instructions and Execution Documents."

Submittal requirements can be found on the City's website in the CDOT Rules and Regulations for Construction in the Public Way, "Geotechnical Review Checklist."

All costs resulting from these provisions must be included in the prices bid for the sewers and sewer structures, as necessary.

SECTION 122. ILLINOIS DEPARTMENT OF TRANSPORTATION PERMIT

Work within State routes will require Illinois Department of Transportation, Region 1, Highway Permits. The following supplements the requirements stated in Section IX of Book 1, Terms and Conditions for Construction:

The Contractor is responsible for securing all Illinois Department of Transportation Highway Permits, initiated by the Department, in order to perform construction work in any IDOT streets as indicated on the Plans. The State will require the Contractor to post a bond to insure fulfillment of the obligations assumed under this permit. The Contractor is responsible for all traffic control requirements, bond and street closure requirements set forth by IDOT.

All costs resulting from these provisions must be included in "TRAFFIC CONTROL AND PROTECTION".

SECTION 123. PARKING METERS AND STREET SIGNS

If parking meters or pay stations are encountered, for requirements, see Book 1 (Terms and Conditions for Construction), Article X (Coordination With Other City Departments), and "B Sewer System Work".

Where construction activities will require the removal and replacement of existing street signs, also see Book 1 (Terms and Conditions for Construction), Article X (Coordination With Other City Departments) for requirements. When street signs are obstructed due to construction activities, such items must be taken into consideration as part of the requirements for Traffic Control and Construction Work Within Public Way described in Book 1. Provisions will apply to any street signs located on the streets within the work of this Contract.

The contractor must provide of list of locations. where construction has occupied an area required to be paid by a parking meter, to be submitted on a weekly basis to the Resident Engineer and the DWM Project Manager.

SECTION 124. TELEVISED INSPECTION OF SEWERS AND SEWER STRUCTURES

124.1 – Description

Contractor must perform televised inspections of sewer and sewer structures required for documenting conditions of city sewers before and after construction. Work is to be performed by a professional video operator having appropriate equipment and significant documentable experience in televising similar types of work.

Defects or deficiencies determined by these inspections must be immediately corrected by the Contractor to the approval of the Commissioner. The manner and methods of repair must be approved by the Commissioner. If, in the judgment of the Commissioner, the defective portions of the sewer or sewer structure cannot be repaired, the Contractor must remove and reconstruct as much of the original work as necessary to obtain a sewer or sewer structure that is satisfactory to the Commissioner.

All sewers to be abandoned must be televised prior to abandonment, unless noted otherwise on the contract plans.

124.2 – Submittals

The Contractor must provide two DVDs of each televised inspection for documenting the condition of sewers within the area of construction, or as directed by the Commissioner. At the Request of the Commissioner, a televised inspection must be made before the start of any construction. The final televised inspection is to be made after installation of sewer(s), and restoration of street and parkway has been completed. The location of televised inspections must be synchronized by means of narration and an on screen distance meter to enable judgment of the physical condition of the sewer(s).

Video 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 project, contract number, and date of inspection(s).

124.3 – General

No additional working days will be allowed due to delays in securing the video inspection services of a private vendor. The final video of the sewer(s) must be made upon the completion of construction, unless directed otherwise by the Commissioner. Any out of focus video or distorted audio on any portion of the video will be cause for rejection and require re-recording the inspection of the sewer at no additional cost to the City.

124.4 – Televising Procedures

Televised sewer inspections must be restricted to one (1) section of the sewer at a time, starting and stopping at manholes, junction structures, or other points of access to provide a high quality video inspection. The televising procedure must be performed so as to avoid creating backups in sewage flow sufficient enough to cause disruptions in service or flooding. When a high volume of sewage flow is present within the sewer and prevents a televised inspection, the Contractor must notify the

Commissioner on how to proceed with the work. The Contractor is to flush sewers when necessary to remove light accumulations of debris to facilitate the televised inspection.

The video camera must be passed through the sewer at a uniform rate of travel not to exceed 30feet per minute. The inspection must show the top and sides of sewer pipes, manholes, junctions, house connections, obstructions, or other conditions, which reveal the sewers architecture and physical condition. Panning and zoom rates must be controlled to provide clarity of the video inspection during playback.

If the video camera is inhibited by any obstruction, which was not removed by flushing, the Contractor must re-set the equipment in a manner so that the inspection can continue from the opposite direction. If the obstruction prevents further video of the sewer, the Contractor must notify the Commissioner on how to proceed with the work.

Measurements for location references within the sewer must be referenced to above ground locations by means of a metering device. Marking of the transport cable(s), or similar method requiring interpolation for distances or sewer depths, is not acceptable. Location references must begin at the centerline of manholes or access point, unless directed otherwise by the Commissioner. All distance measurements must be narrated and electronically displayed on screen during the video inspection as appropriate.

124.5 – Recorded Information for Sewer Inspections

Audio and written documentation must accompany all videos submitted to the Commissioner.

The voice narrations on the video(s) must make brief but informative comments on any data of significance, including, but not limited to, the distance traveled within the sewer, locations of unusual conditions or damage, sewer connections, collapsed pipe or manhole sections, the presence of scale and corrosion, blockages, leakage, and other discernible features.

The video(s) must include the following:

A. DATA VIEW:
   1. Name of streets containing sewers televised.
   2. Report or video number.
   3. Date of TV inspection.
   4. Upstream and downstream manhole or station numbers.
   5. Current distance along reach.

B. Printed labels on DVD and DVD case must include location, date, format, and other descriptive information.

SECTION 125. SALVAGE EXISTING ITEMS

The Contractor must use reasonable care in removing cast iron frames and lids to be replaced and from abandoned manholes, catch basins and inlets encountered in the work, and will deliver this material to the Commissioner at the following storage point:

City of Chicago Department of Water Management Facility
3901 S. Ashland Avenue, Chicago, Illinois.

The Contractor must obtain a signed and dated receipt for these materials that are delivered to the storage point. The Contractor will be assessed a fee of fifty dollars ($50) for each manhole, catch basin or inlet frame and lid and thirty dollars ($30) for each gutter box frame and lid removed and not delivered to the storage point.

All costs to the Contractor resulting from the conditions of this work must be included in the prices for sewers and sewer structures.

SECTION 126. PARTIAL REMOVAL OF SEWERS AND SEWER STRUCTURES

The Contractor must remove portions of existing sewers and structures as shown on the Plans or as ordered by the Commissioner. The structures must include, but no be limited to, sewer junctions and connections, retaining walls, abutments and piers.

The work includes removing and disposing of brick and stone masonry, concrete and reinforcement bars embedded therein, tunnel lining, including steel ribs and liner plates, timber piles, timber sheeting and bracing, and miscellaneous materials; the furnishing of all labor, tools and equipment; and the performing of all appurtenant and collateral work necessary to complete the removal of portions of the existing sewers and structures as specified.

Blasting will not be permitted in the performance of any work of removing portions of specified sewers and structures.

The Contractor must use care to prevent damage to portions of the sewers and structures which are to remain in place. Any portions of said sewers and structures which are outside of the limits of removal, as shown on the Plans or as ordered by the Commissioner, and which are damaged by the Contractor, must be repaired or replaced by the Contractor without cost to the City.

All costs to the Contractor resulting from the conditions of this work must be included in the prices for sewers and sewer structures.

SECTION 127. WATER USE PERMITTING

The Contractor will be required to apply for a water use permit from the Department of Water Management per Book 1, Section X, subsection A of the Contract Documents. All fees associated with water use necessary for Department of Water Management generated projects will be waived.

There will be no separate fee reimbursement in connection with all the above permits and fee requirements and all costs therefore will be considered as incidental to the Project. Water use permits can be attained at the City of Chicago, City Hall, Department of Water Management, 121 N. LaSalle Street, Room 803A, Chicago, IL 60602

SECTION 128. MATERIAL QC/QA

The Contractor is required to comply with the CDOT QC/QA rules and procedures including filling out of all required forms and their submittal etc. for the materials used in the contract as per CDOT QC/QA Addendum as specified on the CDOT QC/QA website www.cdotqcqa.com

The Contractor is required to comply with IDOT Recurring Special Provisions, Check Sheet #24 and #25 adopted January 1, 2019. The recurring special provisions found in the IDOT "Supplemental Specifications and Recurring Special Provisions" documents discuss the Quality Control of Concrete Mixtures at the Plant and Quality Control/Quality Assurance of Concrete Mixtures.

SECTION 129. COMPLIANCE WITH AMERICAN IRON AND STEEL REQUIREMENTS

129.1 – Description of Work

This work is funded in all or in part by the USEPA Water Pollution Control Program for Wastewater State Revolving Loan Fund as administered by the Illinois Environmental Protection Agency (IEPA). Current loan rules include a requirement that certain iron and steel products incorporated into the project be produced in the United States (USA). The requirements are commonly called the American Iron and Steel Requirements (AISR). In Book 1 and Book 2 the Contractor certifies that any "Buy America" provisions will be met. The current loan rules require that the Contractor provide verification to the City that all iron and steel covered by the AISR are American-made. This specification section provides details on what iron and steel materials must meet these requirements and the documentation to be submitted by the Contractor for verification.

a. See USPEA Guidance on Implementation of AISR in Appendix D "Use of American Iron and Steel".

The Contractor acknowledges to and for the benefit of the City of Chicago ("Purchaser") and the State of Illinois (the "State") that it understands the goods and services under this agreement are being funded with monies made available by the Clean Water State Revolving Fund which has statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement" (or AISR) including iron and steel products provided by the Contractor pursuant to this project. The Contractor herby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement (AISR), (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement as may be requested by the Purchaser or the State. Notwithstanding any other provisions of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser), While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of the project, the Purchaser and the Contactor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of the Agreement necessary to give this paragraph force or effect) shall be amended or waived without prior written consent of the State.

The AISR provisions apply to items actually incorporated into the work. The provisions do not apply to items that are used temporarily in the construction and then removed from the work. Such items include: traffic control equipment, trucks, construction equipment, tools, testing equipment, temporary steel plates for construction in roads, trench boxes, scaffolding, dewatering well points, dewatering pumps, hoses, temporary utility supports, temporary sheeting and shoring, lights, temporary devices, temporary trailers, and all other temporary equipment, materials and components used to construct the work, but not incorporated into the work.

Mechanical and electrical components and systems are not considered "construction materials" and are not required to meet these requirements.

a. Mechanical components typically have motorized parts and/or are powered by a motor.

b. Electrical equipment is typically any equipment powered by electricity and includes components that are part of the electrical distribution system.

c. Examples of mechanical and electrical components not required to meet these provisions (including appurtenances necessary for their intended use and operation) include pumps, motors, gear reducers, drives, variable frequency drives, valve actuators (electric/hydraulic/pneumatic), mixers, gates, motorized screens (such as traveling screens), blowers, aeration equipment, compressors, meters, sensors, controls, switches, supervisory control and data acquisition (SCADA) equipment, computer systems, filtration systems, filters, settling/clarifier equipment, settling/clarifier mechanisms, rakes, grinders, disinfection systems, sediment dewatering equipment, conveyors, cranes, HVAC equipment (excluding ductwork, which is covered by this requirement), water heaters, heat exchangers, generators, electrical boxes, electrical enclosures, electrical switchgear, motor control centers, control panels, lighting fixtures, electrical conduit and wiring, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical equipment, etc.

Construction material primarily made of iron or steel and permanently incorporated into the finished project must meet these requirements.

a. "Steel" items are defined as "an alloy that includes at least 50% iron, between 0.02% and 2% carbon, and may include other elements". This steel definition includes carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

b. Iron includes ductile iron, cast iron, grey iron and other iron materials.

c. An item is considered to be made "primarily of iron or steel" if it is "made of greater than 50% iron or steel, measured by cost". Cost is based on "material cost" which includes the material and labor cost to manufacturer the iron or steel product the cost to assemble a multi part item. (For instance, for a fire hydrant the material cost includes the labor and material cost to manufacture the iron and steel parts, but not to assemble the hydrant).

d. Produced in the United States (USA) means that all manufacturing process must take place in the USA. This includes melting, refining, forming, rolling, drawing, finishing, fabricating and coating.

i. If any domestic iron and steel product is taken out of the USA for any part of the manufacturing process, the entire product is considered to be from foreign source.

ii. Raw materials such as iron ore, limestone, and iron and steel scrap used to create the iron and steel do not have to come from USA sources.

iii. Coating materials applied to the iron or steel products do not have to come from USA sources.

iv. Non-iron or steel components of an iron or steel product do not have to come from USA sources. For instance, non iron or steel components of fire hydrants and valves do not have to come from USA sources.

e. Municipal castings permanently incorporated into the finished project made of grey iron, ductile iron or steel must meet this requirement. Examples of municipal castings are as follows: Access hatches, ballast screen, benches (iron and steel), bollards, cast bases, cast iron hinged hatches, square and rectangular, cast iron riser rings, catch basin inlet, cleanout/monument boxes, construction covers and frames, curb and corner bollards, curb openings, detectable warning plates, downspout shoes (Boot, Inlet), drainage grates/frames/curb inlets, inlets, junction boxes, lampposts, manhole covers/rings/frames/risers, meter boxes, service boxes, steel hinged hatches (square and rectangular), steel riser rings, trash receptacles, tree grates, tree guards, trench grates, valve boxes/covers/risers.

f. Structural steel shapes permanently incorporated into the finished project must meet this requirement. Examples of structural steel shapes include I-beams, channels, angles, tees, zees, H.-piles, sheet piling, tie plates, cross ties, tie rods, etc.

g. Iron and steel construction products permanently incorporated into the project must meet this requirement. This includes, but is not limited to the following components if made of iron or steel: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope, cables, tubing, framing, joists, trusses, fasteners (including nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and tube fencing, guardrails, doors, stationary screens, etc.

h. Iron and steel components of cast in place and precast reinforced concrete must meet these requirements. Examples include reinforcing bars, wire fabric, etc.

i. All precast manufacturing must be done in the USA

ii. Cement and other raw materials used in the concrete production do not have to have a USA origin.

i. Iron and steel piping systems permanently incorporated into the project must meet this requirement. This includes, but is not limited to the following components if made of iron or

steel: pipe (lined or unlined), fittings, valves, hangers, couplings, hydrants, tanks, flanges, pipe clamps, restraints and other appurtenances

Items considered as iron or steel in this work are shown in Table 2 below.

The regulations allow certain "waivers" from the AISR requirements. Except for the "de minimis waiver" discussed below, waivers will be difficult and time consuming to apply for. The regulation assumes that waivers will be rare exceptions. For this project waiver applications will be reviewed and approved or rejected by USEPA. The Contractor must notify the Representative of the Commissioner if a component of iron, steel that meeting AISR is not available. The Contractor must provide documentation necessary for the City to prepare a waiver application to USEPA that meets USEPA waiver approval requirements. The allowable waivers are identified the March 20 2014 USEPA guidance memo on AISR. The documentation required from the Contractor for a waiver will be identified on a case-by-case basis.

USEPA has promulgated a "de minimis" waiver that allows the use of non-USA iron and/or steel goods when they occur in de minimis as incidental components of the eligible project.

a. Total de minimis incidental components cumulative may comprise no more than a total of 5% of the total cost of the materials used in and incorporated into the entire project.

b. The cost of an individual item included in the de minimis calculation may not exceed 1 % of the total cost of the materials used in and incorporated into the entire project.

c. USEPA considers the following miscellaneous generally low cost items to be eligible for the de minimis calculation: small washers, screws, fasteners (including nuts and bolts) miscellaneous wire, corner bead, ancillary tube, etc. Iron and steel items that cannot be included in the de minimis calculation include pipe, elbows, flanges, brackets, tees, fittings, valves, treatment and storage tanks, support structures, HVAC duct work, iron and steel construction products and castings, etc.

d. The Contactor may consider that the items presented in the table below meet the USEPA de minimis waiver. The Contractor must identify to the City which items on the work will be considered as being provided under the USEPA de minimis waiver. The Contractor must provide documentation to the City showing that the total cost of the items being provided under the USEPA de minmis waiver comprise no more than 5% of the total materials cost used in and incorporated into the work. Alternatively, the Contractor may consider these items as iron, steel meeting the AISR and provide the appropriate documentation for that category as discussed above.

Table 1
Items Considered Eligible for USEPA De-Minimis Waiver

Pay Item No	Name	Items
Items 15, 16, 17	Reinforced Concrete Pipe Sewer in open cut	Bolts, nuts, gaskets
Items 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29	Drain Connections	Bolts, nuts, gaskets

129.2 – Submittals

Contractor must provide verification documentation that each iron, steel component incorporated into the work meets the AISR. If the Contractor changes suppliers at any time during the construction for any iron, steel, good, or component covered by the requirement, or if any new item is added to the work, the Contractor must notify the Representative of the Commissioner of the change, and must provide to the City verification documentation that the new component meets the AISR.

The Contractor must maintain a log of all iron, steel components incorporated into the work that are covered by this requirement. The log must include (at a minimum) the name of the component, the specification section, the name of the supplier, the date of supplier provision of verification, an alpha/numerical reference number of the supplier's verification documentation, and an appendix including copies of each supplier verification document, each page marked with the Contractor's alpha/numeric reference number for that item. Also provide additional verification for conformance with AISR as discussed in more detail below. The Contractor must provide the log file (including appendix and other supplemental information) to the City as follows:

a. On a monthly basis until all iron, steel and manufactured good components incorporated into the work are included in the log and appendix.

    i. Contractor monthly pay application will not be approved until acceptable log file and appendix has been received by City, or, if no changes have been made, a letter from the Contractor is received stating that no changes have been made and the date of the last complete submittal.

b. Each time a supplier of a component is changed, or a new component added to the work.

c. At the request of the City.

Items on this project that must conform to the AISR provisions:

Table 2
Iron and Steel Items That Must Meet AISR Provisions

Pay Item No	Name	Items
Items 15, 16, 17	Reinforced concrete pipe in open cut	Reinforcing steel, fittings
Items 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29	Drain connections	Ductile Iron Pipe, fittings, steel couplings cast iron pipe
Items 30, 31, 32	Manholes	Steel, reinforcing steel, galvanizing steel adjustment plates, frames, covers
Items 33, 34	Concrete collars, reinforcement bars	Reinforcing steel

Table 2 Iron and Steel Items That Must Meet AISR Provisions		
Pay Item No	**Name**	**Items**
Items 35	Drill and grout dowel and tie bars	Dowel bars, tie bars
Items 36, 37	Catch basins	Steel, reinforcing steel, galvanized steel adjustment plates
Items 38, 39	Chicago standard frame and lid	Frames, covers, gates, galvanized steel adjusting plates
Items 46, 47	Portland cement concrete base course	Tie bars
Items 56, 57	Combination curb and gutter type B-V.12; concrete curb type B	Tie bars, dowel bars
Items 76, 77	Manholes, valve vaults to be adjusted	Galvanized steel adjusting plates
Items 88, 89, 90, 91, 92	Cut, cap, and replace existing water main	Ductile iron pipe, fittings

In addition to the items identified above, Contractor must include in log and provide verification documentation on other items incorporated into the work that may not be listed above including: items inadvertently not included in the lists; items added by addenda, change order, field order or response to request for information; items added to the work by any other means.

129.3 – Documentation Requirements

The AISR provisions require the Contractor to submit proof of compliance for each iron and steel product covered by the regulations. As required by the AISR provisions the Contractor must use one of the following two alternative proofs of compliance.

1. Proof of Compliance Alternate 1 - Contractor is to provide “step certification” of production of each iron and steel product covered by the regulations.

    a. Each handler, supplier, fabricator, manufacturer, processor, coater must provide a certification that their step in the process was performed in the USA. Each time a step in the manufacturing process takes place, the manufacturer deliverers the work along with a certification that the work was done in the USA. Provide certification documentation for each step to the Contractor for submittal to the Representative of the Commissioner.

    b. Sample Step Certification Letter

    (Company Letterhead)

    (Letter Date)

To: (Representative of the Contractor)
(Project name)

From: (Name of Company providing product and Certification)
(Company Address)
(City, State, Zip)

Subject: American Iron and Steel Step Certification
(Project Name)
City of Chicago Department of Water Management
(DWM Project Number)

I, (name of company representative), certify that the (name manufacturing step, i.e. melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing/fabricating, etc.) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated by the USEPA State Revolving Fund Program as administered by IEPA in Illinois.

Pay Item Number	**Material**
XXXX	xxx
XXXX	xxx
XXXX	xxx

These processes took place at the following location:

(Facility Name, Facility Address)

If any of the above compliance statements change while providing material to this project, we will immediately notify you.

(Signed by Company Representative)

2. Proof of Compliance Alternate 2 – When the final manufacturer delivers the iron or steel product to the worksite, the vendor or the Contractor may provide a certification that all the manufacturing processes occurred in the USA.

b. Sample Certification Letter

(Company Letterhead)

(Letter Date)

To: (Representative of the Contractor)

(Project name)

From: (Name of Company providing product and Certification)
(Company Address)
(City, State, Zip)

Subject: American Iron and Steel Step Certification
(Project Name)
City of Chicago Department of Water Management
(DWM Project Number)

I, (name of company representative), certify that the following products and/or materials shipped or provided for the subject project are in full compliance with the American Iron and Steel requirement as mandated by the USEPA State Revolving Fund Program as administered by IEPA in Illinois.

Pay Item Number	**Material**	**Mfg. "or" Fab. Process**	**Location Where Process took Place Name, Address**
XXXX	xxx	xxx	xxx
XXXX	xxx	xxx	xxx
XXXX	xxx	xxx	xxx

If any of the above compliance statements change while providing material to this project, we will immediately notify you.

(Signed by Company Representative)

The documentation letters must be submitted with the Shop Drawings provided for approval.

a. If the letters are not available at the time of shop drawing submittal, the shop drawings must contain a statement that the materials meet the AISR provisions, and state that the compliance letters will be provided prior to delivery of materials to the site.

Materials will be rejected if required documentation is not provided.

SECTION 130. EARTH RETENTION SYSTEM SUBMITTAL (ERS) REQUIREMENTS

Earth Retention System (ERS) review is required for all excavations greater than 12' deep.

Submittal Requirements for Review of Earth Retention Systems (ERS)

Common Items

The following items are to be included with all earth retention system (ERS) submittals, regardless of the structural type. All ERS drawings and calculations are to be sealed and signed by an Illinois registered Structural Engineer.

A. Boring logs and associated field/lab test data.

B. A Geotechnical Report for the project.

C. List all design assumptions used in the calculations, as they are introduced in sequence of computations.

D. Provide copies of all relevant pages of references used in the calculations. These include all graphs, charts, or tables used in the analysis or design.

E. Provide copies of catalogue cuts and tables of material properties used in the structural calculations.

F. All submittals must begin with a sketch and/or listing of soil layering, soil parameters, and design water level assumed in the calculations. Specific borings which were used in establishing the design conditions should be identified by boring numbers as given on the logs.

G. Calculations should show cross-sections giving design elevations for:
   i. Top and toe of the wall
   ii. Existing surrounding ground
   iii. Bottom of the excavation
   iv. Existing adjacent foundations within the zone of influence
   v. Cut slopes and set-backs
   vi. Water elevation.

H. All formulas must be listed, as they are being used in the various parts of the calculations.

I. Include all calculation steps that are a normal part of an actual hand solution whether or not a computer-assisted analysis/design was used. Do not submit re-copied computer output as hand calculation.

J. Construction surcharge should be matched to the actual conditions planned by the constructors. However in no case should traffic surcharge be less than a 240 psf uniformly distributed vertical load.

K. ERS drawings must include plan views and cross-sections which are consistent with the final design options, eliminating alternatives. Sufficient cross-sections must be provided to show top of grade, cutback slopes, adjacent buildings, sidewalks alleys, and roadways, as well as utilities within the zone of influence (within 2.5 times the excavation depth from grade)A Groundwater Control Plan and dewatering calculations prepared by an Illinois registered PE must be submitted for review in all cases where well/wellpoints and/or dewatering are necessary to maintain a dry, stable excavation.

L. ERS drawings must include a step-wise installation and dismantling procedure.

Earth Retention System (ERS) Items - General

The ERS Submitted must include calculations for the design of all vertical wall components and for all bracing components.

For example, depending on the system selected, this may include design for:

- Sheet piles, solider piles and lagging, secant piles, slurry walls, etc.
- Waters, struts, rakers, kicker blocks, anchors, and temporary earth berms.
- Supports for crossing utilities which are not relocated.
- Use of proprietary systems, such as trench boxes or slide rail shoring, requires that a structural engineer licensed in the state of Illinois confirm that the systems components are satisfactory for site-specific conditions. Manufacturers or suppliers cut sheets must be submitted, listing serial numbers of frames or boxes proposed for use on the project. Such cut sheets must clearly state the maximum loading and depths for which the system has been designed. These cut sheets must be stamped by the structural engineer (licensed in Illinois) who is approving use of such system.

Specific submittal requirements for specific ERS system designs, including Cantilever Wall Analysis/ Design, Single Level Braced or Anchored wall, Multiple-Tier Braced Walls and dewatering system can be obtained by contacting the Construction Manager of Department of Water Management.

All costs resulting from these provisions must be included in the prices bid for the sewers and sewer structures, as necessary.

DIVISION II

DETAILED SPECIFICATIONS

IDOT REFERENCED STANDARD SPECIFICATION ITEMS

The following items refer to IDOT "Standard Specification for Road and Bridge Construction", adopted April 1, 2016 (hereinafter referred to as the Standard Specifications or the SSRBC); the "Supplemental Specifications and Recurring Special Provisions", adopted April 1, 2016; the latest edition of the "Illinois Manual on Uniform Traffic Control Devices for Streets and Highways" in effect on date of invitation for bids. The IDOT SSRBC items listed below are included in this specification by reference.

Standard Specifications for Road and Bridge Construction:
http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Construction/Standard-Specifications/Standard%20Specifications%20for%20Road%20and%20Bridge%20Construction%2020 16.pdf

Supplemental Specifications and Recurring Special Provisions: http://www.idot.illinois.gov/doing-business/procurements/engineering-architectural-professional-services/Consultants-Resources/design-and-environment-bde-special-provisions

IDOT Standard Specifications Coded Pay Item Index:
No. 201---- to No. 671---- Road and Bridge Construction Items
No. 701---- to No. 783---- Traffic Control, Signing, Pavement Marking
No. Z..... to No. Z..... Special Pay Items
No. XX...to No. XX... Local Roads Temporary Pay Items No.
XZ....to No. XZ.... Design Temporary Pay Items

Typical Example and Digit Breakdown of a Coded Pay Item:

CODE NO.	DESCRIPTION
20100110	TREE REMOVAL (6 TO 15 UNITS DIAMETER)

201 - First 3 digits indicate the section in the Standard Specifications.
001100 - Last 5 digits indicate the numerical sequence the item has in that section.

ITEM NO.	IDOT CODE	ITEM DESCRIPTION
9	70400100	TEMPORARY CONCRETE BARRIER
10	70400200	RELOCATE TEMPORARY CONCRETE BARRIER
11	70600241	IMPACT ATTENUATORS, TEMPORARY (NON-REDIRECTIVE, NARROW), TEST LEVEL 2
12	70600341	IMPACT ATTENUATORS, RELOCATE (NON-REDIRECTIVE, NARROW), TEST LEVEL 2
33	54248510	CONCRETE COLLAR
34	50800205	REINFORCEMENT BARS, EPOXY COATED
41	20800150	TRENCH BACKFILL
62	40603085	HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N70
64	40603340	HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N70
66	40600290	BITUMINOUS MATERIALS (TACK COAT)
67	78000200	THERMOPLASTIC PAVEMENT MARKING - LINE 4"
68	78000400	THERMOPLASTIC PAVEMENT MARKING - LINE 6"
69	78000600	THERMOPLASTIC PAVEMENT MARKING - LINE 12"
70	78000650	THERMOPLASTIC PAVEMENT MARKING - LINE 24"
71	78000100	THERMOPLASTIC PAVEMENT MARKING - LETTERS AND SYMBOLS
81	60500105	FILLING MANHOLES
82	60500205	FILLING CATCH BASINS

DWM STANDARD SPECIFICATION ITEMS

ITEM NO. 1 ******** ENGINEER'S FIELD OFFICE

Description

Work under this item shall consist of supplying temporary construction facilities. Work under this item shall be performed according to Section 670 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

General Requirements

Temporary Construction facilities must comply with the requirements as listed:

Facilities shall have a ceiling height of not less than eight (8) ft. and a floor space of not less than 800 sq. ft.

Adequate all weather parking space shall be available to accommodate a minimum of five (5) vehicles.

Solid waste disposal consisting of two waste basket(s) and an outside trash container of sufficient size to accommodate a weekly pick-up service shall be provided by the Contractor.

In addition, the following equipment and furniture meeting the approval of the Commissioner shall be furnished:

(a) Five desk(s) with minimum working surface 42"x30" each and five non-folding office chairs with upholstered seats and backs and with wheels.
(b) One four-drawer legal size file cabinets.
(c) Eight folding chairs and one 36"x96" folding tables.
(d) One office style frostless refrigerator with a minimum size of eight cubic feet with a separate freezer unit.
(e) One microwave oven with a minimum capacity of one cubic feet.
(f) One electric desk type tape printing calculators.
(g) One telephone(s) with multiline capability touch tone and voice mail (for exclusive use by the Commissioner). One phone line(s), one for voice, one for fax *and one for security*. One high speed broadband internet connection with unlimited access and wireless networking capabilities for multiple users (for exclusive use of the Commissioner).
(h) One desktop color laser multifunction fax-printer-scanner-copier with network connectivity, including maintenance, paper supply and toner. The machine shall meet the standards listed below
(i) Two new desktop computers or laptops as requested by the commissioner. The computer equipment shall fulfill the minimum requirements, in conformance with the latest technology in use in the City of Chicago from the Department of Innovation and Technology's hardware and software standards and standards listed below.
(j) Cases of approximately twelve cans of aerosol marking paint, of the color chosen by the commissioner, as needed directed by the commissioner.

(k) Accessible potable water and coffee service.
(l) Cleaning service minimum once a week

Computers/Laptops Specs

- 14" Laptop Screen or larger
- latest Intel or AMD processor
- Microsoft Windows 10 (or higher) operating system.
- 1-TB (minimum) SSD drive.
- 12 GB DDR4 RAM or higher
- GTX 1050 GPU or equivalent
- 2 (minimum) USB ports.
- Two (2) 27" (minimum) high resolution LCD monitor.
- Microsoft Office 2010 (minimum) software, with WORD, EXCEL and ACCESS programs.
- Adobe Acrobat XI Pro
- Primavera or Microsoft Projects software to match submittal of PCM.
- Up to 12 hours battery
- Mouse and Keyboard

Printer

One (1) wireless high volume multifunction copier/printer/scanner/fax machine with network printing and scanning with the capability of printing on 8.5"x11" and 11"x17" paper and the capability of printing a minimum of 200 color copies and 5000 black and white copies per month (average) at a minimum speed of 25 pages per minute: including maintenance, operating supplies and paper for the duration of the Contract.

Location

The facility shall be located within the city limits, unless otherwise authorized by the commissioner. Final location to be determined by the commissioner.

Basis of Payment

The facility fully equipped will be paid for at the contract unit price per CALENDAR MONTH or fraction thereof for ENGINEER'S FIELD OFFICE, according to article 670.07 of the IDOT Standard Specifications for Road and Bridge Construction.

ITEM NO. 2 ******** MOBILIZATION

Description

These items includes all costs associated with project mobilization, consisting of preparatory work and operations necessary for the movement of personnel, equipment, supplies and incidentals to and from the project site; for the establishing and removing buildings, offices, and facilities necessary for work on the project; and for all other work or operations which must be performed or costs incurred when beginning work on the project. Work under this item shall be performed according to Section 671 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Site Specific Health and Safety Plan

Prior to the start of construction, the Contractor must submit a site specific Health and Safety Plan in accordance with OSHA to the Commissioner. Plan requirements are as follows:

1. The side specific Health and Safety Plan must be prepared by an experienced Safety specialist and must include work by General and all Sub Contractors.
2. Include description of scope of work to be performed.
3. Include description of safety hazards to be encountered.
4. Include plan for mitigation of each safety hazard.
5. Include plan for dealing with emergencies including location of emergency facilities and emergency contacts.
6. Include employee certifications/training.
7. Describe facilities to be provided for safe means of access and egress to and from all points of work.
8. If confined space work is required, identify Contractor personnel that will serve as a dedicated on-site rescue team. Contractor must not rely on the City of Chicago Fire Department, the Department of Water Management, or any other persons other than the Contractor's personnel to provide rescue services.

After submittal of the plan, the Contractor must attend a meeting to review project and discuss the draft plan. The final plan must be submitted to the Department of Water Management prior to start of work.

Pre-Construction Video

Pre-construction video will include the following services prior to the start of construction:

1. Inspecting and documenting existing conditions of Work Area.
2. Providing a video-recording of the Work Area prior to start of construction.

The Contractor must provide a DVD of the televised inspection of the construction area(s) prior to the start of any construction. Recordings are to be in high quality color. Printed labels DVD containers and disks must include the contract name and number, date the recording was made, and location of the televised inspection. Work is to be performed by a professional video operator having appropriate equipment and significant documentable experience in televising similar construction sites.

No additional working days will be allowed due to delays in securing the televising services of a private vendor. All construction areas must be televised before the start of any construction, but no more than three (3) months before the start of construction, unless directed otherwise by the Commissioner. Prior to televising, the Contractor must visually inspect all areas to be video and make notations of any features that may not be readily visible during the televising of the area. Identify and record all measurements of such items during the pre-video inspection, and include the information in the narration of the area when it is televised. Any out of focus or distorted audio on any portions of the recording will be cause for rejection of the recording and require re-televising the area in question at the Contractor's expense.

The camera must be moved through the construction area at a uniform rate not to exceed 50 feet per minute, stopping when necessary to ensure proper documentation of the condition of the area. Panning and zoom in/out rates are to be controlled to maintain clarity of the documented item(s) during playback. Televise the exterior construction areas during periods of good weather. Avoid televising during periods of poor visibility, precipitation, or times of the year when fallen leaves or snow obscures features in areas to be recorded. Provide auxiliary lighting when required to fill in shadow areas during recording. Televised coverage must include all areas within the zone of influence of the type of construction shown on the drawings, unless directed otherwise by the Commissioner. Audio and video coverage is to be recorded simultaneously. Defects or deficiencies revealed by the televised inspection must be noted on the recording and highlighted by audio commentary. Existing damage to buildings or other structures, paved areas, utility structures, and other features must be recorded and audibility noted.

Each DVD must begin with the recording date, project name and city department, followed by general location references (i.e. street names, building addresses, viewing side and direction of travel, references to building floor plans, or prominent architectural features), as appropriate for the type of project, unless directed otherwise by the Commissioner. The audio track is to contain the narrative commentary of the camera operator recorded simultaneously with the fixed elevation video record within the zone of influence of construction. All video recordings must by electronic means, display the following information continuously and digitally on screen. The information should be positioned on screen so as not to obscure information being recorded.

1. Report or video number.
2. Date recorded.
3. Location reference.

Pre-Investigation Sewer Video

All existing sewers within the limits of the project must be televised before the construction of the new sewer. The contractor shall verify and document the conditions of all existing sewer connections to the proposed sewer. The contractor shall locate and confirm locations of all existing private drains of the existing sewer. Work shall be performed in accordance with Section 124. TELEVISED INSPECTION OF SEWERS AND SEWER STRUCTURES

Post Construction Sewer Video

The final video of the sewer(s) must be completed upon completion of construction, unless directed otherwise by the Commissioner. Work shall be performed in accordance with Section 124 .TELEVISED INSPECTION OF SEWERS AND SEWER STRUCTURES

Method of Measurement

This work will be measured for payment on a lump sum basis.

Basis of Payment

This work will be paid for at the lump sum price for MOBILIZATION. The amount which a Contractor will receive payment for, according to the following schedule, will be limited to six percent of the original contract amount. Should the bid for mobilization exceed six percent, the amount over six percent will not be paid until 90 percent of the adjusted contract value is earned.

(a) Upon submittal and approval of the Pre-Construction Video and Baseline Schedule, seventy percent (70%) of the pay item will be paid

(b) Upon submittal and review of all Pre-Investigation Sewer Videos, five percent (5%) of the pay item will be paid. No payment shall be made until all existing sewers are televised and conditions verified.

(c) When ten percent of the original contract amount is earned, an additional fifteen percent (15%) of the pay item will be paid.

(d) When Final Completion, and Final Acceptance of the Work has been established, the remaining ten percent (10%) of the pay item will be paid.

ITEM NO. 3 ******** PROJECT SIGNS

Description

This work shall consist of furnishing, installing, maintaining, relocating for various states of construction and eventually removing project signs.

Construction Requirements

Project sign construction and placement must conform with CDOT detail A-6-2.

The Contractor must provide the Commissioner a detail of the proposed project sign assembly including construction materials, sign dimensions, and legend dimensions. The project signs must not be furnished by the Contractor prior to receiving approval of the proposed project sign detail from the Commissioner.

The attachment of project signs to existing structures must be approved by the Commissioner; any damage to the existing structures attributable to this attachment shall be repaired or replaced as determined by the Commissioner, at the Contractor's expense.

Project signs must be maintained in good condition throughout the duration of construction at the direction of the Commissioner.

Project signs must be relocated on site as construction progresses at the direction of the Commissioner.

All costs resulting from this work will be paid for under the bid item designated below, and as tabulated in the Schedule of Prices.

Method of Measurement

This work shall be measured for payment for each sign. All hardware, posts or skids, supports, bases for ground mounted signs, connections, which are required for mounting these signs will be included as part of this pay item.

Basis of Payment

This work shall be paid for at the contract unit price per EACH for PROJECT SIGNS.

ITEM NO. 4 ******** TRAFFIC CONTROL AND PROTECTION

Description

Work under this item shall be performed in according to Section 701 of the Standard Specifications, the applicable guidelines contained in the Illinois Manual on Uniform Traffic Control Devices for Streets and Highways, City of Chicago Regulations for Openings, and any Special Details and Highway Standards contained within the Contract Documents, except as herein modified.

This item of work includes furnishing, installation, maintenance, relocation and subsequent removal of all signals, markings, traffic cones, barricades, chain link fence with screening, warning lights, flaggers, ADA compliant temporary ramps and other devices which are to be used for the purpose of regulating, warning or guiding, both vehicular and pedestrian traffic, during the construction of this improvement.

General Requirements

The Traffic Control and Protection Details included in the Contract Documents represent the minimum required combination of traffic control devices needed for typical construction operations. Conditions created by the Contractor's operation which are not covered by the standard details must be protected by devices which may include, but are not limited to, fencing with screening, arrow board, or temporary ADA compliant ramps, as directed by the Commissioner, at no additional cost to the City. Revisions or modifications to the approved traffic control methods must have the Commissioner's written approval. The cost of this work must be included in the Contract Lump Sum Price for Traffic Control And Protection.

The Contractor must submit both a Traffic Control Plan and a Pedestrian Traffic Control Plan for approval by the Commissioner and must furnish the name of the individual in his direct employ who is to be responsible for the installation and maintenance of the traffic control for this project. If the actual installation and maintenance are to be accomplished by a subcontractor, consent must be requested of the Commissioner at the time of the preconstruction meeting in accordance with Article 108.01 of the Standard Specifications. This will not relieve the Contractor of the foregoing requirement for a responsible individual in his direct employ.

Special attention is called to Articles 107.09 and 107.14 of the Standard Specifications and the Highway Standards, Details, Supplemental Specifications and Special Provisions, and Recurring Special Provisions contained herein or in the plans relating to traffic control.

Special attention must be given to advance guide signs during these operations in order to keep barricade placement consistent with lane assignment. The Contractor must cover all traffic control devices, which may be inconsistent with traffic patterns during the transfer from one construction stage to another.

The Contractor's vehicle must always move with and not against or across the flow of traffic. These vehicles must enter or leave work areas in a manner, which will not be hazardous to or interfere with normal traffic and must not park or stop except within designated work areas. Personal vehicles will not be permitted to park within the right of way except in specific areas designated by the Commissioner.
The Contractor must immediately furnish a certified flagger or flaggers if, in the opinion of the Commissioner, the Contractor's construction means or methods warrant. No additional compensation will be made for flaggers. If no flaggers are available the Contractor must cease operations until they become available.

All signs, signals, markings, traffic cones, barricades, chain link fence, warning lights, Temporary ADA ramps, flaggers, and other traffic control devices must conform to the specifications, special provisions and the latest edition of the "State of Illinois Manual on Uniform Traffic Control Devices." The Contractor must obtain, erect, maintain, and remove all traffic control devices in accordance with Article 107.14 of the Standard Specifications. Placement and maintenance of all traffic control devices must be as directed by the Commissioner. The Commissioner will be the sole judge as to the acceptability of placement and maintenance of the traffic control devices prescribed in the appropriate standards.

The Contractor must ensure that all barricades, chain link fence, signs, lights and other devices installed by him are operational every day, including Sundays and holidays. In the event of severe weather conditions, the Contractor must furnish any additional personal required to properly maintain all traffic control devices as directed by the Commissioner.

The placement of barricades and warning signs for the required lane closures must be as specified herein and must proceed in the direction of the flow of traffic. The removal of all signs and barricades must begin at the end of the construction areas and proceed toward oncoming traffic.

Maintenance of Roadways:

The Contractor is required to conduct routine inspections of the work site at a frequency that will allow for the prompt replacement of any traffic control device that has become displaced, worn or damaged to the extent that it no longer conforms to the shape, dimensions, color and operational requirements of the MUTCD, the Traffic Control Standards or will no longer present a neat appearance to motorists. A sufficient quantity of replacement devices, based on vulnerability to damage, shall be readily available to meet this requirement.

Beginning on the date when the Contractor begins work on this project he must assume responsibility for the normal maintenance of all existing roadways within the limits of the improvement. This normal maintenance includes all repair work deemed necessary by the Commissioner but not snow removal operations. Traffic control and protection required for this work will be considered included in the lump sum price for Traffic Control And Protection.

Arrow Boards:

A flashing arrow board meeting the requirements of Article 1106.03 of the Standard Specifications must be operating at all times when a lane is closed to traffic on a multi-lane highway. Arrow boards must be provided and located in ahead-on position within each lane closure taper. The cost of furnishing and maintaining arrow boards will be considered included in the contract CALENDAR DAY price for TRAFFIC CONTROL AND PROTECTION.

Detour Routes:

When traffic is to be directed over a detour route, the Contractor shall furnish, erect, maintain and remove all applicable traffic control devices along the detour route according to the details shown in the plans.

The Contractor must notify the CDOT and IDOT Bureau of Traffic as required 72 hours before commencing construction. The Contractor must notify the C.T.A. two weeks in advance of any lane or street closure

that could impact C.T.A. bus service. The Contractor must post advance notice of detour within the proposed work area and detour route a minimum of one week prior to commencing construction.

Pedestrian Traffic Control:

When an existing sidewalk is removed or is otherwise impassable, the Contractor must install the necessary signs and barricades to direct pedestrian traffic to an alternate pedestrian route. Sidewalk Closed signs (Code No. R11-I102) must be placed at each end of the closed sidewalk section. Type I, Type II, or Type III barricades must be installed in sufficient number to completely close the pathway. Barricades across and along a pathway must have a continuous cane detectable horizontal bar between 4” and 6” above the pavement. Access to and from alternate pedestrian routes must be ADA compliant and must be kept free of any obstructions and hazards. Where construction activates involve sidewalks on both sides of the street, the work must be staged so the both sides of the street are not under constructed at the same time and no more than one corner at a time is out of service.

REQUIREMENTS:

1) Barricades may be Type I, II, III

2) Fencing with screen is to be used to protect the construction area.

3) Barricades across and along a pathway must have a continuous cane detectable horizontal bar between 4” and 6” above the pavement.

4) Access to and from alternate pedestrian routes must be ADA compliant.

5) Alternate pedestrian routes must be a hard surface traversable by a wheel chair.

6) When the alternate pedestrian route is within the roadway it must be protected by a continuous concrete barrier or other crash worthy barrier.

7) When the alternate pedestrian route is to or from the existing sidewalk, an ADA compliant plywood ramp must be installed.

8) Use one "Sidewalk Closed" sign at each end of each sidewalk section being reconstructed at the location where the alternate pedestrian route begins.

9) At each point of closure, sufficient numbers of barricades must be used to completely close the pathway.

10) Pedestrian walkways/ routes must be maintained free of any obstructions and hazards such as holes, debris, mud, construction equipment, stored materials, etc. and must be broom swept daily or as directed by the Commissioner.

11) All hazards near or adjacent to walkways must be clearly delineated.

12) Where construction activities involve sidewalks on both sides of the street, the work must be staged so that both sidewalks are not out of service at the same time.

13) The Contractor must maintain pedestrian access to adjacent properties by installing ADA compliant plywood walkways and/ or ramps from the curb line to adjacent property entrances. Pedestrian access to adjacent properties must be uninterrupted until the walk is full restored.

14) The cost of this work will be included in the contract lump sum price for Traffic Control And Protection.

Traffic Control Deficiency

Traffic Control Deficiency Deduction shall be per Book 2. A deficiency shall include lack of maintaining pedestrian traffic control, the lack of maintaining access to abutting properties, lack of debris removal, fly dumping, timely and correct placement of temporary and permanent pavement markings, along with delay in implementing all items of work contained within this item.

Method of Measurement

This work will be measured for payment on a CALENDAR DAY basis. Temporary concrete barrier will be paid under TEMPORARY CONCRETE BARRIER. Relocation of temporary concrete barrier will be paid under RELOCATE TEMPORARY CONCRETE BARRIER. All other work will be considered included in the CALENDAR DAY sum for TRAFFIC CONTROL AND PROTECTION.

Basis of Payment

This work will be paid for at the contract CALENDAR DAY price for TRAFFIC CONTROL AND PROTECTION.

ITEM NO. 5 ******** CHANGEABLE MESSAGE SIGN

Description

Work under this item shall be performed according to Section 701 of the IDOT Standard Specifications for Road and Bridge Construction, and to the City of Chicago Department of Transportation Regulations for Openings, Construction and Repair in the Public Way.

Materials

The material to be used for Changeable Message Sign must conform to Section 1106.02 of the Standard Specifications for Road and Bridge Construction (SSRBC).

Construction Requirements

This work shall be constructed according to current City of Chicago Department of Transportation Standards and Section 1106.02 of the IDOT Standard Specifications for Road and Bridge Construction.

Basis of Payment

This work shall be paid for at the contract unit price per CALENDAR DAY for CHANGEABLE MESSAGE SIGN.

ITEM NO. 6 ******** MAINTAIN EXISTING LIGHTING SYSTEM

Description

This work consists of furnishing all labor, equipment, and incidental materials for maintaining existing street lighting system until all modifications to the system are installed, energized, tested, and accepted for operation by the Commissioner.

The work shall include any necessary temporary devices to maintain existing illumination. The location and protection of devices necessary to comply with these requirements shall be subject to the approval of the Commissioner. The Commissioner will be the sole judge of satisfying existing illumination levels.

Any temporary wire or cable which may be required to be installed overhead between existing poles or temporary devices shall be furnished, installed, terminated, and maintained in service until the proposed lighting equipment is installed, tested and accepted for operation by the Commissioner.

Materials

Materials shall be according to the following Bureau of Electricity (BOE) Specifications and Articles of Standard Specifications Section 1000 – Materials:

Item		Requirement
(a)	Cable Splicing and Termination	Standard Specifications Article 1066.06
(b)	Fuse holders and Fuses	Standard Specifications Article 1065.01
(c)	Pole Wire	Standard Specifications Article 1066.09
(d)	Lamps	Standard Specifications Article 1067.06
(e)	Aerial Cable Assembly	Standard Specifications Article 1066.04
(f)	Thermal Magnetic Circuit Breaker	BOE Specification 1428
(g)	Metal Light Poles	Standard Specifications Article 1069.01
(h)	Luminaires	Standard Specifications Section 1067

Material Acceptance

The Contractor shall provide a Manufacturer's written certification that the materials comply with these specifications.

General Requirements

General requirements shall be in accordance with Section 801 of the Standard Specifications, and in accordance with Bureau of Electricity Standards and the City of Chicago Electrical Code, except as herein modified.

The Contractor shall maintain existing lighting systems (temporary and permanent) and proposed lighting systems, as well as receptacles and other ancillary devices connected to the applicable street lighting controllers. Effective the day the Contractor starts work (including non-electrical work), the Contractor shall maintain the existing lighting equipment located within the project limits as it then exists. The Contractor shall also maintain any street lighting equipment outside of the project limits but connected to a controller situated within the project limits. The Contractor shall also maintain any

street lighting equipment inside of the project limits but connected to a controller situated outside the project limits.

The Scope of Work shall include the assumption of responsibility for the continuing operation of existing, temporary, or other lighting-systems affected by the work as may be specified elsewhere herein. Existing lighting systems, when depicted on the Plans, are intended only to indicate the general nature of the systems involved and shall not be construed as an exact representation of the field conditions. It remains the Contractor's responsibility to visit the site to confirm and ascertain the exact nature of systems to be maintained. The Contractor shall take over maintenance of all the equipment supplied with electric power from all street lighting controllers regardless of location which control lighting units located on associated streets, crosswalks, and underpasses within or outside of the project limits.

Installation Requirements for Temporary Lighting Units

The Contractor shall furnish and install a temporary lighting unit to replace any existing lighting unit that is removed prior to the new lighting system being operational.
Temporary lighting unit shall include pole, mast arm, 400 watt luminaire, and temporary wiring connections. The Contractor shall furnish and install temporary lighting units and all associated electrical equipment to ensure compliance with the applicable codes, standards, and Specifications.

The Contractor shall coordinate temporary lighting with the sequence of construction and maintenance of traffic for this Project.

The wiring on the pole shall consist of aerial electric cables and waterproof splices at each light pole.

All equipment furnished shall be functional and new in appearance, and shall be maintained. The Contractor shall own all the temporary lighting equipment furnished and installed.

The Contractor shall disconnect and remove temporary lighting and all associated electrical equipment upon energizing and acceptance of the permanent lighting system.

Temporary Wiring

The Contractor shall furnish and install aerial electric cable, including messenger wire, in accordance with Section 818 of the Standard Specifications. The conductor size shall be Number 6 AWG minimum. The messenger wire shall be steel and of adequate size to support the cables from structure to structure under normal and adverse weather conditions.

The electric cables shall be secured to the steel messenger wire with binding strips continuous throughout each span of cable and shall be of adequate strength to support the size of electric cables required for this Project.

Temporary Poles

Temporary lighting poles may be used metal poles in accordance with Article 1069.01 of the Standard Specifications. Metal poles shall be similar in type, size and finish.

Temporary lighting poles may be used steel poles that comply with Bureau of Electricity (BOE) Specification Number 1447 if already owned by the Contractor and in Stock.

The Contractor shall provide and remove temporary foundations for the metal poles that will be adequate to support the poles during normal and adverse weather conditions and as directed by the Commissioner.

Temporary Luminaire

Each luminaire shall be a high pressured sodium vapor, Crime Fighter type. Each luminaire shall be mast arm or bracket arm mounted on the top of the pole. Each luminaire shall be provided with a leveling surface and a leveling device and shall be capable of being tilted by plus or minus 30 degrees and rotated to any degree with respect to the supporting bracket. Each luminaire shall have a pipe arm barrier to limit the amount of inflection.

Installation

Location of cables and fixtures for temporary lighting shall be adjusted and supported to accommodate field conditions encountered, including any potential interferences with other construction or equipment to be installed.
The Contractor shall determine the exact route and location of each temporary lighting fixture and associated wiring, prior to installation.

Temporary lighting shall be installed to permit removal (without damage to other parts) of parts requiring periodic replacement or maintenance.

Temporary wiring/lighting shall be removed immediately upon acceptance of permanent lighting.

Penalty for Non-Compliance

The Contractor will be subject of $500.00 per incident, per day, to be deducted from next pay estimate due Contractor, for each occurrence when the Commissioner determines that Contractor or his Subcontractor is not in full compliance with this Section of the Specification.

Penalty for Failure to Respond

The Contractor is required to respond within ½ hour to any request from the Commissioner for repair or replacement of any broken, defective and/or missing parts as specified under this section, "Response" is interpreted to mean on the job, preparing to make repairs. Failure by Contractor to so respond shall be grounds for a penalty of $500.00 for each and every occurrence, to be deducted from next pay estimate due Contractor.

Preconstruction Inspection

Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor shall initiate a request for preconstruction inspection, to be held in the presence of the Commissioner and a representative of the party or parties responsible for maintenance of any of any lighting and/or traffic control systems which may be affected by the work. The request for the

maintenance preconstruction shall be made no less than seven (7) calendar days prior to the desired inspection date. The maintenance preconstruction inspection shall:

- Establish details of any formal transfers of maintenance responsibility required for the construction period.
- Establish approximate locations of known lighting and/or traffic control systems, which may be affected by the work.
- Establish the condition of lighting and/or traffic control systems which may be affected by the Work.

Reimbursement

If the Contractor utilizes any lighting equipment owned by the City or uses existing Com Ed service, the Contractor shall compensate the City for such usage.

Method of Measurement

Maintain Existing Lighting System will not be measured for payment, but will be paid on a lump sum basis.

Basis of Payment

This work will be paid for the contract LUMP SUM price for MAINTAIN EXISTING LIGHTING SYSTEM, which will be payment in full for maintaining existing street lighting system until the modifications to the system are installed, energized, tested, and accepted for operation by the Commissioner, furnishing, installing, and removing all temporary lighting units, aerial cable and ancillary equipment required to maintain the existing lighting system as described herein.

ITEM NO. 7 ******** TEMPORARY PAVEMENT MARKING - LINE 4"

Work under this item must be performed in accordance with Section 703 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Description

Work under this item includes all costs associated with furnishing, installing, maintaining and removing short term and temporary pavement markings.

Construction Requirements

The Contractor must furnish, install, maintain, and remove additional temporary pavement markings to that shown on the plans at the direction of the Commissioner. Removal of short term pavement markings and temporary pavement markings must conform to section 783 of the IDOT Standard Specifications for Road and Bridge Construction. All costs resulting from this work will be paid for under bid items designated below in this section, and as tabulated in the Schedule of Prices.

Method of Measurement

Temporary Pavement Marking will be measured per Foot, of the line width specified, placed.

Basis of Payment

Short term pavement marking and temporary pavement marking work will be paid for at the contract unit price per FOOT for TEMPORARY PAVEMENT MARKING - LINE 4" as noted in the Schedule of Prices. All costs resulting from removal of short term pavement markings and removal of temporary pavement markings will not be paid for separately and must be included in the cost of this item.

ITEM NO. 8 ******** PAVEMENT MARKING REMOVAL

Description

Work under this item must be performed in accordance with Section 783 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Construction Requirements

The Contractor must remove existing pavement markings as needed in addition to that shown on the plans at the direction of the Commissioner.

Method of Measurement

Temporary Pavement Marking will be measured per square foot removed.

Basis of Payment

This work will be paid for at the contract unit price per square foot for PAVEMENT MARKING REMOVAL as listed in the schedule of prices.

ITEM NO. 13 ******** SEWER, 24", DUCTILE IRON PIPE, CLASS 52, IN OPEN CUT

ITEM NO. 14 ******** SEWER, 36", DUCTILE IRON PIPE, CLASS 52, IN OPEN CUT

Description

Work under these items shall be performed according to Section 550 of the Standard Specifications and the current City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main Construction, except as herein modified.

This work shall consist of constructing storm sewers at locations designated by the Commissioner, including connections to the existing sewers, any dewatering, sheeting and/or shoring required to perform the work as specified. Work must include temporary bulkheads, when required.

General

Ductile iron pipe used in the construction of sewers, connections and appurtenances must be furnished and placed in accordance with the following specifications, supplemented by the specifications given under other headings.

Work Included

The Contractor must furnish and install sewer in open cut and provide all necessary incidental work, complete as specified, all of which various classes of work must be performed as described in Book 3 Division One General Information.

The work includes excavating, removing and disposing of material classified as earth excavation per Section 202.04 of the IDOT Standard Specifications for Road and Bridge Construction, both wet and dry; removing and disposing of pavements, sidewalks, curbs, driveways and existing sewers and drains within the limits of excavation for sewers; any over-excavation due to soil conditions; removing and disposing of abandoned utilities; partial removal and coring of existing sewers; and underground structures, except as otherwise specified herein; salvaging manhole and catch basin frames, lids and covers, and inlet frames and grates; furnishing, placing and removing sheeting, bracing and timbering; formwork; pumping, fluming and removing water and sewage; furnishing and placing concrete, mortar, brick, granular embedment, bedding, fittings and stoppers; furnishing and placing masonry plugs in abandoned sewers and drains not filled with trench backfill; and all necessary incidental work for the construction, complete as specified, all of which various classes of work must be performed as herein specified.

The contractor must submit detailed earth retention system design and calculations for review and approval by the Office of Underground Coordination and any relevant agency, authority, or utility with facilities impacted by underground construction activity. This work will not be paid for separately and is included in the price of SEWER of the size, class and material specified.

Material

Ductile iron pipe must conform to the requirements of AWWA C151, Class 52 and with the additions or substitutions specified in this Section. Fittings must be gray or ductile iron conforming to AWWA C110.

Bells must be designed to provide a watertight joint without any leakage and be capable of withstanding pressures exceeding those that will rupture pipe of this class and thickness without requiring additional jointing material. All pipe must be manufactured so that where a cut is made at any point along the barrel, the cut end will fit properly into a standard mechanical joint bell and be drip tight at hydrostatic test pressure. Exterior of pipe and fittings must be coated with a petroleum asphaltic material in conformance with AWWA C110. Interior of pipe must be cement mortar or ceramic lined in accordance with AWWA C104.

Pipe Joints

Pipe joints must be push-on type joints with rubber gaskets unless otherwise shown on the Drawings, specified, or directed by the Commissioner. Push-on type joints must conform to AWWA C111.

Pipe joints must be made secure and watertight, employing appropriate equipment to draw the sections of the pipe tightly together. Apply lubricant to rubber gaskets immediately before joining pipe sections.

Flanged fittings shown on the Plans must conform to the requirements of AWWA Specifications as to dimensions and thickness of material and must have “American Standard, Class 125” flanges except where short radius fittings are shown on the Plans, and in such cases, fittings must conform to “American Standard Flanged Fitting, Class 125.” The body of flanged fittings, other than the aforementioned short radius fittings, must be Class D of the AWWA Standard Specifications for all sizes less than 14 inches in diameter, and Class B for all sizes 14 inches in diameter and larger.

Polyethylene Encasement

Polyethylene encasement must be installed around all buried pipe. Encasement material must be 4-mil, cross-laminated, high-density polyethylene tubing. The tubing must comply with AWWA C105.

Inspection and Acceptance

All sewers and sewer structures must be inspected by the Department of Sewers prior to the final payment to the Contractor. In conjunction with these sewer inspections, the Contractor must furnish a videotape in DVD format of a televised inspection of the interior of all main line sewer constructed and the existing main line sewer connected to under this contract. The videotape of existing and/or proposed main sewers must be recorded under the supervision of the Commissioner. The cost of producing and furnishing the video tape will be incidental to the sewer item(s) of the contract.

Perform two sessions of videotaping of the sewer:

1) Before construction and

2) prior to the placement of final wearing surface. The name, phone number, and contact person of the firm which will be performing the videotaping of the sewer must be provided by the Contractor at the pre-construction meeting. Clean all sewers prior to videotaping.

The final acceptance of the sewer shall be based on the sewer videotape. All deficiencies exposed on the videotape must be corrected by the Contractor within 30 calendar days of notification. All costs incurred by the Contractor to make the required repairs are to be borne solely by the

Contractor. Pavement removal, if required, must be in full panel sections and pavement anchors will be required for pavement restoration.

The Contractor is required to re-videotape the sewer to verify that the deficiencies noted on any previous videotape have been corrected to the satisfaction of the Chicago Department of Sewers. All costs to re-videotape the sewer, regardless of the number of times required, will be borne solely by the Contractor. Every effort is to be made by the Contractor to correct all deficiencies prior to the placement of the final wearing surface.

If, in the opinion of the Commissioner, the Contractor has delayed in submitting the videotape, the placement of the final wearing surface may be suspended. No time extension will be granted due to this suspension and the Commissioner will be sole judge as to any delays.

Include location maps, legends and descriptions on all videotape submittals. Two copies of each submittal are required.

Method of Measurement

Ductile Iron Pipe sewer will be measured per linear foot installed. Any and all work described in this specification required for the installation must be included in the costs per linear foot.

Basis of Payment

This work will be paid for at the contract unit price per LINEAR FOOT of sewer pipe for SEWER, 24”, DUCTILE IRON PIPE, CLASS 52, IN OPEN CUT and SEWER, 36”, DUCTILE IRON PIPE, CLASS 52, IN OPEN CUT as provided in the Schedule of Prices.

All bends, tees, wyes, couplings, and fittings indicated on the Contract Plans are to be included in the linear feet of pipe.

Trench backfill will be paid for separately under the applicable items.

Pavement and surface restoration will be paid for separately under the applicable pay items.

ITEM NO. 15 ******** SEWER, 24", CLASS III, REINFORCED CONCRETE PIPE, IN OPEN CUT

ITEM NO. 16 ******** SEWER, 36", CLASS III, REINFORCED CONCRETE PIPE, IN OPEN CUT

ITEM NO. 17 ******** SEWER, PRECAST WYE 60" x 36", REINFORCED CONCRETE, CLASS III, IN OPEN CUT

Description

Work under these items shall be performed according to Section 550 of the Standard Specifications and the current City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main Construction, except as herein modified.

This work shall consist of constructing storm sewers at locations designated by the Commissioner, including connections to the existing sewers, any dewatering, sheeting and/or shoring required to perform the work as specified. Work must include temporary bulkheads, when required.

General

Reinforced Concrete Pipe used in the construction of sewers, connections and appurtenances must be furnished and placed in accordance with the following specifications, supplemented by the specifications given under other headings.

Work Included

The Contractor must furnish and install sewer in open cut and provide all necessary incidental work, complete as specified, all of which various classes of work must be performed as described in Book 3 Division One General Information.

The work includes excavating, removing and disposing of material classified as earth excavation per Section 202.04 of the IDOT Standard Specifications for Road and Bridge Construction, both wet and dry; removing and disposing of pavements, sidewalks, curbs, driveways and existing sewers and drains within the limits of excavation for sewers; any over-excavation due to soil conditions; removing and disposing of abandoned utilities; partial removal and coring of existing sewers; and underground structures, except as otherwise specified herein; salvaging manhole and catch basin frames, lids and covers, and inlet frames and grates; furnishing, placing and removing sheeting, bracing and timbering; formwork; pumping, fluming and removing water and sewage; furnishing and placing concrete, mortar, brick, granular embedment, bedding, fittings and stoppers; furnishing and placing masonry plugs in abandoned sewers and drains not filled with trench backfill; and all necessary incidental work for the construction, complete as specified, all of which various classes of work must be performed as herein specified.

The contractor must submit detailed earth retention system design and calculations for review and approval by the Office of Underground Coordination and any relevant agency, authority, or utility with facilities impacted by underground construction activity. This work will not be paid for separately and is included in the price of SEWER of the size, class and material specified.

Pipes and Gaskets

All reinforced concrete pipe must meet ASTM Designation C76. All reinforced concrete pipe used must be gasketed. Each length of pipe must be provided with bell and spigot or tongue and groove ends of concrete formed on machined rings to insure accurate joint surfaces. The theoretical diameters and the actual diameters of the contact surfaces must not vary more than 1/16 inch. Each spigot or tongue must be recessed to accommodate either a round rubber gasket or other confined, compression-type rubber gasket.

The rubber gaskets must be continuous, precision molded gaskets manufactured from a compound containing a basic polymer of not less than 50 percent, by volume, of neoprene and must contain no vulcanized vegetable oil, reclaimed rubber or any deleterious substance and will be the product of a manufacturer having at least five (5) years of experience in the manufacture of rubber gaskets for sewer pipe joints. Circular gaskets must be of sufficient cross-sectional area and volume so that when the joint is assembled, the gasket will be compressed to form a watertight seal. Gaskets must be extruded or molded and cured in such a manner that any cross-section will be dense, homogenous and free from porosity, blisters, pitting and other imperfections. The gaskets must be molded or extruded to the tolerance as specified. All gaskets must be manufactured within a tolerance of plus or minus 1/64 of an inch on any dimension measured at any cross section. The physical properties of the gasket materials must conform to the requirements of those specified under A.S.T.M. Designation C443, A.S.T.M. Designation C361 and A.A.S.H.T.O. Designation M198. The Contractor must submit to the Commissioner for approval, detailed drawings of the pipe and pipe joint to be furnished and placed under this Contract, including the dimensions of the rubber gasket and the joint in the assembled pipe position. The gaskets must be seated on the pipe in accordance with the manufacturer's specifications and the ends of the pipe and the gaskets must be kept clean and free from damage until the joint has been made.

Preformed tapered holes of the proper dimensions as shown on the Plans for the connection of drains and future drain connections will be provided during the manufacture of the pipe. Tapered holes must be so formed that the drain connection will enter the sewer at an angle of approximately 90 degrees with the axis of the sewer. Any preformed tapered hole shall not exceed a maximum of 50 percent of the diameter of the pipe. If the maximum of 50% is met, additional reinforcement steel satisfactory to the Commissioner must be placed around the hole.

If preformed tapered holes have not been provided for the connection of the drains and for future drain connections, the Contractor must make circular cored openings in the sewer pipe.

The work must be carefully planned with regard to the matching of pipe openings to existing drain locations and the cutting of pipes for connections will be permitted only in special cases, and where permitted must be done in a manner satisfactory to and approved by the Commissioner.

Pipe must not be less than 4 feet or more than 8 feet long unless otherwise approved by the Commissioner.

Pipe Laying

Trenches must be kept as free as practicable from excess water until the mortar in the joints has sufficiently hardened.

Each length of pipe must be laid according to Section 550.06 of the Standard Specifications and as shown on the Plans with the groove end up grade except as modified herein. After the pipe with the gasket is lowered into position, it must be drawn home by use of a winch and cable so as to be in proper alignment. The Contractor must prevent excessive movement of the pipe when partially or completely home so as not to displace the rubber gasket or damage the pipe spigot or bell.

Whenever pipe laying is discontinued, the unfinished end of the sewer must be protected from displacement and cave-in or other injury and a suitable stopper or dam must be placed in the end of the sewer.

Joints

In addition to the jointing materials used by the Contractor in conforming to the gasket manufacturer's recommended practices as specified herein, the Contractor must seal all joints in reinforced concrete pipe sewers with mortar made of equal parts Portland cement and sand.

Cement used must be a blend of Type I Portland cement and Fly Ash. Type I cement and Fly Ash must not be less than 4 3/4 bags of Type I cement and 100 pounds of Fly Ash per cubic yard of concrete. Type I Portland cement must conform to the requirements of "Standard Specifications for Portland cement," ASTM Designation C 150. Fly Ash will conform to the requirements of "Tentative Specifications for Fly Ash for use as an Admixture in Portland Cement Concrete," ASTM Designation C 618, except that the Free Carbon will not exceed 3.0 percent. Portland cement must also conform to the requirements of Section 32 13 13 – Concrete Pavement in Book3, Appendix I, City of Chicago Department of Water Management Standard Specifications and Details for Water Main Construction.

The fine aggregate must conform to grade FA2 per Section 1003 of the Standard Specifications.

The Portland cement mortar must be applied to the joint and finished smooth on the entire circumference of pipe on the inside and, so far as practical, on the outside circumference. All foreign material and excess mortar must be removed from the inside surface of the sewer as pipe laying progresses.

Inspection and Acceptance

All sewers and sewer structures must be inspected by the Department of Sewers prior to the final payment to the Contractor. In conjunction with these sewer inspections, the Contractor must furnish a videotape in DVD format of a televised inspection of the interior of all main line sewer constructed and the existing main line sewer connected to under this contract. The videotape of existing and/or proposed main sewers must be recorded under the supervision of the Commissioner. The cost of producing and furnishing the video tape will be incidental to the sewer item(s) of the contract.

Perform two sessions of videotaping of the sewer:

1) Before construction and

2) prior to the placement of final wearing surface. The name, phone number, and contact person of the firm which will be performing the videotaping of the sewer must be provided by the Contractor at the pre-construction meeting. Clean all sewers prior to videotaping.

The final acceptance of the sewer shall be based on the sewer videotape. All deficiencies exposed on the videotape must be corrected by the Contractor within 30 calendar days of notification. All costs incurred by the Contractor to make the required repairs are to be borne solely by the Contractor. Pavement removal, if required, must be in full panel sections and pavement anchors will be required for pavement restoration.

The Contractor is required to re-videotape the sewer to verify that the deficiencies noted on any previous videotape have been corrected to the satisfaction of the Chicago Department of Sewers. All costs to re-videotape the sewer, regardless of the number of times required, will be borne solely by the Contractor. Every effort is to be made by the Contractor to correct all deficiencies prior to the placement of the final wearing surface.

If, in the opinion of the Commissioner, the Contractor has delayed in submitting the videotape, the placement of the final wearing surface may be suspended. No time extension will be granted due to this suspension and the Commissioner will be sole judge as to any delays.

Include location maps, legends and descriptions on all videotape submittals. Two copies of each submittal are required.

Method of Measurement

Combined sewers of the type and size specified will be measured in place per linear foot installed. Any and all work described in this specification required for the installation must be included in the costs per linear foot.

Basis of Payment

This work will be paid for at the contract unit price per LINEAR FOOT of SEWER, 24", CLASS III, REINFORCED CONCRETE PIPE, IN OPEN CUT; SEWER, 36", CLASS III, REINFORCED CONCRETE PIPE, IN OPEN CUT; SEWER, PRECAST WYE 60" x 36", REINFORCED CONCRETE, CLASS III, IN OPEN CUT as provided in the Schedule of Prices.

All bends, tees, wyes, couplings, and fittings indicated on the Contract Plans are to be included in the linear feet of pipe.

Trench backfill will be paid for separately under the applicable items.

Pavement and surface restoration will be paid for separately under the applicable pay items.

ITEM NO. 18 ****** DRAIN CONNECTION, 6", VITRIFIED CLAY PIPE**

ITEM NO. 19 ****** DRAIN CONNECTION, 6", DUCTILE IRON PIPE**

ITEM NO. 20 ****** DRAIN CONNECTION, 8", VITRIFIED CLAY PIPE**

ITEM NO. 21 ****** DRAIN CONNECTION, 8", DUCTILE IRON PIPE**

ITEM NO. 22 ****** DRAIN CONNECTION, 12", VITRIFIED CLAY PIPE**

ITEM NO. 23 ****** DRAIN CONNECTION, 15", VITRIFIED CLAY PIPE**

ITEM NO. 24 ****** DRAIN CONNECTION, 16", DUCTILE IRON PIPE**

ITEM NO. 25 ****** DRAIN CONNECTION, 24", REINFORCED CONCRETE PIPE**

ITEM NO. 26 ****** DRAIN CONNECTION, 24", DUCTILE IRON PIPE**

ITEM NO. 27 ****** DRAIN CONNECTION, 36", REINFORCED CONCRETE PIPE**

ITEM NO. 28 ****** DRAIN CONNECTION, 36", DUCTILE IRON PIPE**

ITEM NO. 29 ****** DRAIN CONNECTION, 60", REINFORCED CONCRETE PIPE**

Description

Work under these items shall be performed according to Section 550 of the Standard Specifications and the current City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main Construction, except as herein modified.

This work shall consist of constructing storm sewers at locations designated by the Commissioner, including connections to the existing sewers, any dewatering, sheeting and/or shoring required to perform the work as specified. Work must include temporary bulkheads, when required.

General

Ductile iron pipe, Vitrified Clay Pipe, Reinforced Concrete Pipe used in the construction of sewers, connections and appurtenances must be furnished and placed in accordance with the following specifications, supplemented by the specifications given under other headings.

The Contractor must locate and promptly and properly connect to the new sewer all house drains, catch basin drains and other existing drains and sewers of whatever nature which are connected to the sewers being replaced, and must also construct drain stacks, as shown on the Plans or ordered by the Commissioner.

Work Included

The Contractor must furnish and install drain connections and provide all necessary incidental work, complete as specified, all of which various classes of work must be performed as described in Book 3 Division One General Information.

The work includes excavating, removing and disposing of material classified as earth excavation per Section 202.04 of the IDOT Standard Specifications for Road and Bridge Construction, both wet and dry; removing and disposing of pavements, sidewalks, curbs, driveways and existing sewers and drains within the limits of excavation for sewers; any over-excavation due to soil conditions; removing and disposing of abandoned utilities; partial removal and coring of existing sewers; and underground structures, except as otherwise specified herein; salvaging manhole and catch basin frames, lids and covers, and inlet frames and grates; furnishing, placing and removing sheeting, bracing and timbering; formwork; pumping, fluming and removing water and sewage; furnishing and placing concrete, mortar, brick, granular embedment, bedding, fittings and stoppers; supporting piers; furnishing and placing masonry plugs in abandoned sewers and drains not filled with trench backfill; and all necessary incidental work for the construction, complete as specified, all of which various classes of work must be performed as herein specified.

The contractor must submit detailed earth retention system design and calculations for review and approval by the Office of Underground Coordination and any relevant agency, authority, or utility with facilities impacted by underground construction activity. This work will not be paid for separately and is included in the price of DRAIN CONNECTION of the size and material specified.

Construction Requirements

The Contractor must locate all existing live drains connected to the existing sewer being replaced or abandoned under this Contract. All existing live drains must be connected to the new sewer.

The Contractor must examine all house drains, catch basin outlets and other existing drains or sewers to be connected to the new sewers, and if any such drain is found defective beyond the limits of the proposed sewer excavation, as determined by the Commissioner, the Contractor must remove and replace the defective portions. Such work will be paid for under this item. Payment will be made for two (2) lineal feet for each linear foot constructed beyond the limits of the proposed sewer excavation.

Entry into concrete pipe sewers must be made by means of tapered holes formed in the pipe or cored holes and entry to vitrified clay pipe sewers and Ductile Iron Sewers must be made by means of wye branches.

Each slant, tapered hole or wye branch and new drain connection must be the same size as the existing drain or sewer unless otherwise shown on the Plans or ordered by the Commissioner. All drain connections to the main sewer must be flush to the wall of the sewer without protrusions.

If existing cast-iron drains are encountered which must be connected to the new sewers, the Contractor must furnish and place ductile-iron pipe and fittings as required or as ordered by the Commissioner.

That portion of each vitrified clay drain connection and drain stack between the barrel of the sewer and the side of the trench must be encased and supported on a concrete or masonry pier as shown on the

Plans, except that 8-inch drain connections from catch basins where such catch basins are located within the lines of the sewer trench must be supported on trench backfill.

Drain connections constructed outside the neat lines of the sewer trench must be placed on a minimum of six (6) inches of granular embedment.

Drain stacks for future drain connections must have socket ends closed by suitable stoppers mortared in place.

Granular material for embedment of all drain connections constructed outside the neat lines of the sewer trench will be paid for under this item.

Furnishing, placing and compacting trench backfill around drain connections constructed outside of the neat lines of the sewer trench will be paid for under this item.

Care must be taken by the Contractor in locating existing live drains so that all existing utilities and structures are maintained and protected from damage, and that all utilities and structures must be restored, as required or ordered by the Commissioner, at the Contractor's expense.

Materials

Vitrified Clay Pipe

All pipe and fittings 21 inches in diameter and smaller must be of the best quality extra strength clay socket pipe conforming to the specifications for "Extra Strength and Standard Strength Clay Pipe and Perforated Clay Pipe," A.S.T.M. Designation C700 except as otherwise specified or noted on the Plans.

Ductile Iron Pipe

Ductile iron pipe must conform to the requirements of AWWA C151, Class 52 and with the additions or substitutions specified in this Section. Fittings must be gray or ductile iron conforming to AWWA C110.

Polyethylene encasement must be installed around all buried pipe. Encasement material must be 4-mil, cross-laminated, high-density polyethylene tubing. The tubing must comply with AWWA C105.

Reinforced Concrete Pipe

All reinforced concrete pipe must meet ASTM Designation C76. All reinforced concrete pipe used must be gasketed. The physical properties of the gasket materials must conform to the requirements of those specified under A.S.T.M. Designation C443, A.S.T.M. Designation C361 and A.A.S.H.T.O. Designation M198.

QC/QA Requirements

To protect the City against expense necessary to repair or replace drain connections which have been improperly installed by the Contractor while performing the work specified and included under Item 5, "Drain Connections," the Contractor must furnish a maintenance bond to the City in the sum of $10,000.

The bond must be issued by a surety that is approved by the City, must be in a form satisfactory to the Commissioner, and be conditioned that the Contractor will for a period of five (5) years from the date of final inspection and approval of the sewer work by the Commissioner, make good at his expense, the repair and/or replacement of all drain connections due to faulty materials, workmanship or any other damage resulting in any way from the work specified to be performed under this Item.

Method of Measurement

Drain Connections will be measured per linear foot installed. Any and all work described in this specification required for the installation must be included in the costs per linear foot.

No extra or customary measurement of any kind will be allowed. The actual length measured on the center line of the complete work, whether straight or curved, will be used in computing the lineal feet of drain connection to be paid for under this Item. The actual length will be measured between the socket of the vitrified clay slant in monolithic concrete sewers, junctions and connections, or the preformed hole in concrete pipe sewers, or the wye branch in vitrified clay pipe sewers and the end of the new drain connection or drain stack. Manhole bases in drain connections will be measured as equivalent lengths of drain connections.

Basis of Payment

This work will be paid for at the contract unit price per LINEAR FOOT for DRAIN CONNECTION, 6”, VITRIFIED CLAY PIPE; DRAIN CONNECTION, 6”, DUCTILE IRON PIPE; DRAIN CONNECTION, 8”, VITRIFIED CLAY PIPE; DRAIN CONNECTION, 8”, DUCTILE IRON PIPE; DRAIN CONNECTION, 12”, VITRIFIED CLAY PIPE; DRAIN CONNECTION, 15”, VITRIFIED CLAY PIPE; DRAIN CONNECTION, 16”, DUCTILE IRON PIPE; DRAIN CONNECTION, 24”, REINFORCED CONCRETE PIPE; DRAIN CONNECTION, 24”, DUCTILE IRON PIPE; DRAIN CONNECTION, 36”, REINFORCED CONCRETE PIPE; DRAIN CONNECTION, 36”, DUCTILE IRON PIPE; AND DRAIN CONNECTION, 60”, REINFORCED CONCRETE PIPE.

All bends, tees, wyes, couplings, and fittings indicated on the Contract Plans are to be included in the linear feet of pipe.

Trench backfill will be paid for separately under the applicable items.

Pavement and surface restoration will be paid for separately under the applicable pay items.

ITEM NO. 30 ******** MANHOLES, TYPE A, 3' DIAMETER

ITEM NO. 31 ******** MANHOLES, TYPE B, 3' DIAMETER

ITEM NO. 32 ******** MANHOLES, TYPE B MODIFIED, 3' DIAMETER

Description

Work under this item shall be performed according to Sections 602 of the IDOT Standard Specifications for Road and Bridge Construction and the current City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main, except as herein modified.

Materials

Materials shall be according to the following:

a) Coarse aggregate for bedding material shall meet a CA 11 gradation in accordance with Section 1004.05 of the IDOT Standard Specifications
b) Fine aggregate for backfilling material shall meet a FA 6 gradation in accordance with Section 1003.04 of the IDOT Standard Specifications.
c) City of Chicago standard frame and lids shall be in accordance with the City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main Construction.

General Requirements

An ADA compliant manhole frame and closed lid shall be placed on all manholes located within the cross walk or as directed by the Commissioner.

All risers and rings required to reach grade are incidental to this item.

QC/QA Requirements

All precast structures shall be from an IDOT approved source.

Method of Measurement

This item will be measured per Each manhole or structure installed.

Frames will be paid for under “CHICAGO STANDARD FRAME”.

Lids and grates will be paid for under “CHICAGO STANDARD LID”.

Basis of Payment

This work will be paid for at the contract unit price per EACH for MANHOLES, TYPE A, 3' DIAMETER, MANHOLES, TYPE B, 3' DIAMETER, and MANHOLES, TYPE B MODIFIED, 3' DIAMETER as indicated in the schedule of prices. All excavation, bedding and removal of surface features will be paid for under this item.

ITEM NO. 35 ******** DRILL AND GROUT DOWEL AND TIE BARS

Work under this item shall be performed in accordance to Sections 442, 420, and 1000 of the Standard Specifications, except as herein modified.

Description

The work shall consist of furnishing and installing #4 or #5 epoxy coated dowel bars or epoxy coated tie bars in existing Portland Cement Concrete (PCC) bases where new PCC Curbs and Gutters, new PCC Bases and pavement patches are poured against existing PCC Bases or existing PCC Curb and Gutters at locations shown on the Plans and as designated by the Commissioner.

Materials

Materials shall be according to the following:

Item	Article/Section
(a) Dowel Bars	1006.11
(b) Tie Bars	1006.10
(c) Non-Shrink Grout	1024

Construction Requirements

Bars shall be located as indicated on the plans. Individual bar locations shall be shifted at least 5 inches away from existing cracks, joints and unsound concrete.

Holes for dowel bars shall be drilled with suitable equipment for this purpose to the depth shown and to a diameter large enough to allow grouting around the dowel bar or tie bar. The dowel bars or tie bar shall be secured in the drilled holes with non-shrink grout. The grout shall be allowed to cure before the concrete for new curbs and gutters and bases and poured.

Any steel reinforcement that must be cut where the raw steel is exposed shall be recoated in epoxy.

Method of Measurement

DRILL AND GROUT DOWEL/TIE BARS will be measured on an EACH basis, for each dowel or tie bar.

Basis of Payment

This work will be paid for at the contract unit price per EACH for DRILL AND GROUT DOWEL AND TIE BARS, which price shall include the cost of all labor, equipment, and materials, including Dowel Bars, Tie Bars and non-shrink grout and all other work or material required to complete the work as specified.

ITEM NO. 36 ******** CATCH BASIN 3' DIAMETER

ITEM NO. 37 ******** CATCH BASIN 4' DIAMETER

Description

Work under this item shall be performed according to Section 602 of the IDOT Standard Specifications for Road and Bridge Construction and the City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main Construction, except as herein modified.

Work Included

Catch basins must be constructed to the dimensions of 48-inch diameter and to the lines and grades established by the Commissioner. Where space is limited, 36-inch diameter catch basins may be used as approved by the Commissioner.

Costs must also include flow restrictors.

The items in this section must meet the American Iron and Steel Requirements (AISR). See Book 3, Division I, "Compliance With American Iron and Steel Requirements" for details on which items must meet these requirements, and for instructions on how to provide certification that these requirements are met.

Method of Measurement

This item will be measured per Each catch basin installed.

Frames will be paid for under "CHICAGO STANDARD FRAME".

Grates will be paid for under "CHICAGO STANDARD LID".

Basis of Payment

This work will be paid for at the contract unit price per EACH for CATCH BASIN 3' DIAMETER and CATCH BASIN 4' DIAMETER, as indicated in plans and schedule of prices.

ITEM NO. 38 ******** CHICAGO STANDARD FRAME

ITEM NO. 39 ******** CHICAGO STANDARD LID

Description

This item includes all costs associated with providing and installing frame and lid sets at manholes, catch basins, or valve vaults in accordance with the specifications herein. Work under this item shall be performed according to Section 604 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

General Requirements

An ADA compliant manhole frame and closed lid shall be placed on all manholes located within the cross walk or as directed by the Commissioner.

An ADA compliant frame and open lid shall be placed on all catch basins located within the cross walk, bike lane or as directed by the Commissioner.

Work Included

The Contractor must furnish, place, and maintain cast-iron frames and lids of the shapes and dimensions shown on the Plans where such items are not included in the costs.

Unless otherwise shown on the Plans or ordered by the Commissioner, perforated lids must be placed on all catch basins and sewer structures at street intersections, and solid lids must be placed on valve vaults.

In order to prevent debris from entering into the structures, 22 gauge galvanized steel plates that are 22-3/4 inches in diameter must be placed beneath perforated lids prior to the placing of any type of surfacing and be kept in place until the completion of all surface restoration. Furnishing, placing and removing of the lid plates must be included in the price bid for this item.

Materials and Workmanship

Materials and workmanship must conform to the requirements of the Specifications.

Any casting with a scale weight which is less than 95% of the computed weight on the basis of the dimensions shown on the drawings and a weight of 0.260 pounds per cubic inch for cast iron will not be accepted. All openings and recesses will be deducted. The computed weights of frames and lids are as follows:

Standard Frame ..... 390 pounds (for bid purposes)
Lightweight Frame .....177 pounds (for bid purposes)
Perforated Lid ..... 120 pounds (for bid purposes)
Solid Lid ..... 150 pounds (for bid purposes)

Each frame must be set on the completed masonry at the elevation established by the Commissioner and in a full bed of mortar.

Measurement

Frames and lids as tabulated in the proposal or as directed by the Commissioner will be measured for payment per each frame or lid installed.

No extra or customary measurement of ADA compliant frame and lids will be permitted. This item is to be measured and paid for under “CHICAGO STANDARD LID”.

Method of Payment

All payment for work under will be paid for under bid items as noted in the Schedule of Prices. CHICAGO STANDARD FRAME will be paid for at the contract unit price for EACH frame. CHICAGO STANDARD LID will be paid for at the contract unit price for EACH lid.

ITEM NO. 40 ******** STANDARD INLETS

Description
Work under this item shall be performed according to Section 602 of the IDOT Standard Specifications for Road and Bridge Construction and the City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main Construction, except as herein modified.

Method of Measurement

This item will be measured per Each inlet installed.

Basis of Payment

This work will be paid at the contract unit per EACH for STANDARD INLETS. Frames and lids shall be paid for separately under their respective contract items. All excavation, bedding and backfilling and removal of surface features will be paid for under this item.

ITEM NO. 42 ******** EARTH EXCAVATION

Description:

Work under this item shall be performed according to the applicable portions of Section 202 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Work Included:

This item is to be used when the Contractor must remove and dispose of all underlying material located outside the maximum allowable surface restoration limits (OD + 5'), which is not classified as removals paid under other items of the contract, which material is required to be removed for the proper installation of the sewer and sewer structures, and proper restoration as required and as ordered by the Commissioner.

This item will also include all excavation, outside the limits of combination curb and gutter removal, necessary to achieve line and grade of proposed sub-base for proposed curb and gutter. No payment will be made under this item for removing and disposing of surplus earth and Temporary Stone placed by the Contractor for temporary surface restoration. The cost of removing and disposing of such material must be included in the several unit prices and lump sum prices bid for sewers, sewer structures and surface restoration.

The work includes excavating, loosening, loading, removing and disposing of material underlying existing pavements; excavating, removing and disposing of existing topsoil or sod and underlying material; furnishing all labor, tools, trucks and other equipment; and performing all necessary incidental work to completely remove and dispose of the materials as specified, all of which various classes of work must be performed as herein specified. Final shaping and compacting of the subgrade for the placing of new pavements must not be performed as part of the work under this item but the cost thereof must be included in the prices bid for the item "Subbase Granular Material."

Removal of Unsuitable Material:

This item will also include removal and disposal of unsuitable material below the base of the proposed sewer or sewer structures required to provide a stabilized base. In case it is found desirable or necessary to excavate below the bottom of the structure to provide proper bearing for the masonry, the excavation must be carried to such additional depth as the Commissioner may direct. The material ordered for filling such additional excavation will be paid for under appropriate items of the Contract.

The work includes loosening, loading, removing and disposing of both wet and dry materials; furnishing, placing and removing sheeting, bracing and timbering; pumping, bailing and cleaning; and all necessary incidental work to complete the excavation, all of which various classes of work must be performed as herein specified.

Where the soil present in the trench bottom or soil beneath manholes and structures not inside the sewer trench is too soft and/or wet to permit the proper laying and support of the sewer, the Contractor must remove the unstable material for a suitable depth to stabilize the trench bottom with a minimum depth of twelve (12) inches of stabilization stone, as specified in the item "Stabilization Stone."

The Commissioner must be the sole judge as to the need for stabilizing where not specified and must also determine the depth of excavation required to do so. The additional excavation required to stabilize the trench bottom will be paid for under this item.

The crushed stone used to stabilize the trench bottom will be paid for under the item “Stabilization Stone.”

No additional earth excavation will be authorized unless a change in the Plans for the structure to be built or soil conditions require such additional earth excavation.

Unauthorized Excavation:

Whenever excavation is performed without authority, beyond the lines or grades shown on the Plans or as ordered by the Commissioner, the Contractor must refill, without extra payment therefore, all such excavated space beyond such lines and grades, with concrete or such material as the Commissioner may direct.

Wherever tunnel excavation is performed outside the specified dimensions of the masonry section, to allow the placing of sheeting, bracing or lining and whenever the Contractor is allowed to excavate the tunnel beyond the lines of the finished work for his convenience, and whenever material outside the specified dimensions of the section caves or breaks into the tunnel, then the Contractor, without extra payment therefore, must completely fill the remaining space outside the lines of the finished work with concrete of the quality specified for the sewer section or with other materials as the Commissioner may order.

Method of Measurement:

No extra or customary measurement of any kind will be allowed. The volume of underlying material removed under this item will be measured as the volume of material excavated within the limits as stated above. These volumes will be determined by the Commissioner using the method of average-end-areas based on cross sections taken at such intervals as may be necessary, supplemented where necessary by other measurements to determine the total volume of the various materials constituting special excavation.

Basis of Payment

EARTH EXCAVATION will be paid for at the contract unit price per CUBIC YARD of excavation as specified herein.

ITEM NO. 43 ******** STABILIZATION STONE

Description

This item includes all costs associated with providing and installing stabilization stone in accordance with the specifications herein as ordered by the Commissioner.

Work Included

The Contractor must furnish, transport, place, and compact crushed stone fill to be used for stabilization when filling voids created by removal of materials considered additional excavation as required to stabilize the trench bottom.

The work includes furnishing, transporting, placing, and compacting the crushed stone fill; furnishing all labor, tools, and appurtenances; and any incidental work necessary to complete and maintain stabilized fill as specified, all of which various classes of work must be performed as herein specified.

Materials and Workmanship

The material to be used for Stabilization Stone must be crushed stone conforming to Section 1004 of the Standard Specifications for Road and Bridge Construction (SSRBC), except for that the gradation of the material must conform to CA 6 or CA 1, as ordered by the Commissioner, and that the CA 6 material will be crushed limestone.

Measurement

Stabilization stone must be furnished as needed to fill the voids of materials removed under “Earth Excavation” as required for trench stabilization. No extra or customary measurement of any kind will be allowed. The stabilization stone will be measured by weight. The Contractor must deliver to the Commissioner at the time each load is depositing a signed weigh ticket showing the net weight of the stone.

Basis of Payment

This work will be paid for at the contract unit price per TON for STABILIZATION STONE.

ITEM NO. 44 ******** TEMPORARY STONE

Description

This item includes all costs associated with providing, installing, and removing temporary crushed stone in accordance with the specifications herein as well as Section 402.10 of the Standard Specifications for Road and Bridge Construction (SSRBC).

The Contractor must furnish, transport, place, and compact temporary crushed stone as directed by the commissioner in order to maintain adequate surface drainage and to provide safe vehicular operation. The Contractor shall place temporary crushed stone within 24 hours after being directed by the Commissioner. The Contractor must re-grade the temporary stone as frequently as necessary to maintain surface drainage and safe vehicular operations.

The work includes grading and compacting the subgrade; furnishing, transporting, placing and compacting crushed stone; maintaining and regrading the temporary stone as frequently as deemed necessary by the Commissioner for surface drainage and safe vehicular operation; furnishing all labor, tools, and appurtenances; the transport and removal of crushed stone as required; and any incidental work necessary to complete and maintain the temporary stone as specified, all of which various classes of work must be performed as herein specified.

Materials

The material to be used for temporary stone must be crushed stone conforming to Section 1004 of the Standard Specifications for Road and Bridge Construction (SSRBC), with the gradation of the material conforming to CA 6, or as ordered by the Commissioner.

The temporary stone must be maintained in a passable and safe condition for traffic by dressing or grading the fill already placed or by placing additional fill as ordered by the Commissioner.
Method of Measurement

No extra or customary measurement of any kind will be allowed. The temporary stone will be measured by weight. The Contractor must deliver to the Commissioner, at the time each load is deposited, a signed weigh ticket showing the net weight of the stone.

Method of Measurement

This item will be measured per Ton of Temporary Stone placed.

Basis of Payment

This work will be paid for at the contract unit price per TON for TEMPORARY STONE.

ITEM NO. 45 ******** TEMPORARY COLD PATCH

Description

This item includes all costs associated with providing, installing, and removing temporary cold patch in accordance with the specifications herein.
The Contractor must furnish, transport, place, and compact temporary cold patch as directed by the commissioner in order to maintain adequate surface drainage and to provide safe vehicular operation. The Contractor shall place temporary cold patch within 24 hours after being directed by the Commissioner.

The work includes grading and compacting the subgrade; furnishing, transporting, placing and compacting cold patch; maintaining and regrading the temporary cold patch as frequently as deemed necessary by the Commissioner for surface drainage and safe vehicular operation; furnishing all labor, tools, and appurtenances; the transport and removal of the cold patch as required; and any incidental work necessary to install and maintain the temporary cold patch.

Materials and Workmanship

The bituminous premix shall be composed of mineral aggregates uniformly coated with inverted emulsified asphalt CBAE-2 plus additive, shall exhibit no stripping of the bituminous material from the aggregate when immersed in water immediately after mixing, and shall be capable of being stockpiled over a period of at least six months without hardening.

The mixture shall be capable of being loaded into trucks by either hand shovels or power loading equipment, shall be sufficiently workable for placing with shovels, rakes or other hand tools, and shall readily compact by hand tamping, hand or power rolling, or under the action of traffic at the mixing temperature or at temperatures as low as 9 °C (15 °F)., immediately after preparation or over a period of at least six months in a stockpile. The mixture shall remain in place when used to patch wet or dry pavements and shall be stable under normal traffic conditions.

The temporary cold patch must be maintained in a passable and safe condition for traffic by dressing or grading the material already placed or by placing additional material as ordered by the Commissioner.

Method of Measurement

No extra or customary measurement of any kind will be allowed. The temporary cold patch will be measured by weight. The Contractor must deliver to the Commissioner, at the time each load is deposited, a signed weigh ticket showing the net weight of the cold patch.

Basis of Payment

This work will be paid for at the contract unit price per TON for TEMPORARY COLD PATCH.

ITEM NO. 46 ******** PORTLAND CEMENT CONCRETE BASE COURSE, VARIABLE DEPTH

ITEM NO. 47******** PORTLAND CEMENT CONCRETE BASE COURSE, HES, VARIABLE DEPTH

Description

Work under this item shall be performed according to Section 353 of the IDOT Standard Specifications for Road and Bridge Construction, consisting of constructing a Portland cement concrete base course and or Portland Cement Concrete base course using High-Early-Strength concrete, except as herein modified.

Materials

The material to be used for portland cement concrete base course and high-early-strength Portland cement concrete base course (variable depth) must conform to Section 1020 and related sections per section 353 of the Standard Specifications for Road and Bridge Construction (SSRBC). Any High Early Strength concrete mix must reach a minimum compressive strength of 3500 PSI in three days.

Construction Requirements

This work shall be constructed according to current City of Chicago Department of Transportation Standards and Section 353 and 1020 of the IDOT Standard Specifications for Road and Bridge Construction.

Method of Measurement

Measured Quantities. Portland cement base course will be measured in place and the volume will be computed in cubic yards. The width and depth shall be measured to the maximum dimensions shown on the plan cross section or as directed by the Commissioner. No extra or customary measurement of any kind will be allowed. No deduction will be made in the measured area of a concrete base course for manholes, catch basins, inlets or similar structures

Basis of Payment

This work will be paid for at the contract unit price per CUBIC YARD for PORTLAND CEMENT CONCRETE BASE COURSE, VARIABLE DEPTH and PORTLAND CEMENT CONCRETE BASE COURSE, HES, VARIABLE DEPTH.

ITEM NO. 48 ******** BITUMINOUS PAVEMENT SURFACE REMOVAL, 2" AND LESS

ITEM NO. 49 ******** CONCRETE PAVEMENT SURFACE REMOVAL, 2" AND LESS

Description

This item includes all costs associated with removing and disposing of pavement. Removal of full or partial depth pavement removal must be in accordance with the specifications herein.

Work Included

The Contractor must remove and dispose of asphalt or concrete pavement overlying existing pavement bases within the limits shown on the Plans or established by the Commissioner and outside the actual limits of excavation for sewers and sewer structures. The work must be done as specified in Articles 440.01 thru 440.03 of the Standard Specifications for Road and Bridge Construction (SSRBC).

No payment will be made under this item for any materials removed and paid for under other items of the Contract.

The work includes removing and disposing of asphalt or concrete surface from the base course; furnishing all labor, tools, trucks and other equipment; and performing all necessary incidental work to completely remove and dispose of the materials as specified, all of which various classes of work must be performed as herein specified. Final cleaning and preparing the base course for the placing of the new pavement surface must not be performed as part of the work under this item, but the cost thereof must be included in the unit prices bid for the new pavement surface.

Method of Measurement

No extra or customary measurement of any kind will be allowed. The square yards of surface course removed under this item will be measured as the square yards of pavement surface removed within the limits shown on the Plans or established by the Commissioner. No deductions will be made from the measured area for manhole or catch basin covers or inlets or other similar covers or castings.

Basis of Payment

This work will be paid for at the contract unit price per SQUARE YARD for BITUMINOUS PAVEMENT SURFACE REMOVAL, 2" AND LESS and CONCRETE PAVEMENT SURFACE REMOVAL, 2" AND LESS. All payment for work under Pavement Removal will be paid for under bid items as noted in the Schedule of Prices.

ITEM NO. 50 ***** SUBBASE GRANULAR MATERIAL, TYPE B 4"

ITEM NO. 51 ***** SUBBASE GRANULAR MATERIAL, TYPE B 6"

Description

This item includes all costs associated with providing and installing subbase granular material, in accordance with Illinois Standard Specifications for Bridge and Road Construction Section 331 and the specifications herein modified

Work Included

The work includes removing and disposing of surplus earth and crushed stone surface fill, to the subgrade level; preparation of the subgrade; testing and all necessary incidental work to complete the subbase course as specified, all of which various classes of work must be performed as herein specified.

Materials and Workmanship

The subbase material must be crushed limestone having a CA 6 gradation which must be furnished, placed on a prepared subgrade, and compacted to a minimum thickness of six (6) inches in accordance with the requirements for Subbase Granular Material, Type B, as stated in the applicable provisions of Section 311 of the Standard Specifications for Road and Bridge Construction (SSRBC). Materials must conform to Section 1004 of the SSRBC.

Subbase must be compacted to or not less than 95% of the maximum dry density as determined by ASTM D1557. At the direction of the commissioner, the contractor shall perform testing.

Measurement

The granular subbase material will be measured as the square yards placed within the limits as shown on the Plans, or as established by the Commissioner. No deduction will be made in the measured area of the base course for manholes, catch basins, inlets or similar structures.

Basis of Payment

All payment for Work under these items, SUBBASE GRANULAR MATERIAL, TYPE B 4", and SUBBASE GRANULAR MATERIAL, TYPE B 6", will be paid for at the contract unit price per SQUARE YARD under these bid items as noted in the Schedule of Prices.

ITEM NO. 52 ******** PAVEMENT REMOVAL

Description

Work under this item shall be performed according to Section 440 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Work Included

This work shall consist of the removal and disposal of existing pavement, subbase and fill outside of the sewer trench limits of (OD+3) and any over-excavation due to soil conditions, regardless of depth and material types encountered, as shown on the plans or as directed by the Commissioner, to the proposed sub-grade elevation. Any additional excavation to a depth suitable for construction required for installing the proposed cross-section at the proposed line and grade will be incidental to this item and no additional payment will be made.

All sawcutting required for the pavement removal will be considered incidental to the removal, and no additional costs shall be paid.

Method of Measurement

This work will be measured for payment in place in square yards.

Basis of Payment

This work will be paid for at the contract unit price per SQUARE YARD for PAVEMENT REMOVAL.

ITEM NO. 53 ******** CURB REMOVAL

ITEM NO. 54 ******** COMBINATION CURB & GUTTER REMOVAL

Description

Work under this item shall be performed in accordance with Section 440 of the Standard Specifications and the Standard Construction Details, except as herein modified**.**

General Requirements

This work shall consist of the removal and disposal of existing Curb and Combination Curb & Gutter to the proposed sub-grade elevation. Any additional excavation required as per CDOT Rules and Regulations for installing the proposed Curb and Combination Curb & Gutter per the proposed cross-section at the proposed line and grade will be incidental to this item and no additional payment will be made.

Construction Requirements

The Contractor shall saw cut full depth a perpendicular clean joint between that portion of the Curb and Combination Curb & Gutter to be removed and that portion of existing which is to remain in place.

Preparation of the subgrade following pavement removal shall be in accordance with Section 301 of the Standard Specifications. This work will be part of this item and no additional compensation will be made.

Method of Measurement

Curb, Combination Curb & Gutter removal will be measured in place per linear foot removed.

Basis of Payment

This work will be paid for at the contract unit price per LINEAR FOOT for CURB REMOVAL and COMBINATION CURB & GUTTER REMOVAL, which price shall include removal and disposal of the existing material and saw cutting.

ITEM NO. 55 ******** SIDEWALK AND ADA RAMP REMOVAL

Description

Work under this item shall be performed in accordance with Section 440 of the Standard Specifications and the Standard Construction Details, except as herein modified**.**

General Requirements

This work shall consist of the removal and disposal of existing sidewalk and ADA Ramp to the proposed sub-grade elevation. Any additional excavation required for installing the proposed sidewalk and ramp per the proposed cross-section at the proposed line and grade will be incidental to this item and no additional payment will be made.

Construction Requirements

The Contractor shall saw cut full depth a perpendicular clean joint between that portion of the sidewalk and/or ramp to be removed and that portion of which is to remain in place.

Preparation of the subgrade following pavement removal shall be in accordance with Section 301 of the Standard Specifications. This work will be part of this item and no additional compensation will be made.

Method of Measurement

Sidewalk and ADA Ramp removal will be measured in place in Square Feet.

Basis of Payment

This work will be paid for at the contract unit price per SQ FT for SIDEWALK AND ADA RAMP REMOVAL, which price shall include removal and disposal of the existing material and full depth saw cutting.

ITEM NO. 56 ******** COMBINATION CONCRETE CURB AND GUTTER, TYPE B-V.12

ITEM NO. 57 ******** CONCRETE CURB, TYPE B

Description

This item includes all costs associated with providing and installing combination curb and gutter and concrete curb in accordance with Section 606 of the Standard Specifications for Road and Bridge Construction (SSRBC) except as herein modified.

The items in this section must meet the American Iron and Steel Requirements (AISR). See Book 3, Division I, "Compliance With American Iron and Steel Requirements" for details on which items must meet these requirements, and for instructions on how to provide certification that these requirements are met.

Work Included

The Contractor must construct Combination Curb and Gutter, Type B-V.12 and Concrete Curb, Type B, at provided for maintaining proper elevation for ADA ramp construction, of the Chicago Department of Transportation (CDOT) Standard Curbs, as shown on the Plans or as established by the Commissioner. The curb and curb and gutter must be constructed to the lines, grades and dimensions established by the Commissioner.

The work includes removing and disposing of surplus earth or other material not removed under other items of the Contract; formwork; furnishing and placing dowel bars, tie bars, concrete, preformed joint filler and asphalt for sealed joints, backfilling behind curb and gutter with suitable material; and all necessary incidental work to complete the curb and curb and gutter as specified, all of which various classes of work must be performed as herein specified. Tie bars shall be #5 round epoxy coated tie bars, 18" long at 30" centers as shown on the standard details included herein as Book 3, Appendix I, "City of Chicago Department of Transportation Standard Details."

Where installation of Concrete Curb, Type B occurs at traffic circle restoration, the curb type must be mountable as shown in the contract plans and includes installation of 2" depth control joints filled with sealant and 2 - #4 12" epoxy coated rebar at each joint; and Type 2 yellow raised pavement markers.

Where streets having a concrete base are encountered and complete pavement replacement is not required, the work must include furnishing and installing #5 epoxy coated tie bars, 18" long at 30" centers, drilled and grouted into the existing concrete base adjacent to the new curb or curb and gutter. The cost of these tie bars will be paid for under the item DRILL AND GROUT DOWEL AND TIE BARS.

This work also includes curb painting at fire hydrants as directed by the Commissioner. Curb painting is to be in accordance with the applicable portions of Section 780 of the SSRBC. Curb paint color shall be "Safety Yellow." When directed by the Commissioner, the top and face of the curb is to be painted yellow for 15 feet each side of the fire hydrant, except where the 15 foot dimension intersects a crosswalk, driveway or similar feature. Glass beads are NOT required. Painting is to have neat straight edges along back of curb and vertically up the curb face.

Materials and Workmanship

Materials and workmanship must conform to the requirements of Section 606, "Concrete Gutter, Curb, Median and Paved Ditch," of the SSRBC for curb and gutter, and Section 424, “3,” of the SSRBC, and the current City of Chicago Department of Transportation ADA Standards for Concrete Curb, Type B.

Method of Measurement

No extra or customary measurement of any kind will be allowed. The curb and gutter will be measured in place as the lineal feet of curb and gutter or curb specified within the limits established by the Commissioner. No deductions will be made from the measured length of curb and gutter for light standards, inlets, catch basins, manholes or other similar structures.

Removal and disposal of existing appurtenances will be paid for under other applicable items.
All costs for epoxy coated tie bars drilled and grouted into existing base, as specified above, will be paid for as DRILL AND GROUT DOWEL/TIE BARS.

Basis of Payment

All payment for work under this section will be paid for at the contract unit price per FOOT for COMBINATION CONCRETE CURB AND GUTTER, TYPE B-V.12 and CONCRETE CURB, TYPE B.

ITEM NO. 58 ******** PORTLAND CEMENT CONCRETE SIDEWALK – 5-INCH

Description

Work under this item shall be performed according to Section 424 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Construction Requirements

This work shall be constructed according to current City of Chicago Department of Transportation ADA Standards. Construction of ADA ramps will be paid for separately.

Basis of Payment

This work will be paid for at the contract unit price per SQUARE FOOT for PORTLAND CEMENT CONCRETE SIDEWALK – 5-INCH.

ITEM NO. 59 ******** PORTLAND CEMENT CONCRETE ADA RAMP – 5-INCH

Description

Work under this item shall be performed according to Section 424 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Construction Requirements

This work shall be constructed according to current City of Chicago Department of Transportation ADA standards.

Method of Measurement

This work will be measured for payment in place in square feet. It will include the side curbs, side flares, level landing area, ramps and the sidewalk constructed between adjacent ramps within the corner radius.

Basis of Payment

This work will be paid for at the contract unit price per SQUARE FOOT for PORTLAND CEMENT CONCRETE ADA RAMP – 5-INCH. Detectable warning tiles required for this work will be paid for separately.

ITEM NO. 60 ******** PROTECTIVE CONCRETE COAT

Description

Work under this item shall be performed according to the applicable portions of Sections 420, 421, 483, 503 and 587 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

This work shall consist of providing and applying the protecting concrete sealer as directed by the Commissioner.

Materials

The use of linseed oil shall not be permitted. Material shall be in accordance with Section 1026 of the IDOT Standard Specifications for Road and Bridge Construction. The material shall not affect the appearance of the concrete.

General Requirements

Proposed material shall be submitted for approval by the Commissioner. No material application work shall be allowed without the approval of the Commissioner.

Construction Requirements

The material shall be applied according to the Manufacturer's specifications.

Basis of Payment

This work will be paid for at the contract unit price per SQUARE YARD for PROTECTIVE CONCRETE COAT.

ITEM NO. 61 ******** DETECTABLE ADA WARNING TILES, LINEAR

Description

Work under this item shall consist of installing cast iron detectable warning tiles on ADA curb ramps as shown on the plans and according to the latest Chicago Department of Transportation ADA Standards. Work shall be performed according to Section 424 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Materials

Detectable warning tiles shall be cast gray iron and shall be provided by a Manufacturer approved by the City of Chicago Department of Transportation. A list of approved Manufacturers of cast iron detectable warning tiles is available on the City of Chicago Department of Transportation website under Construction Guidelines/Standards.

The cast iron detectable warning tiles shall be of uniform quality, free from surface defects and shall be provided with an untreated, natural surface finish as directed by the Commissioner.
Construction Requirements

The detectable warning system shall be installed in fresh concrete and shall comply with the City of Chicago Department of Transportation Regulations for Openings, Construction and Repair in the Public Way, Appendix B, ADA Standards. The equipment and installation procedures shall be according to the Manufacturer's specifications.

The Contractor shall install the detectable warning system flush with adjacent concrete, and resulting in a snug fit between tiles to limit water infiltration around the perimeter of the system and between tiles, as directed by the Commissioner.

QC/QA Requirements

A Manufacturer's written certification that the material complies with these specifications shall be provided to the Commissioner.

Method of Measurement

This work will be measured for payment in place in square feet.

Basis of Payment

This work will be paid for at the contract unit price per SQUARE FOOT for DETECTABLE ADA WARNING TILES, LINEAR.

ITEM NO. 63 ******** HOT-MIX ASPHALT SURFACE COURSE, IL-9.5L, MIX "C", N30 (CDOT)

Effective: December 6, 2016
Revised: March 1, 2019

Description

Work under this item shall consist of constructing an IL-9.5L asphalt surface course. Work shall be according to the requirements for an IL-9.5L mixture per Sections 406 and 1030 of the IDOT Standard Specifications for Road and Bridge Construction (SSRBC), except as herein modified.

Materials

Coarse Aggregate

Coarse Aggregate shall meet the requirements of Article 1004.03 of the SSRBC except as herein modified. Aggregates shall be Class C quality or better Gravel, Crushed Gravel, Carbonate Crushed Stone, Crystalline Crushed Stone, or Recycled Crushed Concrete.

Fine Aggregate

Fine Aggregate shall meet the requirements of Article 1003.03 of the SSRBC except as herein modified. Gradation shall be FM01, FM02, FM20, or FM22. In addition, FM22 Recycled Crushed Concrete may be used if approved by the Engineer.

Reclaimed or Recycled Material

(a) Only processed FRAP and RAS will be permitted in the IL-9.5L mix. Reclaimed or recycled material shall be according to the current Special Provision for RECLAIMED ASPHALT PAVEMENT AND RECLAIMED ASPHALT SHINGLES (D-1).

(b) Recycled Crushed Concrete shall be produced in accordance with the requirements of the Aggregate Gradation Control System (AGCS). The source, quality control plan, and product shall be approved by the Engineer. Gradation will be FM22 or CM16

Mixture Design

1030.04(b) Volumetric Requirements. Revise the table in Article 1030.04(b)(2) to read:

VOLUMETRIC REQUIREMENTS Low ESAL				
Mixture Composition	Design Compactive Effort	Design Air Voids Target %	VMA (Void in the Mineral Aggregate), % min.	VFA (Voids Filled with Asphalt Binder), %
IL-9.5L	N_{DES}=30	3.0	15	65-78*

* If the maximum design VFA value is exceeded, but the Hamburg Wheel Test criteria has been met, the VFA will be considered acceptable.

Revise the first sentence of Article 1030.04(d) Verification Testing to read:

"Low ESAL mix designs submitted for verification will be tested to ensure that the resulting mix designs will pass the required criteria for the Hamburg Wheel Test (Illinois Modified AASHTO T 324). The Commissioner will perform a verification test on gyratory specimens compacted by the Contractor. If the mix fails the Commissioner's verification test, the Contractor shall make necessary changes to the mix and provide passing Hamburg Wheel and tensile strength test results from a private lab. The Commissioner will verify the passing results."

Replace Article 1030.04(d)(1) Hamburg Wheel Test Criteria with the following:

"The maximum allowable rut depth shall be 0.5 in. (12.5 mm). The minimum number of wheel passes at the 0.5 in. (12.5 mm) rut depth criteria shall be 10,000 passes. Test specimens shall be compacted to an air void content of 6.0% ± 1.0%"

Delete the table "Illinois Modified AASHTO T 324 Requirements", however, Note 1/ shall still apply to Hamburg specimens when a Warm Mix additive has been added to the mixture.

Mix Design Verification. The Commissioner will perform all mix design verification testing. Verification testing will be according to the D1 HMA Design Guidelines using the requirements for high ESAL mixtures but with the target values for each parameter according to the Hot-Mix Asphalt Surface Course, IL-9.5L, Mix "C", N30 requirements referenced in this special provision.

If a Warm Mix Additive is used, the Substitution of Warm Mix Asphalt for Hot Mix Asphalt (CDOT) special provision shall also apply. If an ABR value greater than 15% is utilized the use of a Warm Mix Asphalt additive will be required.

QC/QA Requirements

Shall be according to Article 1030.05, except the required density shall be according to the IDOT Bureau of Local Roads and Streets Special Provision, LR 1030, SPECIAL PROVISION FOR GROWTH CURVE, revised January 1, 2010, except as herein modified.

Revise the first sentence of the second paragraph of LR 1030 to read:

"The Contractor shall perform a growth curve at the beginning of placement of each type of mix for each lift on each day of placement, unless directed otherwise by the Commissioner."

Revise the first sentence of the fifth paragraph of LR 1030 to read:

"Daily core samples are not required, and shall only be taken when requested by the Commissioner."

Replace the last sentence of the sixth paragraph of LR 1030 with the following:

"An average nuclear gauge density results shall be based on all tests across the mat, including all confined longitudinal joint density tests, at each test location. Unconfined longitudinal density tests will be evaluated separately as detailed above. Each location shall consist of five tests across the mat including both longitudinal joint density tests, unless directed otherwise by the Commissioner."

Revise the first sentence of the seventh paragraph of LR 1030 to read:

"Quality Control density tests shall be performed at randomly selected locations within ¼ mile intervals per lift per lane."

Basis of Payment

Shall be according to Article 406.14, except as herein modified.

This work will be paid for at the contract unit price per TON (metric ton) for HOT-MIX ASPHALT SURFACE COURSE, IL-9.5L, MIX "C", N30 (CDOT).

ITEM NO. 65 ******** BITUMINOUS SPEED HUMPS

Description

Work under this item shall be performed according to Section 406 and 440 of the IDOT Standard Specifications for Road and Bridge Construction and the detail "Speed Hump, Local Streets" in the plans, except as herein modified. This work consists of providing all labor, materials and equipment for the placing of speed humps at the locations shown in the plans and/or as directed by the commissioner.

General Requirements

The Contractor shall obtain prior approval from the commissioner concerning the method of installation and scheduling for speed hump work. This work will be performed in coordination with the hot-mix surface course paving operations. Any deviation from the recommended procedure herein shall be approved by the Commissioner.

Material

Bituminous Materials (Tack Coat) and Hot-Mix Asphalt Surface Course, Mix "D", N70 in accordance to Section 403 of Standard Specifications for Road and Bridge Construction.
Installation Procedure

a) Placement of Hot-Mix Asphalt Surface course across full width of pavement.

b) Layout of speed hump locations by Contractor and approval by Commissioner.

c) Removal of three inch deep, twenty-four inch wide strip of existing hot-mix asphalt surface course along the perimeter of the speed hump:

i. Along gutter lines of each side of street over twelve foot width of speed hump.

ii. Across full width of pavement at the edges of the speed hump. The removal line across the pavement width shall be neat.

d) Clean dirt and loose material from limits of speed hump.

e) Apply BITUMINOUS MATERIALS (TACK COAT) over limits of speed hump area at a rate of .05 to .10 gallons/square yard or as directed by Commissioner in accordance with Article 406.05 of the Standard Specifications.

f) Place HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N70 to the dimensions and requirements of the plan detail "Speed Hump, Local Streets" and in accordance with Section 406 of the Standard Specifications.

g) Protect the speed hump against damage during the construction period. Speed humps damaged prior to opening to public traffic will be replaced at the Contractor's cost.

Method of Measurement

BITUMINOUS SPEED HUMPS will be measured for payment in square yards. Pavement marking for the speed humps shall be incidental to this item.

Basis of Payment

This work will be paid for at the contract unit price per SQUARE YARD for BITUMINOUS SPEED HUMPS including all work necessary to remove and dispose of existing pavement and to install the speed hump.

ITEM NO. 72 ******** PREFORMED THERMOPLASTIC PAVEMENT MARKING – GREEN

Description

This work shall consist of furnishing and installing Green Preformed Thermoplastic Pavement Markings (with and without Embedded White Symbols) in accordance with Article 1095.05 of the Standard Specifications, except as herein modified.

Material

(a) The pigment used for the green thermoplastic compound shall not contain any hazardous materials listed in the Environmental Protection Agency Code of Federal Regulations (CFR) 40, Article 261.23, Table 1. The combined total of RCRA listed heavy metals shall not exceed 100 ppm when tested by X-ray fluorescence spectroscopy. The pigments shall also be heat resistant, UV stable and color-fast. The pigment shall be uniformly distributed throughout the thermoplastic compound.

(b) The daytime chromaticity coordinates for green colored pavement markings shall meet the following chart.

X	0.230	0.266	0.367	0.444
Y	0.754	0.500	0.500	0.555

The daytime luminance factor (Y) shall be at least 7, but no more than 35.

(c) The nighttime chromaticity coordinates for green colored pavement markings shall meet the following chart.

X	0.230	0.266	0.367	0.444
Y	0.754	0.500	0.500	0.555

(d) The surface of the preformed thermoplastic markings shall provide a minimum skid resistance value of 60 BPM when tested according to ASTM E 303-74.

Method of Measurement

The Green Preformed Thermoplastic Pavement Markings (with and without Embedded white Symbols) shall be measured on a square foot basis.

Basis of Payment

PREFORMED THERMOPLASTIC PAVEMENT MARKING – GREEN shall be paid for at the contract unit price per SQUARE FOOT installed and accepted.

ITEM NO. 73 ******** CROSSWALK SURFACING SYSTEM

Description

This work shall consist of furnishing and installing a durable imprinted aggregate reinforced preformed thermoplastic pavement marking system (herein "System") that provides a textured, highly attractive and durable topical treatment to the surface of asphalt pavement.

Materials

PREFORMED THERMOPLASTIC MATERIAL: Must be composed of an ester modified rosin impervious to degradation by motor fuels, lubricants, etc. in conjunction with aggregates, pigments, binders, and anti-skid/anti-slip elements. Pigments and anti-skid/anti-slip elements must be uniformly distributed throughout the material. The material shall conform to AASHTO designation M249, with the exception of the relevant differences due to the material being supplied in a preformed state, being non-reflective, and potentially being of a color different from white or yellow.

1) Pigments:
    a) White: The material shall be manufactured with sufficient titanium dioxide pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected.

    b) Other Colors: The pigment system must not contain heavy metals nor any carcinogen, as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.

2) Skid Resistance: The surface of the material shall contain a minimum of thirty percent (30%) intermixed anti-skid/anti-slip elements. These anti-skid/anti-slip elements must have a minimum hardness of 6 (Mohs scale). Upon application the material shall provide a minimum skid resistance value of 60 BPN when tested according to ASTM E 303.

3) Slip Resistance: The surface of the material shall contain a minimum of thirty percent (30%) intermixed anti-skid/anti-slip elements. These anti-skid/anti-slip elements must have a minimum hardness of 6 (Mohs scale). Upon application the material shall provide a minimum static friction of coefficient of 0.6 when tested according to ASTM C 1028 (wet and dry), and a minimum static coefficient of friction of 0.6 when tested according to ASTM D 2047.

4) Thickness: The material must be supplied at a minimum thickness of 150 mil (3.8mm).

5) Environmental Resistance: The material must be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and impervious to oil and gasoline. The System must be able to be applied in temperatures down to 45ºF (7ºC) without any special storage, preheating, or treatment of the material before application.

6) Storage Life: The material may be stored for 12 months, if stored indoors and protected from the elements.

TRANSVERSE LINES TO SUPPLEMENT SYSTEM APPLICATION: Shall be white, retroreflective preformed thermoplastic line stripe material in 90 mil (2.3 mm) or 125 mil (3.2 mm) thicknesses in 12 in. (.30m) widths. This preformed thermoplastic material may be supplied and applied by the certified applicator in conjunction with the system.

STAMPING TEMPLATES: A wire rope template is required in the execution of the System. The template is used for imprinting the defined pattern once the preformed thermoplastic has been applied. The wire rope diameter for the imprinting template used for the specified pattern is 3/8 in. (9.5mm). The stamping templates shall be distributed by the System manufacturer.

HEATING EQUIPMENT: The System manufacturer shall distribute reciprocating infrared heating equipment designed specifically to elevate the temperature of the preformed thermoplastic material and asphalt pavement without adversely affecting it. The primary heating unit must employ a bank of propane-fired infrared heaters, mounted on a track device that allows the heater bank to reciprocate back and forth over a designated area, thereby allowing the operator to monitor the temperature of the preformed thermoplastic at all times during the pavement heating process.

1) A smaller, mobile infrared heater may be used to specifically to heat areas such as borders and narrow areas that are inaccessible to the primary heaters. This secondary heater also allows the operator to monitor the temperature of the preformed thermoplastic at all times during the heating process.

2) An approved hand-held propane heat torch shall be used to heat isolated areas of the preformed thermoplastic.

SEALER: A two-part epoxy sealer specified by the manufacturer of the preformed thermoplastic material must be applied to the substrate prior to thermoplastic material application to ensure proper adhesion, and to provide reinforcement for larger volumes of material.

AGGREGATE: Supplemental anti-skid/anti-slip elements to be applied to the surface of the molten thermoplastic as needed, if the factory applied anti-skid/anti-slip elements embed too deeply into the surface of the molten thermoplastic material during the heating process.

The System must be able to be applied to asphalt surfaces without preheating the application surface to a specific temperature.

The System shall utilize standard colors and patterns, as approved by the Commissioner.

The System must be resistant to the detrimental effects of motor fuels, antifreeze, lubricants, hydraulic fluids, etc.

Quality Assurance

The System manufacturer must be ISO 9001:2008 certified for design, development and manufacturing of preformed thermoplastic, and provide proof of current certification.

The System shall be supplied and applied only by an applicator certified by the System manufacturer. The applicator shall provide proof of current certification before commencing work. The Certified Applicator shall follow the System manufacturer's current published application procedures.

Technical services: The successful bidder shall provide technical services as required.

Warranty

Provide certification from the manufacturer that the imprinted texture, coating and coloring materials have a minimum five year warranty from Final Acceptance of the project.

Performance measures for the imprinted textures at the end of five years of the project: a) the imprint must maintain a depth of 50% of the original installed depth and width, b) the crosswalk should be uniform in color with no chips, spalling, or pieces of material missing. Original color values will be measured at the time of acceptance.

Submittals

Submit product data and cut sheets for all materials for approval from the Commissioner prior to ordering any material.

Submit installer qualifications and proof of current certification.

Shop Drawings

Prior to ordering any material, Contractor shall receive Commissioner approval on Contractor submitted shop drawings which show complete information for color, layout and installation.

Installation

Substrate condition: The System must only be applied to a stable, high quality asphalt pavement substrate over a stable base that is fre of defects, as per the manufacturer published Substrate Guide. The asphalt pavement surface shall be dry and free from all foreign matter, including but not limited to dirt, dust, de-icing materials, and chemical residue.

Procedure: The System must be applied to asphalt pavement using reciprocating infrared heating equipment. A two- part epoxy sealer specified by the manufacturer must be applied to the substrate prior to the preformed thermoplastic application. Immediately following sealer application, the panels of aggregate reinforced preformed thermoplastic are positioned properly on the asphalt substrate with the aggregate side facing up. The preformed thermoplastic is then heated to the required melting temperature. Additional aggregate may be applied to the preformed thermoplastic surface as needed following the melting process. As the material is cooling, it is imprinted with a stamping template made from 3/8 in. (9.5 mm) flexible wire rope in the specified design using a vibratory plate compactor. The preformed thermoplastic material is then allowed to cool thoroughly before being opened to vehicle or pedestrian traffic.

The System shall not be applied to Portland Cement Concrete.

Method of Measurement

The quantity to be paid will be the area in square feet of CROSSWALK SURFACING SYSTEM, measured in place, completed and accepted. No deduction will be made for the area(s) occupied by manholes, inlets, drainage structures, or by any public utility appurtenances within the area. Asphalt or concrete materials placed prior to treatment will be paid separately under the appropriate pay items. Milling or any other necessary surface preparation required for the placement of CROSSWALK SURFACING SYSTEM will be included in the cost of the CROSSWALK SURFACING SYSTEM.

Basis of Payment

This work will be paid for at the contract unit price per SQUARE FOOT for CROSSWALK SURFACING SYSTEM which price will include all labor, installation, equipment, materials and incidental work necessary to complete the work as specified.

ITEM NO. 74 ******** SODDING, SALT TOLERANT

Description

Work under this item includes all costs associated with preparing planting area, furnishing, and placing sod in accordance with the specifications herein.

This work shall be performed in accordance with Section 252 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Work Included

The Contractor must furnish and place sod and other materials required in the sodding operations at areas that have been disturbed during construction and on such areas as are shown on the Plans or ordered by the Commissioner.

The work includes preparing the planting surface; furnishing and placing topsoil, fertilizer nutrients, sod, sod watering and performing all necessary incidental work, to complete the work as specified, all of which various classes of work must be performed as herein specified.

Excavating, removing and disposing of existing topsoil or sod and underlying material for placement of new topsoil and sod will be paid for under the item "Earth Excavation."

Excavating, removing and disposing of existing topsoil or sod and underlying material shall be incidental.

Materials and Workmanship

The salt tolerant sod must be in accordance with Article 1081.03 of the SSRBC.

Prior to the placing of the sod, the planting area must be raked and graded and a minimum depth of four (4) inches of topsoil added evenly throughout the area to be sodded. The topsoil furnished as part of this item must consist of loose, friable, loamy, non-acid soil, rich in organic matter and free from clay or other objectionable matter.

Fertilizer nutrients must be furnished and incorporated in the soil as part of the ground preparation operations. Agricultural ground limestone will not be required in the work. Fertilizer nutrients shall be applied as specified in Article 252.03 of the SSRBC.

The sod must be compacted by tamping lightly so that it will become incorporated with the ground surface and insure tight joints between adjacent pieces. The sod must then be thoroughly saturated with water in accordance with Article 252.08 of the SSRBC. No supplemental watering is required.

When directed by the Commissioner, the Contractor must, at his own expense, replace all defective and unsatisfactory work.

Method of Measurement

This work will be measured for payment in place in square yards of sod within the limits shown on the

Plans or established by the Commissioner.

Basis of Payment

SODDING, SALT TOLERANT will be paid for at the contract unit price per SQUARE YARD, which price shall include all necessary material and labor to complete the work as specified, including topsoil, excavation, disposal of material, fertilizer nutrients and watering.

ITEM NO. 75 ******* TOP SOIL

Description

Work under this item shall be performed according to Section 211 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Construction Requirements

Soil mixture must be CDOT Planter Soil Blend

Work Included

The Contractor must furnish and place top soil and other materials required in the restoration operations at the traffic circle restoration and all areas that have been disturbed during construction and on such areas as are shown on the Plans or ordered by the Commissioner.

The work includes preparing surface; furnishing and placing topsoil, fertilizer nutrients, shredded hardwood bark mulch and performing all necessary incidental work, including removal, salvage, and reinstallation of existing road signs, to complete the work as specified.

Method of Measurement

This work will be measured for payment in place in square yards of topsoil within the limits shown on the Plans or established by the Commissioner.

Basis of Payment

TOP SOIL will be paid for at the contract unit price per SQUARE YARD, which price shall include all necessary material and labor to complete the work as specified, including topsoil, excavation, disposal of material, mulch, and grading.

CDOT2110040 PLANTER SOIL BLEND

Effective: October 1, 2012
Revised: August 15, 2013

Description

This work shall consist of furnishing and placing a mechanically pulverized and blended planter soil blend at locations shown on the plans or as directed by the Commissioner.

Materials

Materials shall be according to the following Articles of the IDOT Standard Specifications for Road and Bridge Construction except as modified herein:

	Article/Section
(a) Fine Aggregate (Note 1)……..	1003.06
(b) Topsoil…….	1081.05(a)

Note 1. The fine aggregate shall consist of natural sand.

General Requirements

The planter soil blend shall consist of two (2) parts pulverized topsoil and one (1) part fine aggregate (sand). The sand, in the amount required to produce an acceptable planter soil blend, shall be mechanically blended during the pulverization process. The planter soil blend shall be stored in stockpiles at the producer's or supplier's facility and be protected from erosion, absorption of excess water, and contamination at all times. Delivery to the job site shall only occur after the Commissioner has given final approval. Final approval of the planter soil blend shall be based on comparison testing performed by CDOT Quality Assurance (QA) on production samples split with Quality Control (QC).

QC/QA Requirements

QC results acceptable to the Commissioner will be required prior to authorizing QC/QA split comparison testing for final acceptance. If material in excess of the initial stockpile approved is necessary to complete the required work, new QC testing and QC/QA split comparison testing will be required for each subsequent stockpile.

Sampling

All sampling shall be from the planter soil blend production stockpile. The number of QC sampling locations required around the stockpile shall be according to the schedule shown below. The procedure shall be according to the method described by the "How to Sample" section of the "Quality Control Sampling of Sand and Rootzone Mixture Stockpiles" under the USGA website. This information can be found by following the link shown below. The "T" handled PVC sampling device specified in the procedure shall not be used; instead the sampling device shall consist of a metal shovel of sufficient size to obtain a representative sample from each sample location in one operation. The composite stockpile sample consisting of material from all sampling locations equally spaced around the stockpile shall be thoroughly remixed and quartered down to a testing sample size of one gallon ± 10%. Testing samples secured from the final quartering split shall be from the combination of opposite diagonal quarters within the final quartering step. QC is responsible for providing the final testing sample for all QA splits which shall consist of the two remaining diagonal quarters within the final quartering step. If the stockpile sampling scheduled does not provide enough material to provide a testing sample size of one gallon ± 10% for each required QC or QA split testing sample, multiple and equal number of samplings at each stockpile sampling location around the stockpile shall be increased until enough material is available to provide all the necessary testing samples in a minimum volume of one gallon ± 10% each.

http://www.usga.org/course_care/articles/construction/greens/Quality-Control-Sampling-of-Sand-and-Rootzone-Mixture-Stockpiles/

Stockpile Quantity (c.y.)	Stockpile Sampling Locations
< 200	3
≥ 200*	Quantity (c.y.) / 75

* The number of stockpile samplings shall be rounded up to the nearest whole number.

Testing

Mechanical and chemical analyses shall be performed on the planter soil blend sample and the results shall fall within the stated limits shown below.

Mechanical Analyses (Note 1)

Particle Size Analysis (AASHTO T88)	Minimum	Maximum
Clay content (< 0.002 mm)	0 %	28 %
Silt content (0.002 to 0.05 mm)	45 %	77 %
Sand content (0.05 to 2 mm)	25 %	33 %
Gravel content (>2 mm)	0 %	5 %
Organic Content (AASHTO T194)	5 %	10 %

Chemical Analyses

General Components (Note 2)	Minimum	Maximum
pH value	5.5	7.5
Cation Exchange Capacity (meq/100g)	15	N/A
Soluble salt (mmho/cm)	0	1.7

Sodium (ppm)	0	200
Sulfur (ppm)	10	40
Primary Nutrients		
Phosphorous (ppm)	30	40
Potassium (ppm)	90	240
Secondary Nutrients		
Magnesium (ppm)	60	1000
Calcium (ppm)	600	5500
Micronutrients (Note 3)	Minimum	Maximum
Zinc (ppm)	1	10
Manganese (ppm)	12	40
Boron (ppm)	1	4
Copper (ppm)	1	6
Iron (ppm)	15	200

Note 1. Mechanical analysis testing on the QA split comparison sample will be granted an additional 10% tolerance on the upper and lower limits for determining approval by the Commissioner.

Note 2. Any constituents added to the final blend in an attempt to bring one or more of the General Component ingredients within tolerance will not be allowed and will be cause for the immediate rejection of the planter soil blend material in its entirety.

Note 3. Micronutrient testing on the QA split comparison sample will be granted an additional 20% tolerance on the upper and lower limits for determining final approval by the Commissioner. Results outside the increased tolerance range will be subject to review and acceptance on a case by case basis as determined by the Commissioner.

Certifications

All testing shall be completed by laboratories approved to perform the testing detailed above. Laboratories conducting the chemical testing must be an active member with the Illinois Soil Testing Association (ISTA) and laboratories performing the mechanical testing must be currently accredited by AASHTO for the specified mechanical test methods. All laboratories must provide proof of qualifications prior to testing.

Submittals

QC mechanical and chemical analyses shall be compiled in a final report detailing the QC results, and shall be submitted by the General Contractor to the Commissioner for review a minimum of 60 days prior to the scheduled start of any plantings. The final report shall include the project number, project name, source of material, quantity of material represented by the test results, supplier of the material, one (1) quart planter soil blend sample in a sealed plastic bag, and the recommendations for chemically supplementing the soil to meet the nutrient requirements of the intended plantings.

Acceptance

Planter soil blend will be considered acceptable for use and incorporation into the project upon Commissioner's approval of the Planter Soil Blend submittal as required in the Submittal section, and Commissioner's approval of all QA split comparison testing per the requirements in the QC/QA Requirements section. Test results older than 6 months at the time of planting will not be accepted.

Placement

Prior to placing the planter soil blend, all final adjustments to any utility structures within the planters must be completed and accepted by the Commissioner. Planters shall be free of all trash and debris before placement begins. If geotechnical fabrics and/or drainage layers have been specified, the condition of these items shall be intact and free of holes, tears, or defects.

The planter soil blend shall be placed in two lifts. The first lift shall be 2/3 of the planter soil depth. After placing each lift, moisten the surface at a rate sufficient to hydraulically settle the soil. Allow the water to thoroughly percolate through the soil before placing the next lift. Planter soil blend improperly placed or found to be unacceptable to the Commissioner shall be removed and replaced with a planter soil blend in accordance with this specification at no cost to the City. The Contractor shall be responsible for repairing any damage caused during the removal and replacement operation, which includes, but is not limited to, plant material, irrigation system(s), water proofing membrane, adjacent sidewalk, curb and gutter, pavements, planters, etc.

Any areas disturbed by irrigation installation shall be restored to finish grade and raked smooth. The finished grade shall be within ± 0.10 foot of the design grade while allowing the necessary room for placement and mixing of soil supplements as required by the Commissioner.

All debris, litter, tire tracks, dirt, and unintended materials shall be removed, swept, or washed off of all landscape, hard median surfaces, and pavement on a daily basis. Equipment shall not be operated on the installed planter soil blend. Any planter soil blend deemed by the Commissioner to be compacted by equipment or other similar means shall be removed and replaced at no cost to the City.

ITEM NO. 76 ******** MANHOLES TO BE ADJUSTED

ITEM NO. 77 ******** VALVE VAULTS TO BE ADJUSTED

Description

This work shall be performed according to Section 602 of the Standard Specifications, except as herein modified.

This work shall consist of the adjustment of existing catch basins, manholes, inlets, valve vaults, City electric manholes, water meter vaults or Buffalo boxes or other structures. This work shall include the first two feet of masonry or other material required to be added, removed or rebuilt to bring the specified casting to the finished grade of the proposed improvement.

Materials

The Cement Factor shall be a minimum of 7.35 cwt. The mix shall be designed according to Section 3.0 of the IDOT QC/QA PCC Level III Technician Manual. High early strength concrete must achieve a minimum compressive strength of 3,500 psi within 3 days of placement.

The use of HMA for pavement patching is not allowed.
The use of HDPE plastic adjusting rings (602.02(l)) is not allowed.
The use of Recycled Rubber Adjusting rings (602.02(m)) is not allowed.

General Requirements

Under no circumstance will an adjustment not be completed in the same day as it is started.
Under no circumstance will any debris be left in the street overnight.

The Contractor must stage adjustment work so that the traffic flows in a safe manner. The Contractor must coordinate with MWRD prior to the adjustment of MWRD structures. Prior to starting construction, an inspection of all the existing structures, shall be made by the Commissioner and the Contractor to determine the amount of existing debris in these structures.

Basis of Payment

This work will be paid for at the contract unit price per EACH for MANHOLES TO BE ADJUSTED, or VALVE VAULTS TO BE ADJUSTED.

ITEM NO. 78 ******** CATCH BASINS TO BE CLEANED

ITEM NO. 79 ******** VALVE VAULTS TO BE CLEANED

Description

This work shall be performed according to Section 602 of the Standard Specifications, except as herein modified.

This work shall consist of cleaning existing catch basins, manholes, inlets, valve vaults, City electric manholes, water meter vaults or other structures. Any inlets, manholes and valve vaults within the limits of construction which is not to be adjusted shall be cleaned at the direction of the Commissioner. This work shall include the removal of any accumulations of silt, debris or foreign matter of any kind down to one foot below the invert of the outfall pipe. The cleaning shall be performed after the placing of the planting soil and sod is completed.

General Requirements

Under no circumstance will any debris be left in the street overnight. The Contractor must stage cleaning work so that the traffic flows in a safe manner. Prior to starting construction, an inspection of all the existing structures, shall be made by the Commissioner and the Contractor to determine the amount of existing debris in these structures.

Basis of Payment

This work will be paid for at the contract unit price per EACH for CATCH BASINS TO BE CLEANED and VALVE VAULTS TO BE CLEANED.

ITEM NO. 80 **********REMOVING MANHOLES

Description

When the removal of the existing structure is required and does not fall within the trench limits of the incidental removals as part of the installation of the new sewer, the contractor must remove structures as indicated on plans or as directed by the commissioner. Work under this item shall be performed according to Section 605 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

General Requirements

The work includes excavating, removing and disposing of material, both wet and dry; removing and disposing of pavements within the limits of excavation for structure removal; removing and disposing of any abandoned utilities, tracks or underground structures, except as otherwise specified herein; salvaging manhole frames, lids and covers; furnishing, placing and removing sheeting, bracing and timbering; formwork; pumping, fluming and removing water and sewage; backfilling with trench backfill; all work required to plug existing sewer lines to be abandoned and all necessary incidental work for the removal and backfill of the existing manhole.

The Contractor shall deliver all old frames and grates to the City at a facility designated by the Commissioner. A signed and dated receipt for the delivery of the old frames shall be given to the Commissioner.

Method of Measurement

Removal of manholes outside of the trench limits as indicated in the plans or as directed by the Commissioner will be measured per each.

All work associated with the salvage of the frames and lids shall be incidental to this item.

Basis of Payment

This work will be paid for at the contract unit price per EACH for REMOVING MANHOLES.

ITEM NO. 83 ******** TEMPORARY WATER MAIN SUPPORT STRUCTURE - TYPE III, 12" and Smaller

Description

This item includes all costs associated with providing and installing water main support structures in accordance with the specifications herein.

Work Included

The Contractor must provide and install and water main supports as shown on the Contract Plans or as ordered by the commissioner, where water mains cross the sewer trench. Water mains up to and including 12-inch diameter shall be supported using the Type III support structure. Water mains 16-inch diameter and larger main as shown on the Contract Plans shall be supported using a Type II support structure. The contractor must verify the location and elevation of the 16-inch diameter and larger main prior to submitting the shop drawings. The shop drawings must be submitted for approval and stamped by a registered P.E. in the State of Illinois.

The Contractor must provide and install the water main support detailed as shown on the Contract Plans. The support must be installed where the water main crosses the proposed sewer, in order to anchor the water main in place and prevent any movement during and after sewer construction. The Contractor must place the support structure prior to sewer excavation reaching the immediate area of the water mains in such a manner as to protect the water mains from damage.

The price to be paid under this item must cover the cost of all work specified, shown on the Contract Plans or ordered by the Commissioner to complete this item. Payment for the water main support structures will be paid for under this Item as required, INSTRUCTIONS AND EXECUTION DOCUMENTS, and this will be compensation for all related work as specified.

In the event that the Contractor proposes an alternate method of supporting the aforementioned water mains, the proposed method must be submitted for review and approval by the Commissioner, who will be the sole judge of the acceptability of the method proposed. Payment for the alternate method of support must not exceed the bid price for structure shown.

No additional payment, due to minor revisions to the support structure, because of changed conditions during construction will be made to the Contractor.

Method of Measurement

Water main support structures as required or as directed by the Commissioner will be measured for all work required for installing and leaving in place permanent water main supports or removing temporary water main supports, as detailed on the water main support drawings. Item must include all costs for equipment, labor, and materials for constructing water main support structures. The following items will be paid for at the contract unit price per unit per each.

Basis of Payment

This work shall be paid for at the contract unit price per EACH for TEMPORARY WATER MAIN SUPPORT STRUCTURE - TYPE III, 12" AND SMALLER.

ITEM NO. 84 ******** CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

Description

This item includes all costs associated with providing and installing controlled low strength material in accordance with the specifications herein.

Work Included

The Contractor must furnish and place CLSM for all watermain supports as directed by the Commissioner.

The work includes furnishing and placing grout, plugs, and all other incidental and collateral work necessary to fully complete the sewer grouting as specified.

The Contractor must also furnish and place plugs as shown on the plans or as directed by the Commissioner for sewers and drains of any size which are to be abandoned and are not filled with trench backfill.

The Contractor must also furnish and place CLSM for temporary water main support structures as shown on the details in the Contract plans.

Materials

Controlled Low Strength Material (CLSM) must be in accordance to the Standard Specifications for Road and Bridge Construction (SSRBC) Section 593, or as ordered by the Commissioner.

Measurement

No extra or customary measurement of any kind will be allowed in measuring the grout placed under this item. The number of cubic yards of grout and fractions thereof will be measured in place within the limits established by the Commissioner.

Method of Payment

All payment for Work under this section will be paid for at the contract unit price per CUBIC YARD for CONTROLLED LOW-STRENGTH MATERIAL (CLSM).

ITEM NO. 85 ****** WATER MAIN INSTALLED IN OPEN CUT - 6-INCH**

ITEM NO. 86 ****** WATER MAIN INSTALLED IN OPEN CUT - 8-INCH**

ITEM NO. 87 ****** WATER MAIN INSTALLED IN OPEN CUT - 12-INCH**

Work of the following Specification Sections are referenced under this Bid Item.

Section 111 – Pipe and Structure Excavation and Backfill
Section 112 – Pumping, Bailing and Diversion
WM Section 33 11 13 – Ductile Iron Pipe and Fittings.
WM Section 33 11 15 – Thrust Restraint for Water Main Piping.
WM Section 33 13 00 – Disinfection and Testing of Water Mains.

Method of Measurement

WATER MAIN INSTALLED IN OPEN CUT of the type specified will be measured per linear foot installed for the diameter specified, exclusive of footage included in other Bid Items, for work which includes:

a. Saw cutting to full depth of existing pavement.

b. Removal and disposal of existing surface features.

c. Trench excavation and disposal of spoils.

d. Furnishing, placing and removing excavation protection system.

e. Excavation dewatering.

f. Furnishing and installing ductile iron water main piping, fittings, gaskets, polyethylene encasement, thrust restraint, concrete thrust blocks and appurtenances.

g. Measurement for payment of furnishing and installing ductile iron water distribution pipe will be on a linear foot basis as determined by measurement along the centerline of the pipe in place. Payment will constitute full compensation for all Work necessary for installation of ductile iron water distribution pipe, saw cutting pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service distribution system, backfilling to pavement surface and compaction, cleaning, testing and all other specified work.

h. Installation and removal of temporary hydrants, including additional piping and fittings.

i. Furnishing, placing and compacting trench backfill and bedding.

j. Testing and disinfection of installed water mains as directed by the Water Quality Surveillance Section and in accordance with the requirements of SECTION 33 13 00.

k. Finish grading.

Basis of Payment

This work shall be paid for at the contract unit price per L I N E A R FOOT for WATER MAIN INSTALLED IN OPEN CUT - 6-INCH, WATER MAIN INSTALLED IN OPEN CUT - 8-INCH and WATER MAIN INSTALLED IN OPEN CUT - 12-INCH.

ITEM NO. 88 ****** CUT, CAP AND REPLACE EXISTING WATER MAIN FOR UTILITY INSTALLATION – 6 INCH**

ITEM NO. 89 ****** CUT, CAP AND REPLACE EXISTING WATER MAIN FOR UTILITY INSTALLATION – 8 INCH**

ITEM NO. 90 ****** CUT, CAP AND REPLACE EXISTING WATER MAIN FOR UTILITY INSTALLATION – 12 INCH**

ITEM NO. 91 ****** CUT, CAP AND REPLACE EXISTING WATER MAIN AND TEE FOR UTILITY INSTALLATION – 8 INCH**

ITEM NO. 92 ****** CUT, CAP AND REPLACE EXISTING WATER MAIN AND TEE FOR UTILITY INSTALLATION – 12 INCH**

Work of the following Specification Sections are referenced under this Bid Item.

a. Section 31 23 10 – Excavation, Trenching and Backfilling.

b. Section 31 23 19 – Dewatering Excavation.

c. Section 33 11 13 – Ductile Iron Pipe and Fittings.

d. Section 33 11 15 – Thrust Restraint for Water Main Piping.

e. Section 33 13 00 – Disinfection and Testing of Water Mains.

Method of Measurement

Cut, CAP AND REPLACE EXISTING WATER MAIN for utility installation of the type specified will be measured as each water main cut and capped for the diameter specified, for work which includes:

a Saw cutting to full pavement depth, removal and disposal of existing surface features.

b. Excavation and disposal of spoils.

c. Furnishing, placing and removing excavation protection system.

d. Dewatering excavations

e. Cutting, capping and bracing the existing pipe and removal of existing pipe and fittings before the utility installation.

f. Furnishing and installing water main piping, fittings, gaskets, polyethylene encasement, thrust restraint and appurtenances after the new utility is installed.

g. The following fittings of the type and size shown on the Drawings are included for WM Bid Items which include Cut, Cap and Replace existing Water Main for Utility Installation: two (2) D.I. MJ

Caps or MJ Plugs as required, two (2) D.I. MJ Reducers as required, and two (2) D.I. Transition Sleeves or MJ Sleeves as required.

h. The following fittings of the type and size shown on the Drawings are included for WM Bid Items which include Cut, Cap and Replace existing Water Main for Utility Installation: one (1) D.I. MJ Tee, three (3) D.I. MJ Caps, three (3) D.I. MJ Reducers, and three (3) D.I. Transition Sleeves or MJ Sleeves as required.

i. Water main pipe length included:

   i. Eighteen (18) feet or less used in reconnecting the existing water main

   ii. Where the water main pipe used in reconnecting the existing water main exceeds eighteen (18) feet the work will be measured under the applicable pay items

j. Furnishing, placing and compacting trench backfill and bedding.

k. Connecting of replacement pipe to the existing water main.

l. Testing and disinfection as directed by the Water Quality Surveillance Section and in accordance with the requirements of SECTION 33 13 00.

Basis of Payment

This work shall be paid for at the contract unit price per EACH for CUT, CAP AND REPLACE EXISTING WATER MAIN FOR UTILITY INSTALLATION – 6 INCH; CUT, CAP AND REPLACE EXISTING WATER MAIN FOR UTILITY INSTALLATION – 8 INCH; CUT, CAP AND REPLACE EXISTING WATER MAIN FOR UTILITY INSTALLATION – 12 INCH; CUT, CAP AND REPLACE EXISTING WATER MAIN AND TEE FOR UTILITY INSTALLATION – 8 INCH; and CUT, CAP AND REPLACE EXISTING WATER MAIN AND TEE FOR UTILITY INSTALLATION – 12 INCH.

ITEM NO. 93 ******** VALVE INSTALLATION – 8-INCH

Work of the following Specification Sections are referenced under this Bid Item.

Section 111 – Pipe and Structure Excavation and Backfill
Section 112 – Pumping, Bailing and Diversion
WM Section 33 11 13 – Ductile Iron Pipe and Fittings.
WM Section 33 11 15 – Thrust Restraint for Water Main Piping.
WM Section 33 12 16 – Water Main Control Valves.
WM Section 33 12 20 – Water Main Valve Basins and Meter Vaults
WM Section 33 13 00 – Hydrostatic Testing and Disinfecting Water Mains.

Method of Measurement

Measurement for payment to furnish and install valves, which size as dimensioned on the plans, will be on a per EACH basis. Payment will be based upon actual quantity, of each valve furnished and installed, in accordance with the requirements of the Contract Documents. Payment will constitute full compensation for all work necessary to install the valves, including, but not limited to, the purchase, delivery to the work site, on-site storage, delivery to the work areas, surface preparation, placement and cleanup.

VALVE INSTALLATION will be measured per EACH installed valve, for work which includes:

a) Saw cutting to full pavement depth or surface features.

b) Removal and disposal of existing surface features including, but not limited to, asphalt or concrete pavement/reinforced pavement, curb and gutter, pavers to be discarded, landscaping, sidewalk or any other flatwork encountered.

c) Furnishing, placing and removing excavation protection systems.

d) Dewatering excavations.

e) Furnishing and installing valve, two (2) 1-Inch test taps (for valves less than or equal to 12 inches in size), two (2) 2-Inch test taps (for valves 16-inches and larger) gaskets, polyethylene encasement, thrust restraint and appurtenances. Refer to DWM Water Section Detail D-13.

f) Furnishing and installing valve basin, frame and lid.

g) Furnishing, placing and compacting trench backfill and bedding.

Basis of Payment

This work shall be paid for at the contract unit price per EACH for VALVE INSTALLATION – 8-INCH.

DIVISION III

APPENDICES

APPENDIX I
CITY OF CHICAGO DEPARTMENT OF TRANSPORTATION STANDARD DETAILS

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APPENDIX A
CITY OF CHICAGO SPECIAL GUIDELINES
STANDARD CONSTRUCTION DETAILS
Table of Contents

SHEET#	SHEET NAME
A-1-1	Standard New Street Construction Section
A-1-2	Standard Alley Section
A-1-3	Intersection Crosswalk Layout
A-2-1A to 1N	Street Cuts and Asphalt Restoration Requirements
A-2-2A	Street Pavement Restoration Detail with Trench Backfill
A-2-2B	Street Pavement Restoration Detail with Flowable Fill
A-2-2C	Pavement Patching and Portland Cement Concrete Replacement
A-2-2D	Parkway Restoration Detail
A-2-3A	Typical Joint Layout for P.C. Concrete Pavements
A-2-3B	P.C.C. Pavement Joint Details
A-2-3C	P.C.C. Base Course Joint Details
A-2-3D	Proposed 10” Bus Pad Pavement
A-2-3E	Proposed Bus Pad Pavement and Traffic Control Layout
A-2-3F	Contraction Joint Assembly for Bus Pad
A-2-4	Pavement Widening Adjacent to New Construction
A-2-5	Street Widening for Diagonal Parking
A-2-6	Concrete Curb & Gutter Detail
A-2-7	P.C.C. Alley Pavement Restoration Pipe or Conduit Trench Detail, Concrete Alley
A-2-8	Asphalt Alley Pavement Restoration Pipe or Conduit Trench Detail
A-2-9	Portland Cement Concrete Alley
A-2-10A	Details of Structure Casting Isolation Box
A-2-10B	Details of Structure Casting Isolation Box for P.C.C. Pavement and Base Course
A-2-11	Catch Basin Adjustment in Existing Pavement
A-2-12	Frame Adjustment in Pavement
A-3-1	ADA Compliant Sidewalk Construction Details
A-3-2	Details of Portland Cement Concrete Construction
A-3-3 to 3A	Elimination of Vaulted Sidewalk Adjacent to Building

APPENDIX A: CITY OF CHICAGO SPECIAL GUIDELINES STANDARD CONSTRUCTION DETAILS

Table of Contents

SHEET#	SHEET NAME
A-4-1	Sewer Construction and Stormwater Management Requirements
A-5-1	Tree Planting Detail in Parkway
A-5-2 to 2C	Tree Pit Detail
A-5-3	Trench Guidelines for Installation of Underground Utilities Adjacent to Trees
A-5-4A	Bus Shelter 3 Section-Full Size New Installation
A-5-4B	Bus Shelter 3 Section-1 Glass Panel Removed New Installation
A-5-4C	Bus Shelter 2 Section-Full Size New Installation
A-5-4D	Bus Shelter 3 Section-Narrow Size New Installation
A-6-1A to 1B	Component Parts of a Temporary Traffic Control Zone
A-6-2	Typical Construction Sign & Placement Detail
A-7-1A to 1B	Crosswalk Marking Detail
A-7-2	6’ Bike Symbol
A-7-3	8’ Bike Symbol
A-7-4	Bike Arrow
A-7-5	Bike Turn Arrow
A-7-6	Bike Chevron
A-7-7	Shared Lane Marking Chevron Right Leg Detail
A-7-8	Shared Lane Marking Lateral Positioning
A-7-9	Shared Lane Yield to Bikes Sign
A-7-10	Bike and Arrow Symbol Spacing
A-7-11	Shared Lane Marking
A-7-12	Shared Lane Marking – Longitudinal Spacing

CHICAGO DEPARTMENT OF TRANSPORTATION

CITY OF CHICAGO

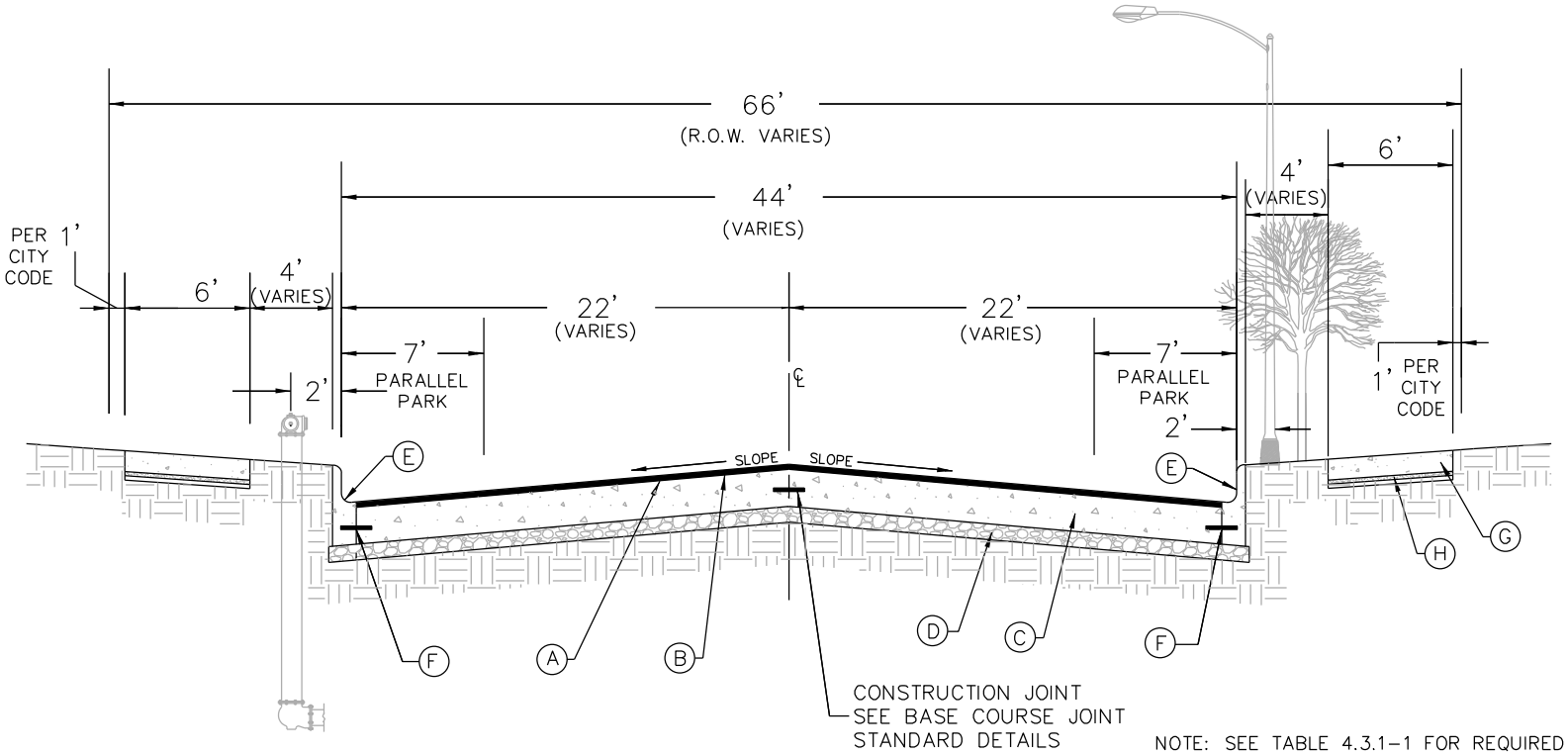
STANDARD NEW STREET CONSTRUCTION SECTION

REVISION	DATE
REVISION 1	1/1/2014
REVISION 2	1/27/2016

DATE 12/22/06

DRAWN BY CDOT

SHEET A-1-1



NOTE: SEE TABLE 4.3.1-1 FOR REQUIRED THICKNESS OF MATERIALS FOR ASPHALT PAVEMENTS AND CONCRETE PAVEMENTS.

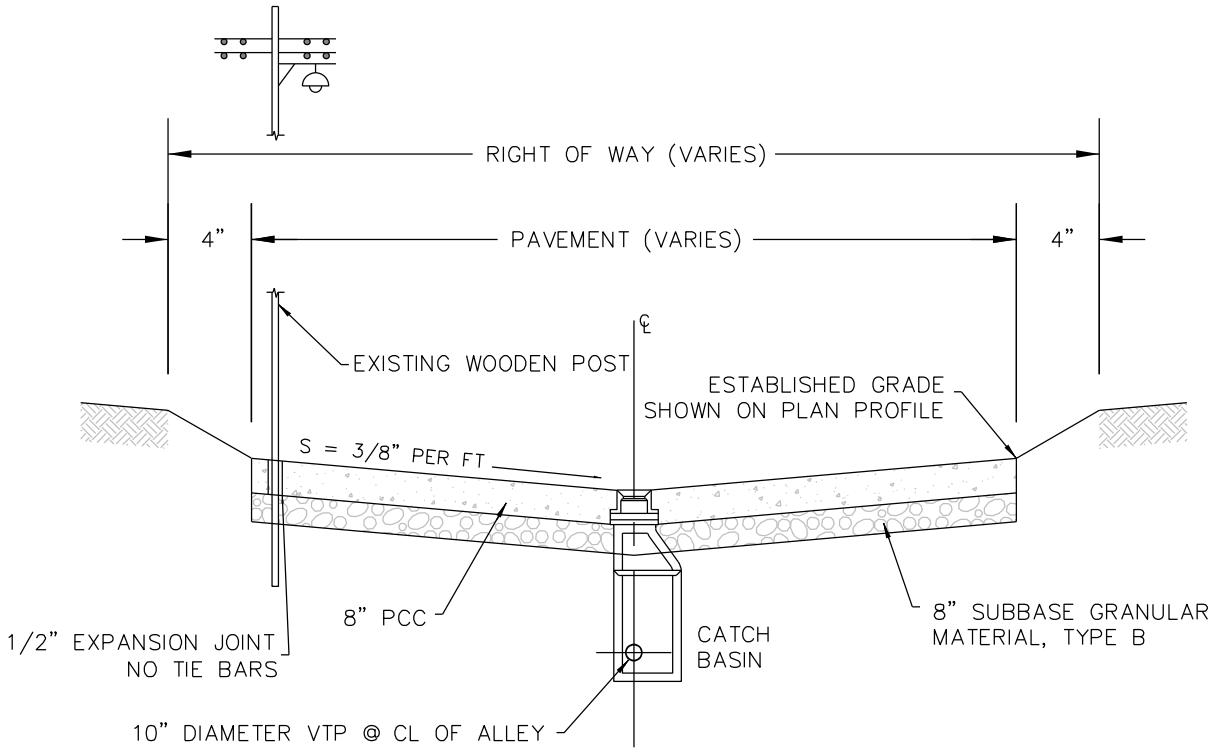
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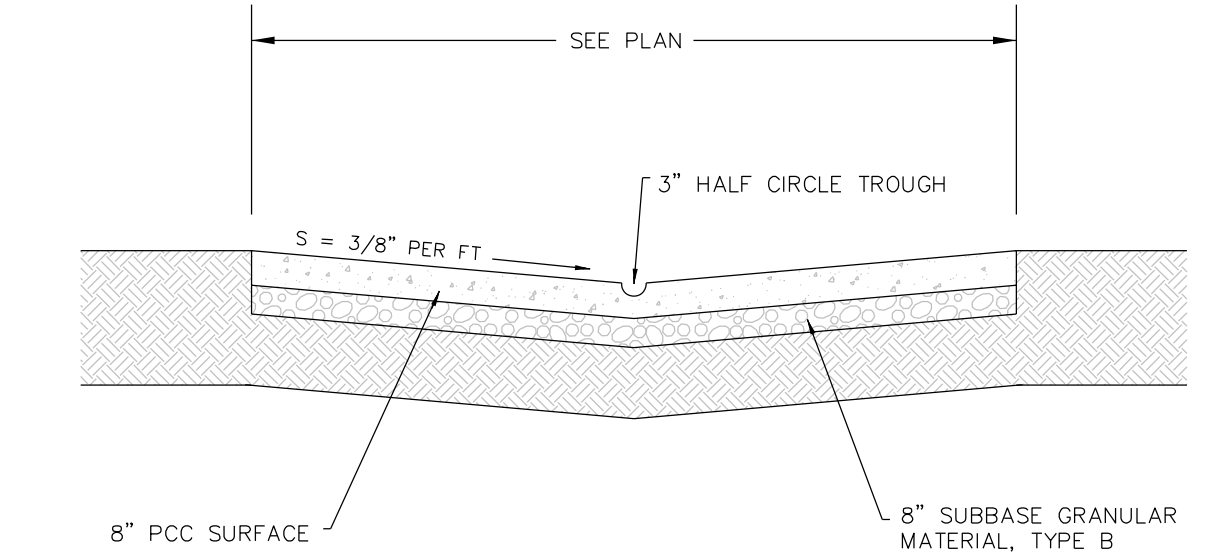
TYPE OF STREETS	FRONTAGE	MIN. R.O.W.	ROADWAY	PAVEMENT
LOCAL STREETS	RESIDENTIAL	66'	34'	32'
COLLECTOR STREETS	RESIDENTIAL PARKS	66'	38'	36'
	INDUSTRIAL COMMERCIAL	66'	44'	42'
SECONDARY ARTERIALS	RESIDENTIAL PARKS	66'	42' (TW 50')	40' (TW 48')
	INDUSTRIAL COMMERCIAL	66'	44' (TW 50')	42' (TW 48')
PRIMARY ARTERIALS (MINIMUM R.O.W. DESIGN)	ALL	100'	2 @ 33' (14' MEDIAN)	2 @ 31'
PRIMARY ARTERIALS (PREFERRED DESIGN)	ALL	108'	2 @ 36'	2 @ 34'

LEGEND:

- (A) HOT MIX ASPHALT SURFACE AND BINDER COURSE
- (B) BITUMINOUS MATERIAL & AGGREGATE (PRIME COAT)
- (C) P.C. CONCRETE BASE COURSE
- (D) SUBBASE GRANULAR MATERIAL, TYPE B, 6"
- (E) CURB AND GUTTER (SEE A-2-6)
- (F) TIE BAR
- (G) 5" P.C.C. SIDEWALK * (SEE A-3-1)
- (H) SUBBASE GRANULAR MATERIAL, TYPE B OR C, 4"

* CURB RAMP & KEYSTONE 8" P.C.C. AT SIGNALIZED AND INDUSTRIAL STREET INTERSECTIONS





CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	STANDARD ALLEY SECTION		
		DATE	SHEET	DRAWN BY
		12/12/06	A-1-2	CDOT

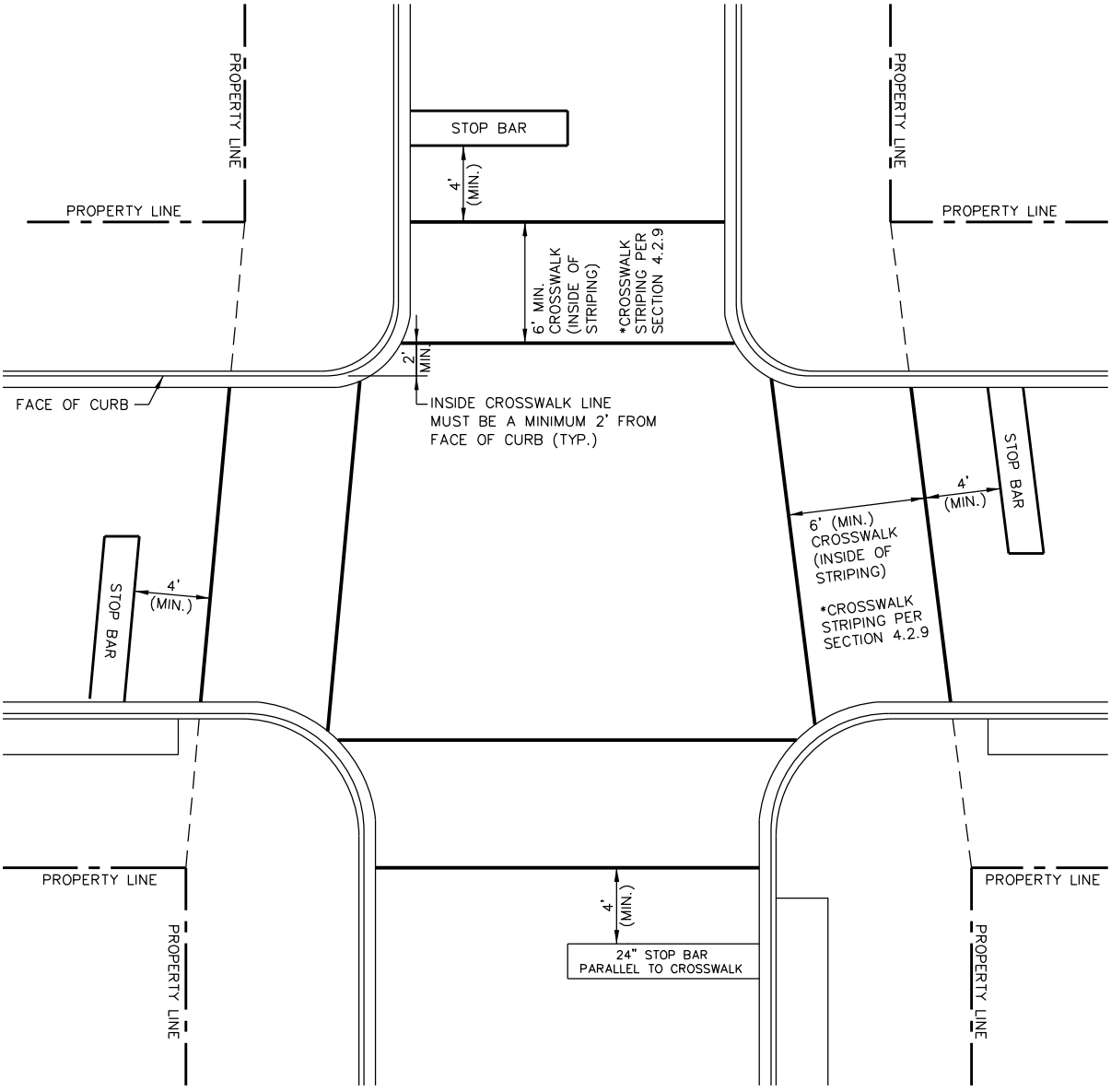
NOTES:

TYPICAL CROSSWALK CONSISTS OF TWO PROJECTED LINES, ONE OF THEM A PROJECTION OF THE PROPERTY LINE AND THE OTHER PARALLEL AS DEFINED BY SIDEWALK WIDTH.

WHERE CROSSWALK LOCATIONS ARE DEFINED BY SPECIFIC CURB RAMP SITUATIONS, THE ABOVE TYPICAL LAYOUT MAY NOT APPLY. SEE CURB RAMP LAYOUTS IN APPENDIX B FOR ADDITIONAL CROSSWALK DETAILS.

FOR CROSSWALKS AT INTERSECTIONS WHERE PROPERTY LINES ARE NOT AT 90 DEGREES, ALIGN THE PROPERTY LINES (SEE DASHED LINE BELOW) TO LOCATE INNER CROSSWALK LINE.

SEE SECTION 4.2.9 AND SHEET A-7-1 FOR GUIDELINES REGARDING THE LAYOUT OF CONTINENTAL AND LADDER MARKINGS.



CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	INTERSECTION CROSSWALK LAYOUT		
		DATE	SHEET	DRAWN BY
		01/10/07	A-1-3	CDOT

SCENARIO

ASPHALT RESTORATION LIMITS ARE SHOWN ONLY FOR EACH OF THE FOLLOWING SCENARIOS:

(1) 1/4 POINT LONGITUDINAL ASPHALT RESTORATION.

(2) FULL WIDTH LATERAL ASPHALT RESTORATION.

(3) ASPHALT RESTORATION TO FLOW LINE.

NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.

LEGEND

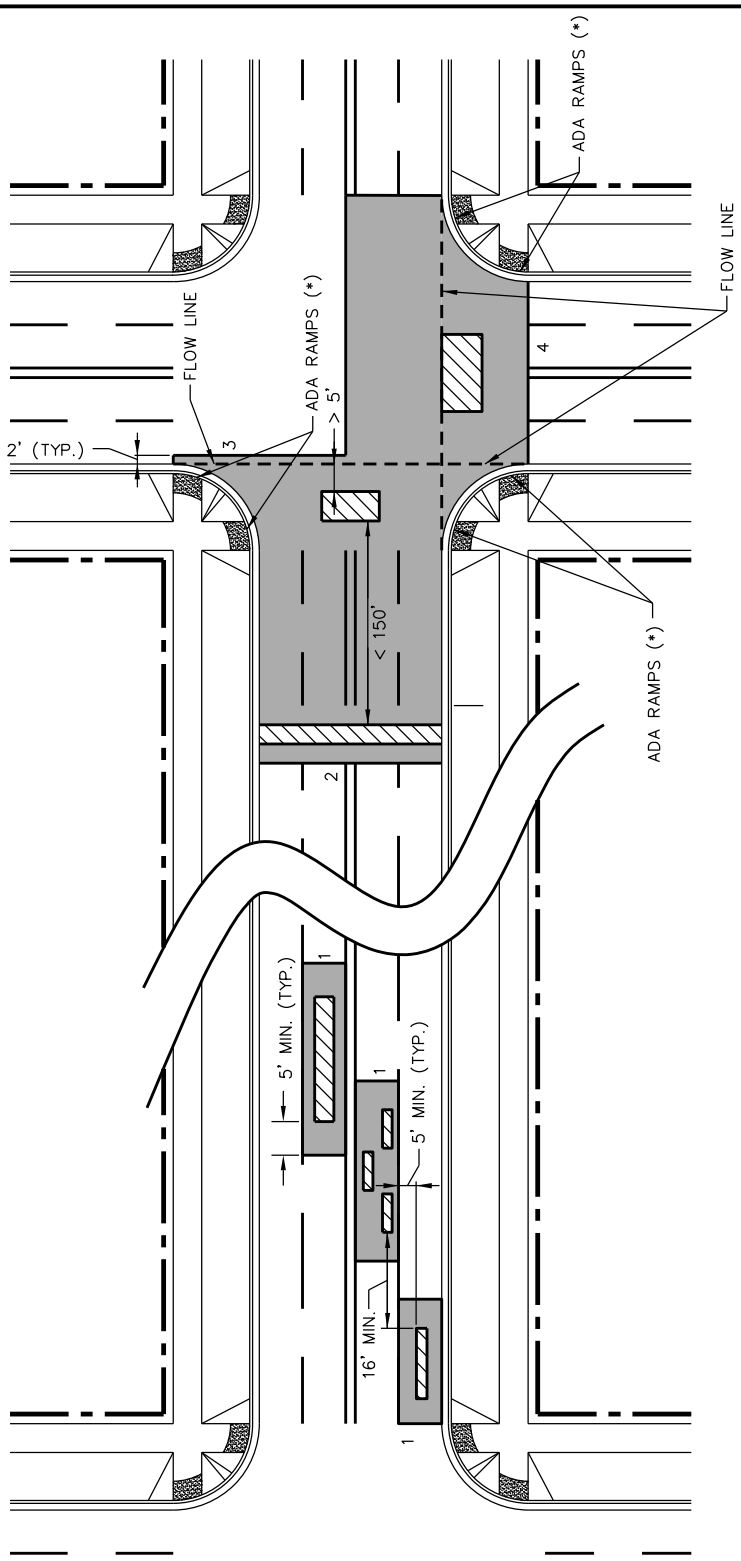
UTILITY TRENCH OR UTILITY\STREET CUT WITHIN THIS ZONE

CITY STANDARD FOR ASPHALT RESTORATION

*** FOR ADA REQUIREMENTS FOR SIDEWALKS AND SIDEWALK RAMPS, SEE APPENDIX B. THESE RAMPS SHALL BE RESTORED IF NONCOMPLIANT.**

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS		
1/1/2016	REVISION 2			
		DATE	SHEET	DRAWN BY
		01/03/07	A-2-1A	CDOT



SCENARIO

ASPHALT RESTORATION LIMITS ARE SHOWN ONLY FOR EACH OF THE FOLLOWING SCENARIOS:

(1) 1/4 POINT LONGITUDINAL ASPHALT RESTORATION.

(2) FULL WIDTH LATERAL ASPHALT RESTORATION.

(3) ASPHALT RESTORATION TO FLOW LINE.

(4) ½ POINT ASPHALT RESTORATION.

NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.

LEGEND

UTILITY TRENCH OR UTILITY\STREET CUT WITHIN THIS ZONE

CITY STANDARD FOR ASPHALT RESTORATION

*** FOR ADA REQUIREMENTS FOR SIDEWALKS AND SIDEWALK RAMPS, SEE APPENDIX B. THESE RAMPS SHALL BE RESTORED IF NONCOMPLIANT.**

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS		
1/1/2016	REVISION 2			
		DATE	SHEET	DRAWN BY
		01/03/07	A-2-1B	CDOT

SCENARIO

ASPHALT RESTORATION LIMITS ARE SHOWN ONLY FOR EACH OF THE FOLLOWING SCENARIOS:

(1) 1/4 POINT LONGITUDINAL ASPHALT RESTORATION.

(2) 1/2 POINT LONGITUDINAL ASPHALT RESTORATION.

(3) 1/2 POINT LATERAL ASPHALT RESTORATION.

(4) FULL-WIDTH ASPHALT RESTORATION.

NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.

LEGEND

UTILITY TRENCH OR UTILITY\STREET CUT WITHIN THIS ZONE

CITY STANDARD FOR ASPHALT RESTORATION

*** IF ASPHALT RESTORATION LIMIT IS LESS THAN 4' FROM THE CROSSWALK, THEN THE REPLACEMENT OF THE ADA RAMPS IS REQUIRED (IF NONCOMPLIANT).**

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION
1/1/2014	REVISION 1
1/1/2016	REVISION 2

CITY OF CHICAGO

STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS

DATE	SHEET	DRAWN BY
01/03/07	A-2-1C	CDOT

CHICAGO DEPARTMENT OF TRANSPORTATION

CDOT

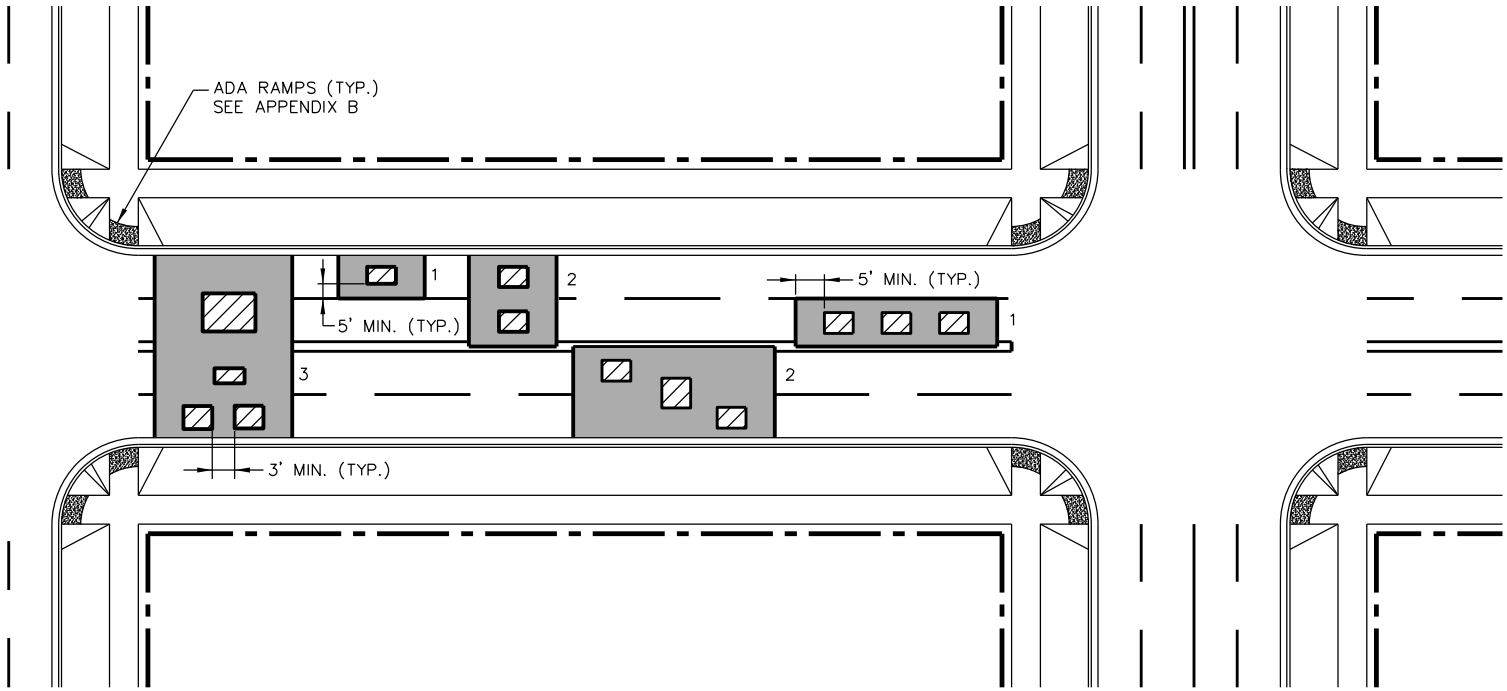
CITY OF CHICAGO

STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS

DATE	REVISION	DATE
1/1/2016	REVISION 1	1/1/14

SHEET A-2-1D

DRAWN BY CDOT



LEGEND

UTILITY TRENCH OR UTILITY\STREET CUT WITHIN THIS ZONE

CITY STANDARD FOR ASPHALT RESTORATION

* **IF ASPHALT RESTORATION LIMIT IS LESS THAN 4' FROM THE CROSSWALK, THEN THE REPLACEMENT OF THE ADA RAMPS IS REQUIRED (IF NONCOMPLIANT).**

SCENARIO

ASPHALT RESTORATION LIMITS ARE SHOWN ONLY FOR EACH OF THE FOLLOWING SCENARIOS:

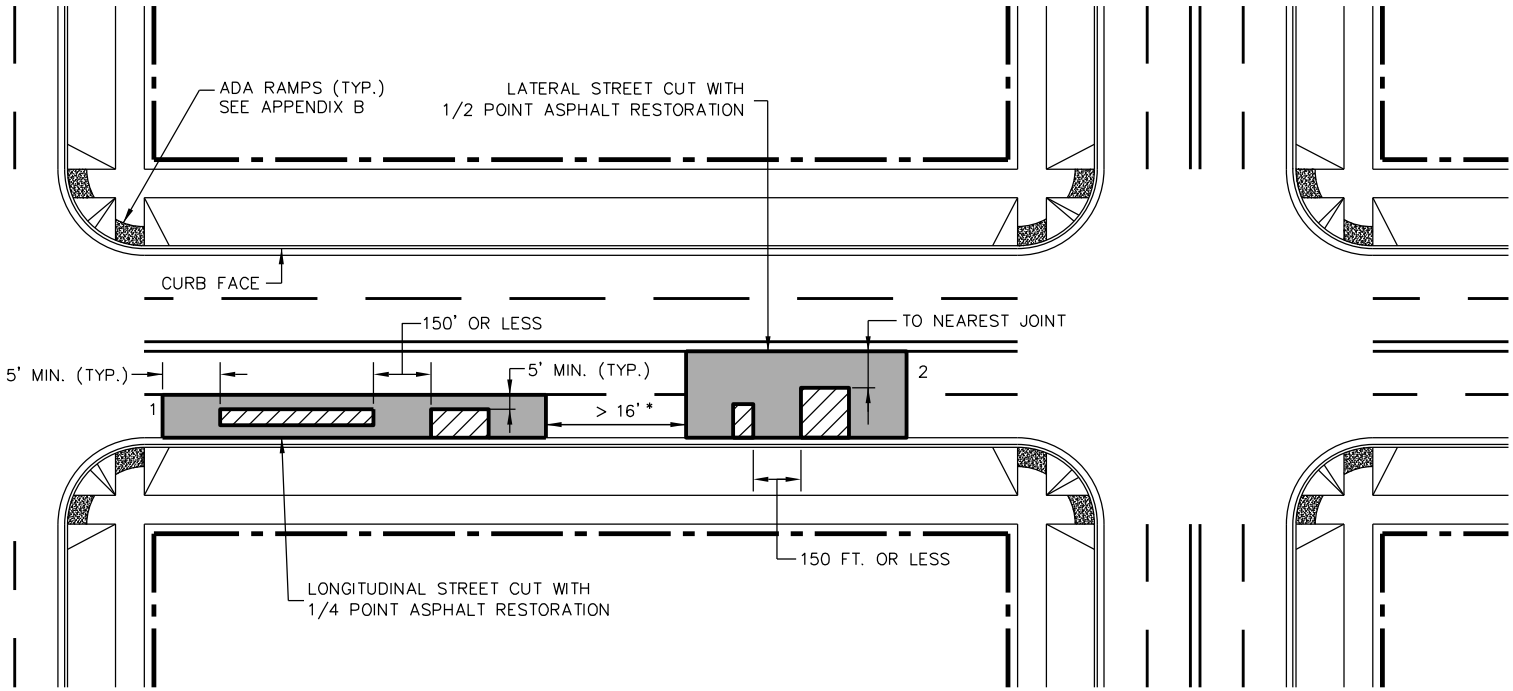
(1) 1/4 POINT LONGITUDINAL ASPHALT RESTORATION.

(2) 1/2 POINT LONGITUDINAL ASPHALT RESTORATION.

(3) FULL-WIDTH ASPHALT RESTORATION.

NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.

STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS
(2 OR MORE OPENINGS, WITHIN 2 YEARS & 150 FT.)



LEGEND

UTILITY TRENCH OR UTILITY\STREET CUT WITHIN THIS ZONE

CITY STANDARD FOR ASPHALT RESTORATION

*** IF ASPHALT RESTORATION LIMITS OF ONE CONTRACTOR ARE WITHIN 16' OF THE LIMITS PREVIOUSLY PAVED BY ANOTHER CONTRACTOR, THEN THAT CONTRACTOR SHALL EXTEND THE ASPHALT RESTORATION TO THE EXISTING LIMITS.**

SCENARIO

ASPHALT RESTORATION LIMITS ARE SHOWN ONLY FOR EACH OF THE FOLLOWING SCENARIOS:

(1) 1/4 POINT LONGITUDINAL ASPHALT RESTORATION.

(2) 1/2 POINT LONGITUDINAL ASPHALT RESTORATION.

NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION
3/26/2012	REVISION 1
6/22/2012	REVISION 2
1/1/2014	REVISION 3
1/1/2016	REVISION 4

CITY OF CHICAGO

STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS

DATE	DRAWN BY
01/04/07	CDOT

SHEET A-2-1E

CHICAGO DEPARTMENT OF TRANSPORTATION

CDOT

CITY OF CHICAGO

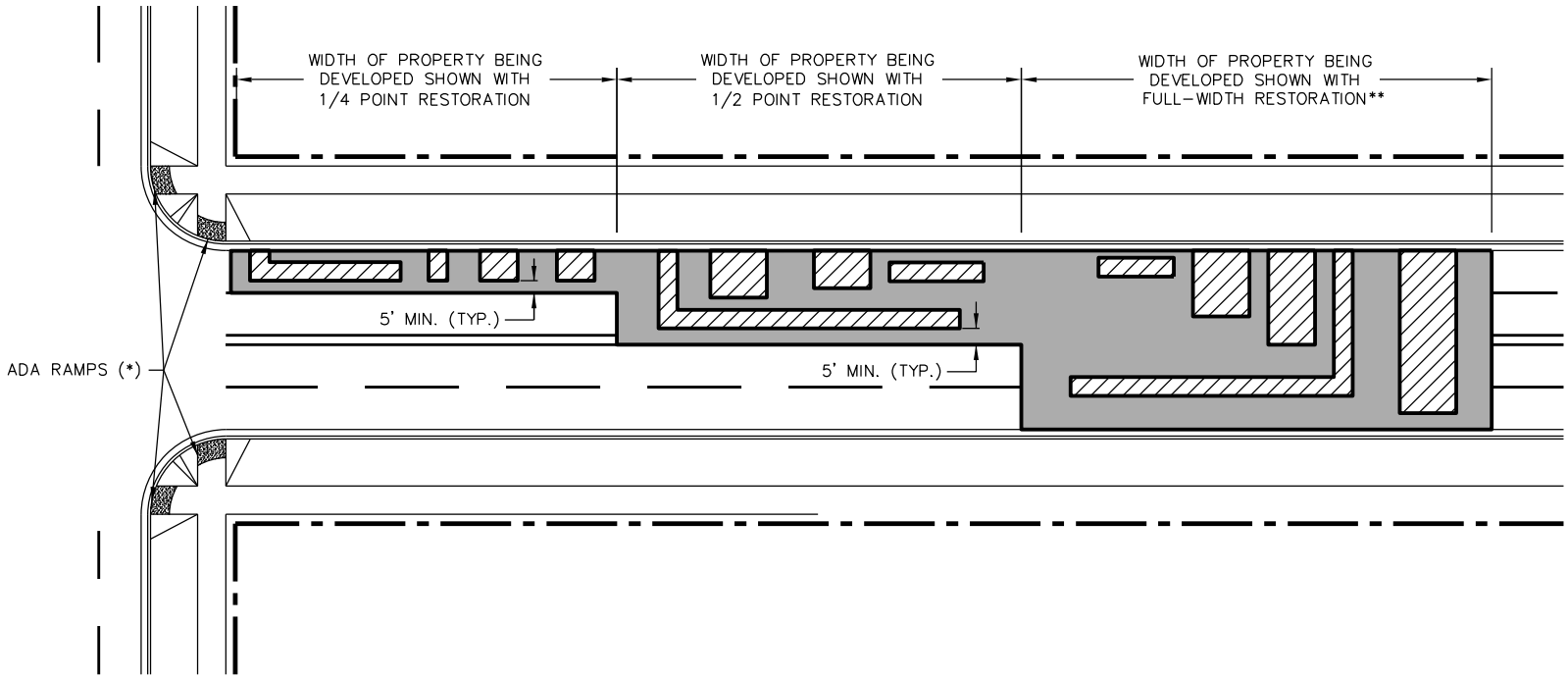
STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS

DATE	REVISION
1/1/2014	REVISION 1
1/1/2016	REVISION 2

DATE 01/05/07

SHEET A-2-1F

DRAWN BY CDOT



LEGEND

UTILITY TRENCH OR UTILITY\STREET CUT WITHIN THIS ZONE

CITY STANDARD FOR ASPHALT RESTORATION

* **FOR ADA REQUIREMENTS FOR SIDEWALKS AND SIDEWALK RAMPS, SEE APPENDIX B. THESE RAMPS SHALL BE RESTORED IF NONCOMPLIANT.**

** **FOR BIDDING PURPOSES, A DEVELOPER SHOULD ASSUME, AT MINIMUM, CURB-TO-CURB RESTORATION AT A LIMIT BEYOND THE PROPERTY LIMITS.**

NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.

CHICAGO DEPARTMENT OF TRANSPORTATION

CITY OF CHICAGO

STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS

DATE	REVISION
1/1/2016	REVISION 1

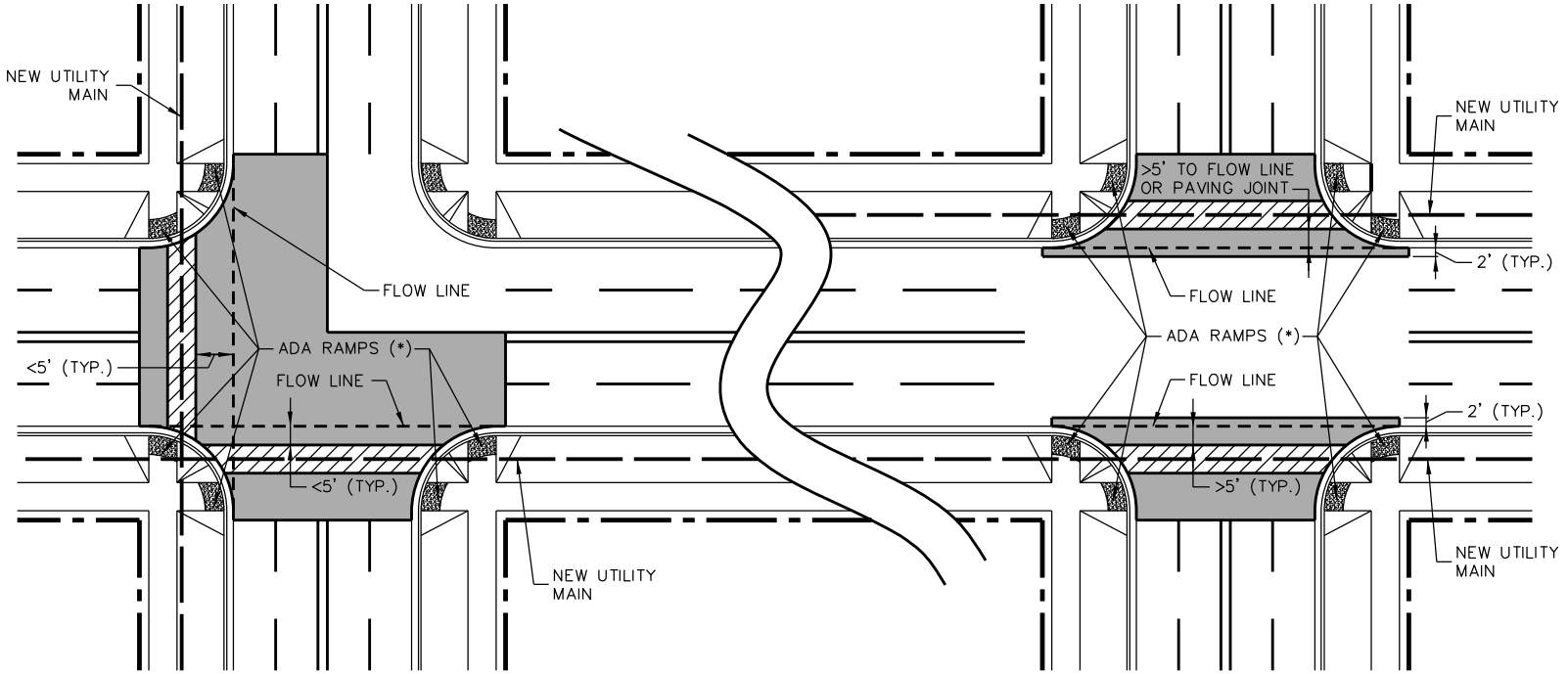
DATE 1/1/14

SHEET A-2-1G

DRAWN BY CDOT

TWO UTILITY CUTS 5' OR LESS FROM FLOW LINE

TWO UTILITY CUTS 5' OR GREATER FROM FLOW LINE



LEGEND

UTILITY TRENCH OR UTILITY\STREET CUT WITHIN THIS ZONE

CITY STANDARD FOR ASPHALT RESTORATION

*** FOR ADA REQUIREMENTS FOR SIDEWALKS AND SIDEWALK RAMPS, SEE APPENDIX B. THESE RAMPS SHALL BE RESTORED IF NONCOMPLIANT.**

NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.

CHICAGO DEPARTMENT OF TRANSPORTATION

CDOT

CITY OF CHICAGO

STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS

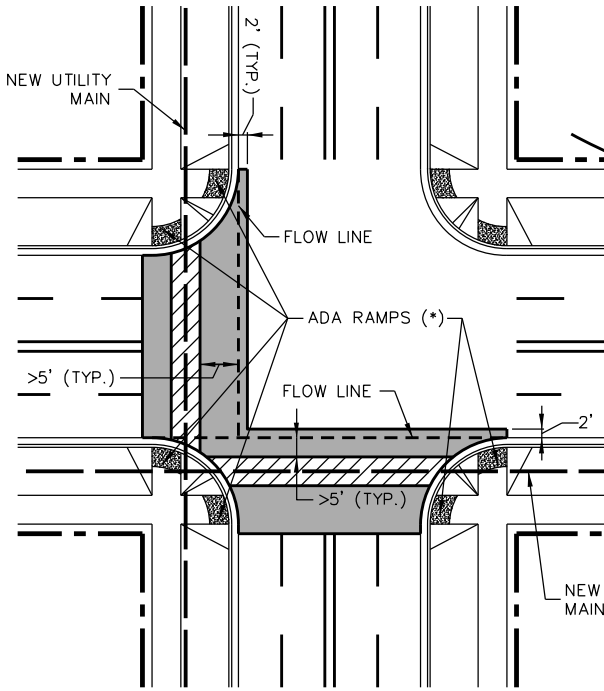
DATE	REVISION
1/1/2016	REVISION 1

DATE 1/1/14

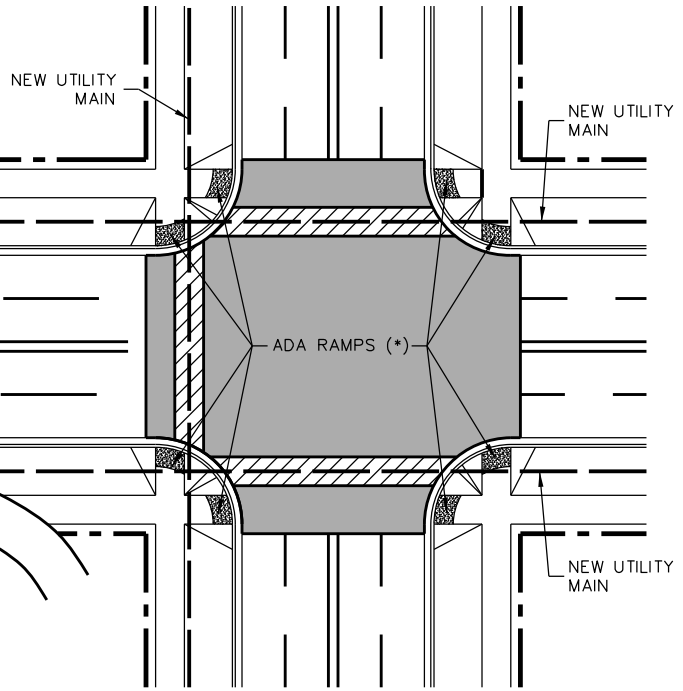
SHEET A-2-1H

DRAWN BY CDOT

TWO UTILITY CUTS 5' OR GREATER FROM FLOW LINE



THREE UTILITY CUTS – FULL INTERSECTION RESTORATION



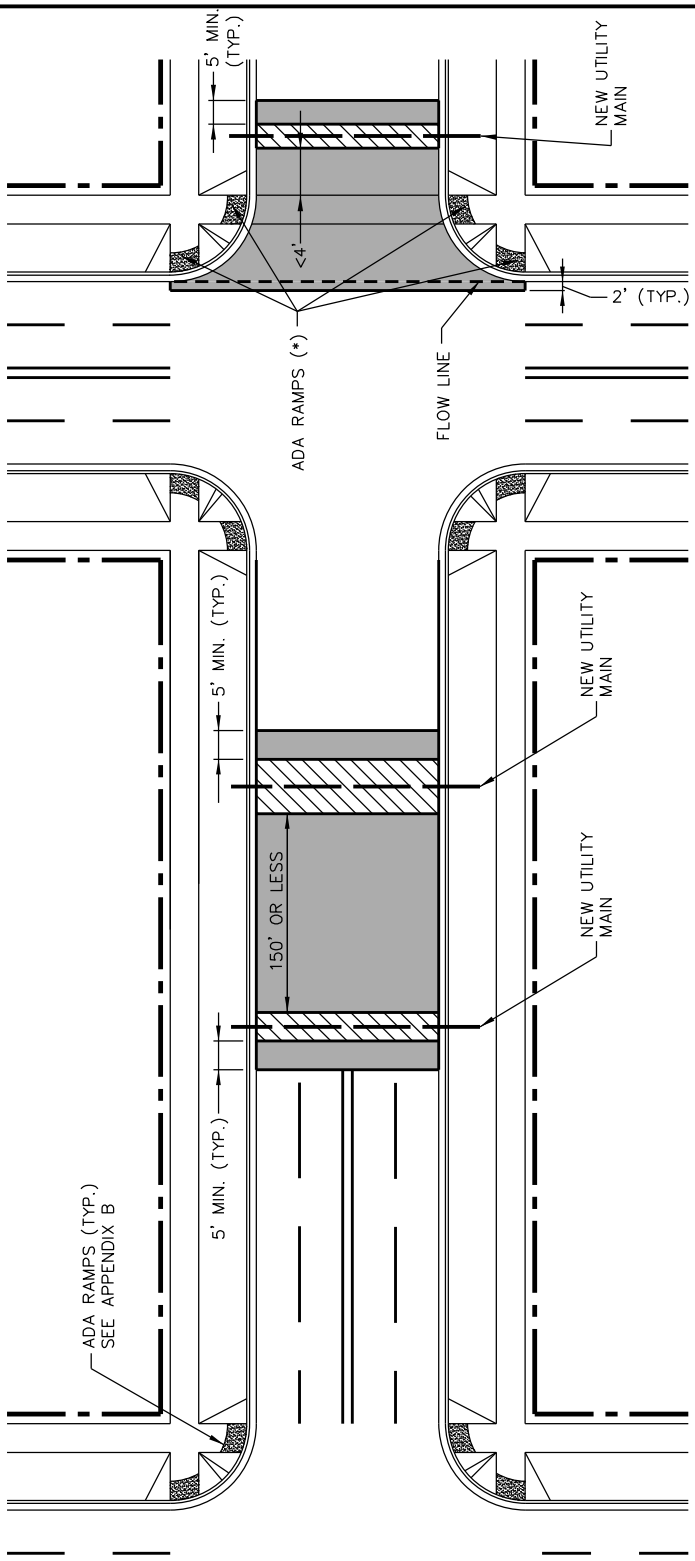
LEGEND

UTILITY TRENCH OR UTILITY\STREET CUT WITHIN THIS ZONE

CITY STANDARD FOR ASPHALT RESTORATION

*** FOR ADA REQUIREMENTS FOR SIDEWALKS AND SIDEWALK RAMPS, SEE APPENDIX B. THESE RAMPS SHALL BE RESTORED IF NONCOMPLIANT.**

NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.



NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.

LEGEND

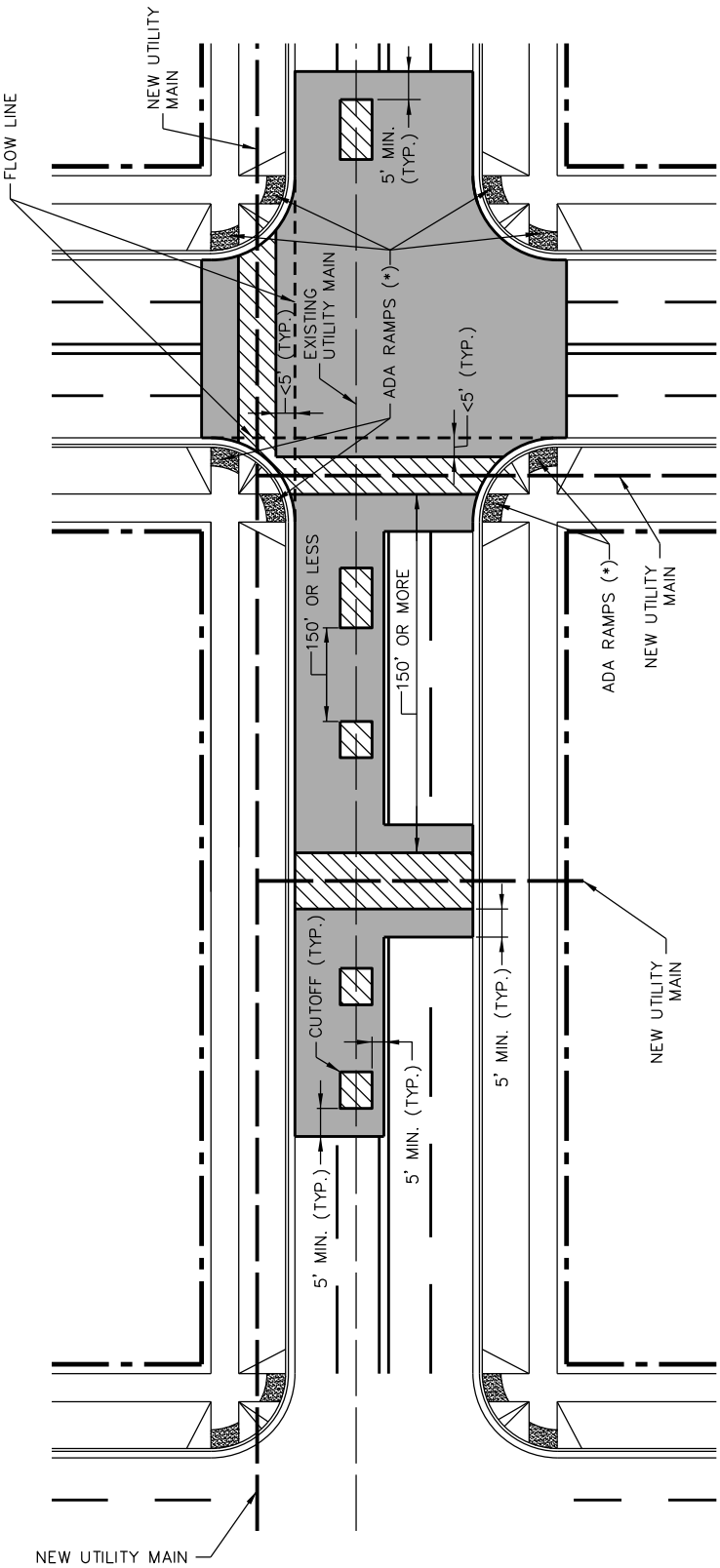
UTILITY TRENCH OR UTILITY STREET CUT WITHIN THIS ZONE

CITY STANDARD FOR ASPHALT RESTORATION

* **FOR ADA REQUIREMENTS FOR SIDEWALKS AND SIDEWALK RAMPS, SEE APPENDIX B. THESE RAMPS SHALL BE RESTORED IF NONCOMPLIANT.**

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2016	REVISION 1	STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS		
		DATE	SHEET	DRAWN BY
		1/1/14	A-2-1I	CDOT



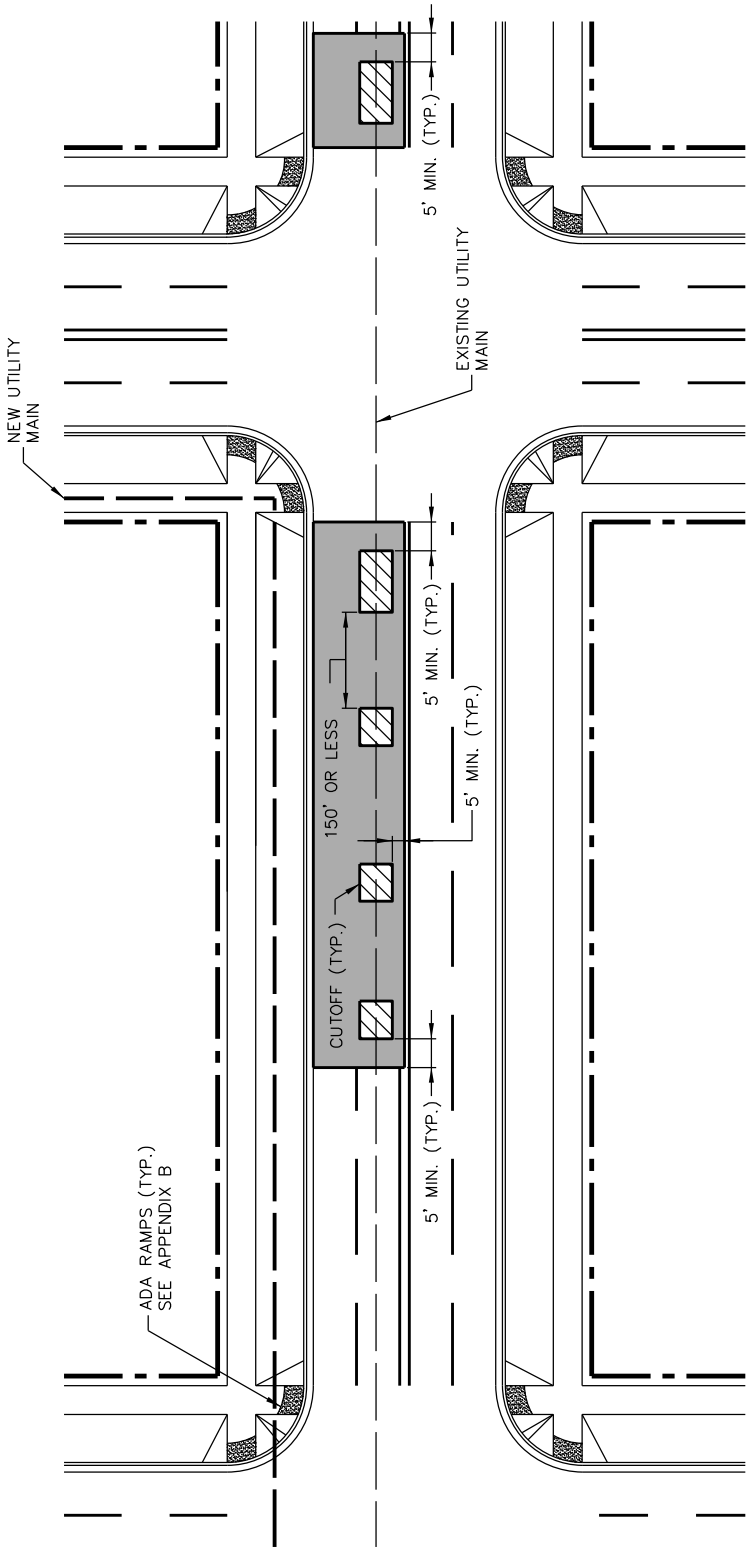
NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.

LEGEND
UTILITY TRENCH OR UTILITY\STREET CUT WITHIN THIS ZONE
CITY STANDARD FOR ASPHALT RESTORATION

* **FOR ADA REQUIREMENTS FOR SIDEWALKS AND SIDEWALK RAMPS, SEE APPENDIX B. THESE RAMPS SHALL BE RESTORED IF NONCOMPLIANT.**

CDOT
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2016	REVISION 1	STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS		
		DATE	SHEET	DRAWN BY
		1/1/14	A-2-1J	CDOT



NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.

LEGEND

- UTILITY TRENCH OR UTILITY STREET CUT WITHIN THIS ZONE
- CITY STANDARD FOR ASPHALT RESTORATION

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2016	REVISION 1	STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS		
		DATE	SHEET	DRAWN BY
		1/1/14	A-2-1K	CDOT

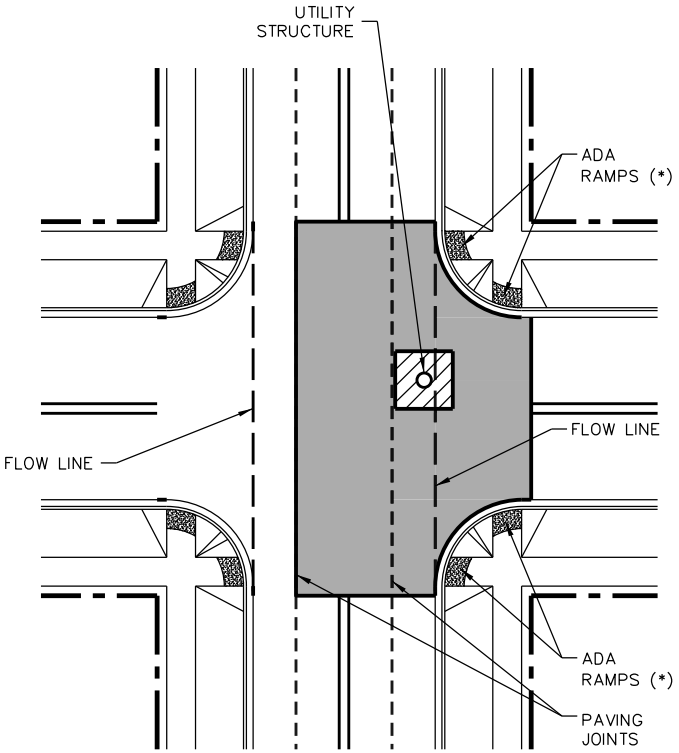
CHICAGO DEPARTMENT OF TRANSPORTATION

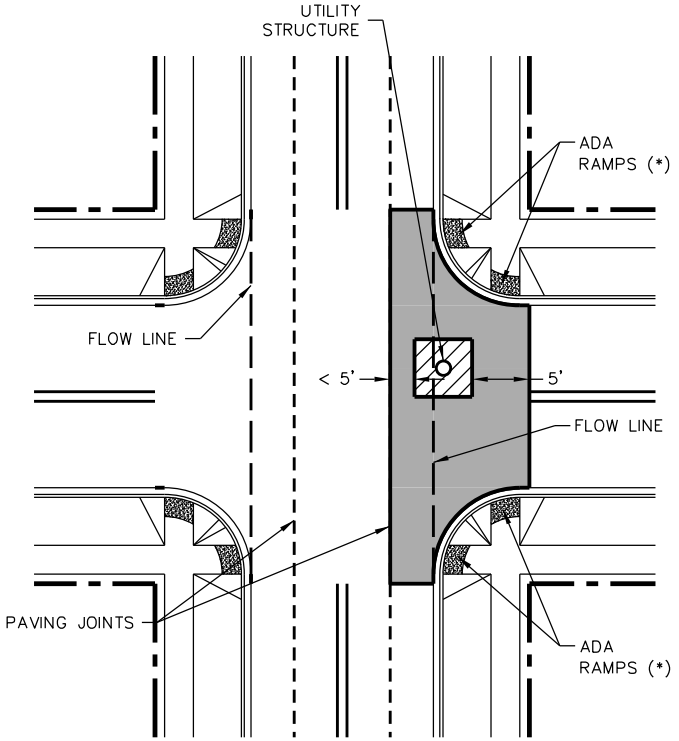
CDOT

DATE	REVISION	CITY OF CHICAGO
		STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS

DATE	DRAWN BY
1/1/16	CDOT

SHEET A-2-1L





LEGEND

UTILITY TRENCH OR UTILITY\STREET CUT WITHIN THIS ZONE

CITY STANDARD FOR ASPHALT OR CONCRETE RESTORATION

*** FOR ADA REQUIREMENTS FOR SIDEWALKS AND SIDEWALK RAMPS, SEE APPENDIX B**

FINAL PAVING LIMITS DETERMINED AND APPROVED BY CDOT

NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.

NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.

FINAL PAVING LIMITS DETERMINED AND APPROVED BY CDOT

LEGEND

UTILITY TRENCH OR UTILITY\STREET CUT WITHIN THIS ZONE

CITY STANDARD FOR ASPHALT OR CONCRETE RESTORATION

*** FOR ADA REQUIREMENTS FOR SIDEWALKS AND SIDEWALK RAMPS, SEE APPENDIX B**

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
		STREET CUTS AND ASPHALT RESTORATION REQUIREMENTS		
		DATE	SHEET	DRAWN BY
		1/1/16	A-2-1M	CDOT

CHICAGO DEPARTMENT OF TRANSPORTATION

CDOT

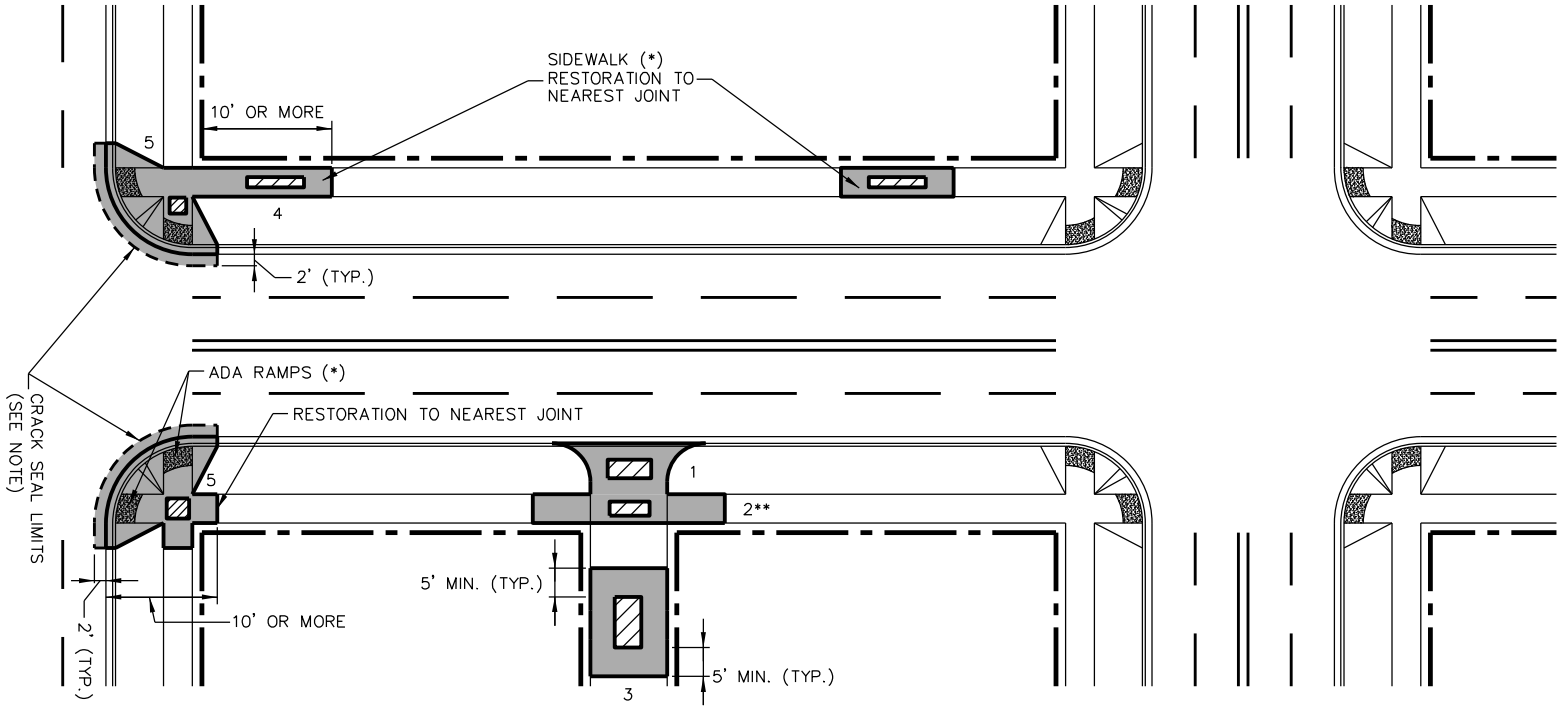
CITY OF CHICAGO

STREET CUTS AND ASPHALT RESTORATION EQUIREMENTS

DATE	REVISION	DATE
1/1/16	REVISION 1	1/1/14

SHEET A-2-1N

DRAWN BY CDOT



LEGEND

UTILITY TRENCH OR UTILITY\STREET CUT WITHIN THIS ZONE

CITY STANDARD FOR ASPHALT OR CONCRETE RESTORATION

* **FOR ADA REQUIREMENTS FOR SIDEWALKS, SIDEWALK RAMPS, SEE APPENDIX B**

** **FOR ADA AND ALLEY REQUIREMENTS, SEE APPENDIX B**

SCENARIO

ASPHALT RESTORATION LIMITS ARE SHOWN ONLY FOR EACH OF THE FOLLOWING SCENARIOS:

(1) FULL ALLEY APRON.

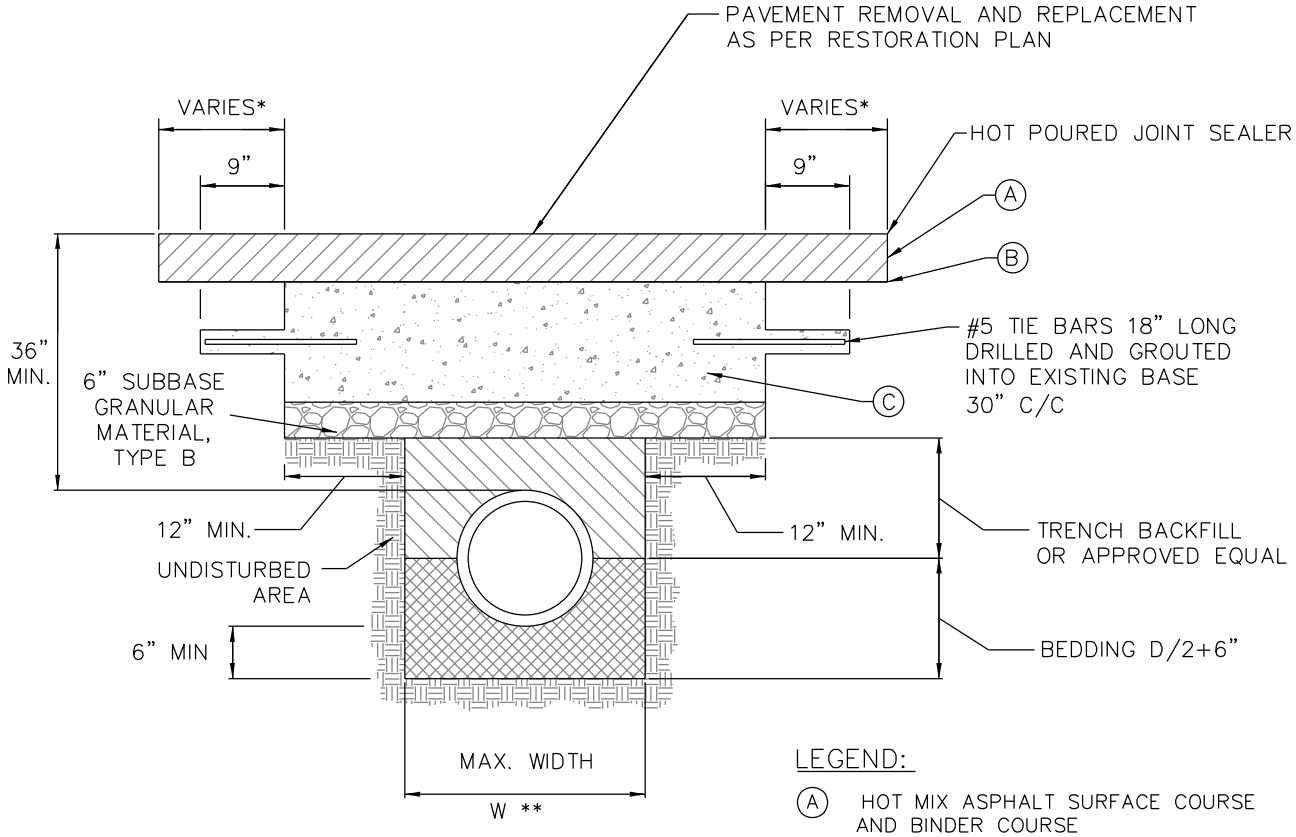
(2) APRON & SIDEWALK CONSTRUCTED PER APPENDIX B. IF CROSS SLOPE CAN'T BE ATTAINED, THE ADJACENT RAMP AND SIDEWALK WILL BE REQUIRED TO BE REMOVED AND REPLACED.

(3) FULL WIDTH OF ALLEY & 5' BEYOND UTILTY CUT OR TRENCH.

(4) REPLACEMENT OF SIDEWALK, 10' OR GREATER AND ADJACENT TO ADA RAMPS.

(5) FULL REPLACEMENT OF ADA RAMPS IF NONCOMPLIANT (IF COMPLIANT, THEN REPLACEMENT OF SECTION REMOVED).

NOTE:
WHEN WORK IS PERFORMED ON A MORATORIUM STREET, THE FULL PERIMETER OF THE ASPHALT RESTORATION LIMITS SHALL BE SEALED COMPLETELY AT THE EDGES OF THE CUT WITH HOT POURED JOINT SEALER.



LEGEND:

(A) HOT MIX ASPHALT SURFACE COURSE AND BINDER COURSE

(B) BITUMINOUS MATERIAL & AGGREGATE (PRIME COAT)

(C) PCC BASE COURSE

* PAVEMENT SHALL BE REMOVED & REPAVED TO NEAREST CONSTRUCTION JOINT IF TRENCH EDGE IS 5' OR LESS FROM JOINT. (OR AS REQUIRED BY THE COMMISSIONER)

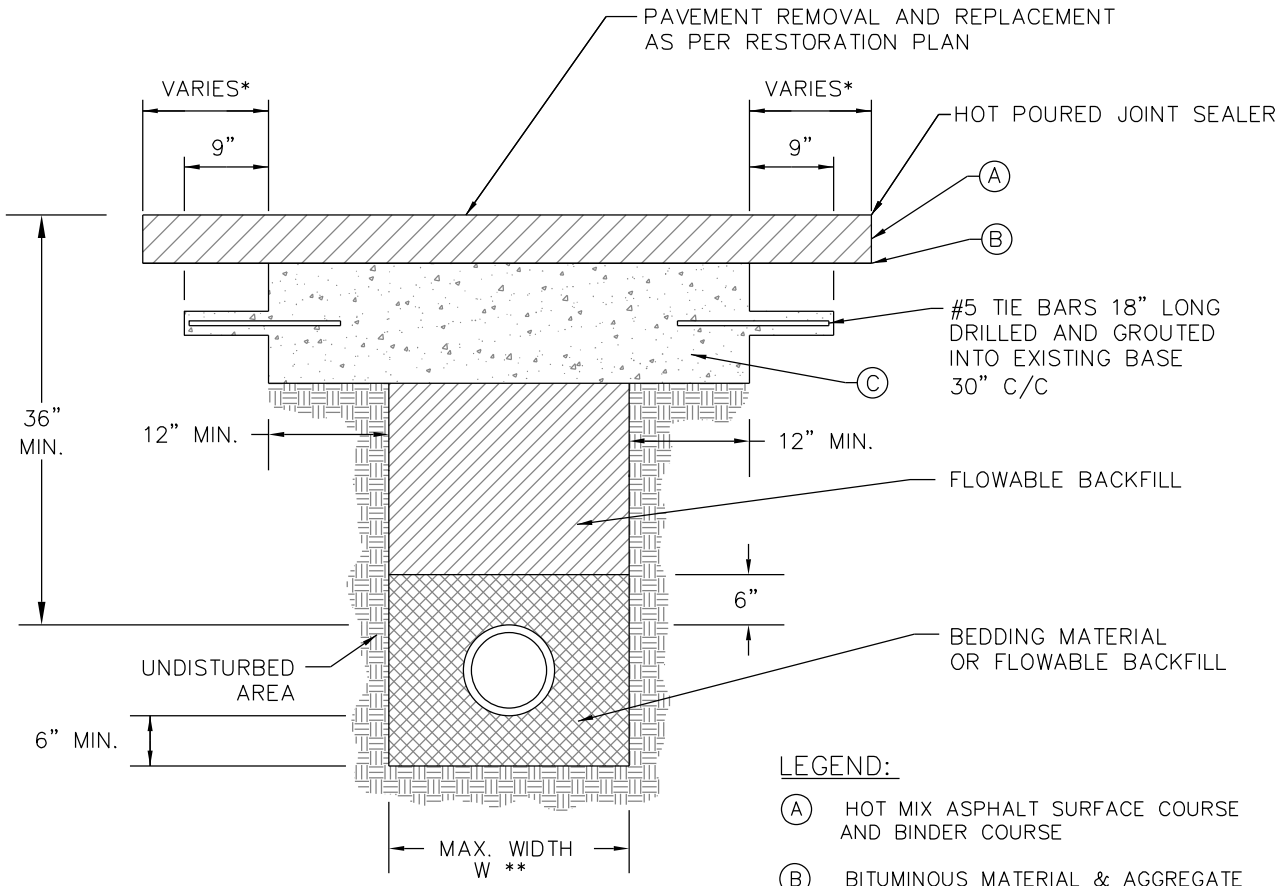
** W = 9" + O.D. +9", WHEN TRENCH DEPTH $\leq$ 5 FT.
W = 18" + O.D. + 18", WHEN TRENCH DEPTH > 5 FT.

NOTES:

1. THE PORTLAND CEMENT CONCRETE BASE SHALL BE 8" OR MORE (SEE SECTION 4.2b FOR REQUIRED THICKNESS). FOR CONCRETE STREETS THE CONCRETE SHALL BE BROUGHT TO GRADE (INCLUDING 1'–0" OVERLAP) AND FINISHED AS REQUIRED IN THE IDOT SSRBC.
2. ALL EXISTING PAVEMENTS SHALL BE SAW CUT 1'–0" ON BOTH SIDES OF THE TRENCH OR PAVEMENT OPENING. UNDER NO CIRCUMSTANCES SHOULD EXISTING PAVEMENT, WHICH HAS BEEN UNDERMINED OR OTHERWISE DISTURBED, BE LEFT IN PLACE AND NOT RESTORED.
3. ALL STREET PAVEMENT WILL REQUIRE PLACEMENT OF #5 TIE BARS, 18 INCHES LONG DRILLED AND GROUTED (NON SHRINK) AT 30" CENTERS ON ALL SIDES. A MINIMUM OF TWO TIE BARS WILL BE REQUIRED ON EACH SIDE OF SAW CUT BOUNDARIES.
4. ALL TIE BARS AND DOWEL BARS ARE TO BE EPOXY COATED (INCIDENTAL).

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	STREET PAVEMENT RESTORATION DETAIL WITH TRENCH BACKFILL		
1/27/2016	REVISION 2			
		DATE	SHEET	DRAWN BY
		12/12/06	A-2-2A	CDOT



LEGEND:

(A) HOT MIX ASPHALT SURFACE COURSE AND BINDER COURSE

(B) BITUMINOUS MATERIAL & AGGREGATE (PRIME COAT)

(C) PCC BASE COURSE

* PAVEMENT SHALL BE REMOVED & REPAVED TO NEAREST CONSTRUCTION JOINT IF TRENCH EDGE IS 5' OR LESS FROM JOINT. (OR AS REQUIRED BY THE COMMISSIONER)

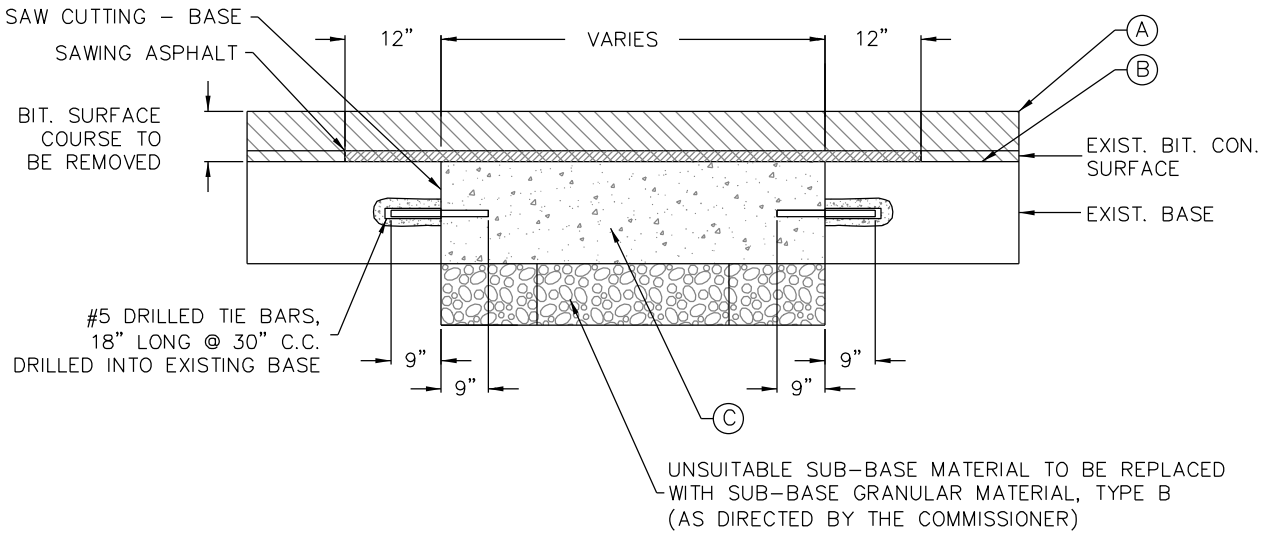
** W = 9" + O.D. +9", WHEN TRENCH DEPTH $\leq$ 5 FT.
W = 18" + O.D. + 18", WHEN TRENCH DEPTH > 5 FT.

NOTES:

1. THE PORTLAND CEMENT CONCRETE BASE SHALL BE 8" OR MORE (SEE SECTION 4.2b FOR REQUIRED THICKNESS). FOR CONCRETE STREETS THE CONCRETE SHALL BE BROUGHT TO GRADE (INCLUDING 1'–0" OVERLAP) AND FINISHED AS REQUIRED IN THE IDOT SSRBC.
2. ALL EXISTING PAVEMENTS SHALL BE SAW CUT 1'–0" ON BOTH SIDES OF THE TRENCH OR PAVEMENT OPENING. UNDER NO CIRCUMSTANCES SHOULD EXISTING PAVEMENT, WHICH HAS BEEN UNDERMINED OR OTHERWISE DISTURBED, BE LEFT IN PLACE AND NOT RESTORED.
3. ALL STREET PAVEMENT WILL REQUIRE PLACEMENT OF #5 TIE BARS, 18 INCHES LONG DRILLED AND GROUTED (NON SHRINK) AT 30" CENTERS ON ALL SIDES. A MINIMUM OF TWO TIE BARS WILL BE REQUIRED ON EACH SIDE OF SAW CUT BOUNDARIES.
4. ALL TIE BARS AND DOWEL BARS ARE TO BE EPOXY COATED (INCIDENTAL).

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	STREET PAVEMENT RESTORATION DETAIL WITH FLOWABLE FILL		
1/27/2016	REVISION 2			
		DATE	SHEET	DRAWN BY
		01/11/07	A-2-2B	CDOT



LEGEND:

(A) HOT MIX ASPHALT SURFACE COURSE AND BINDER COURSE

(B) BITUMINOUS MATERIAL & AGGREGATE (PRIME COAT)

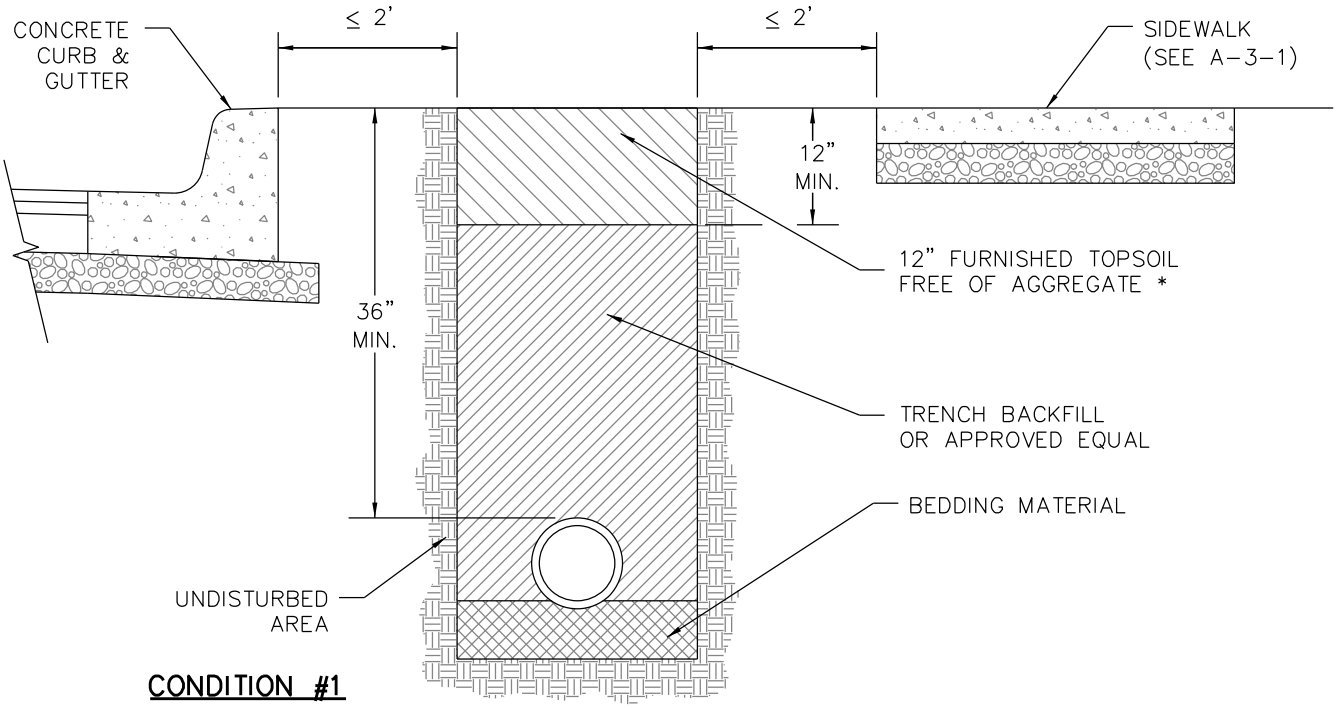
(C) PCC BASE COURSE

NOTES:

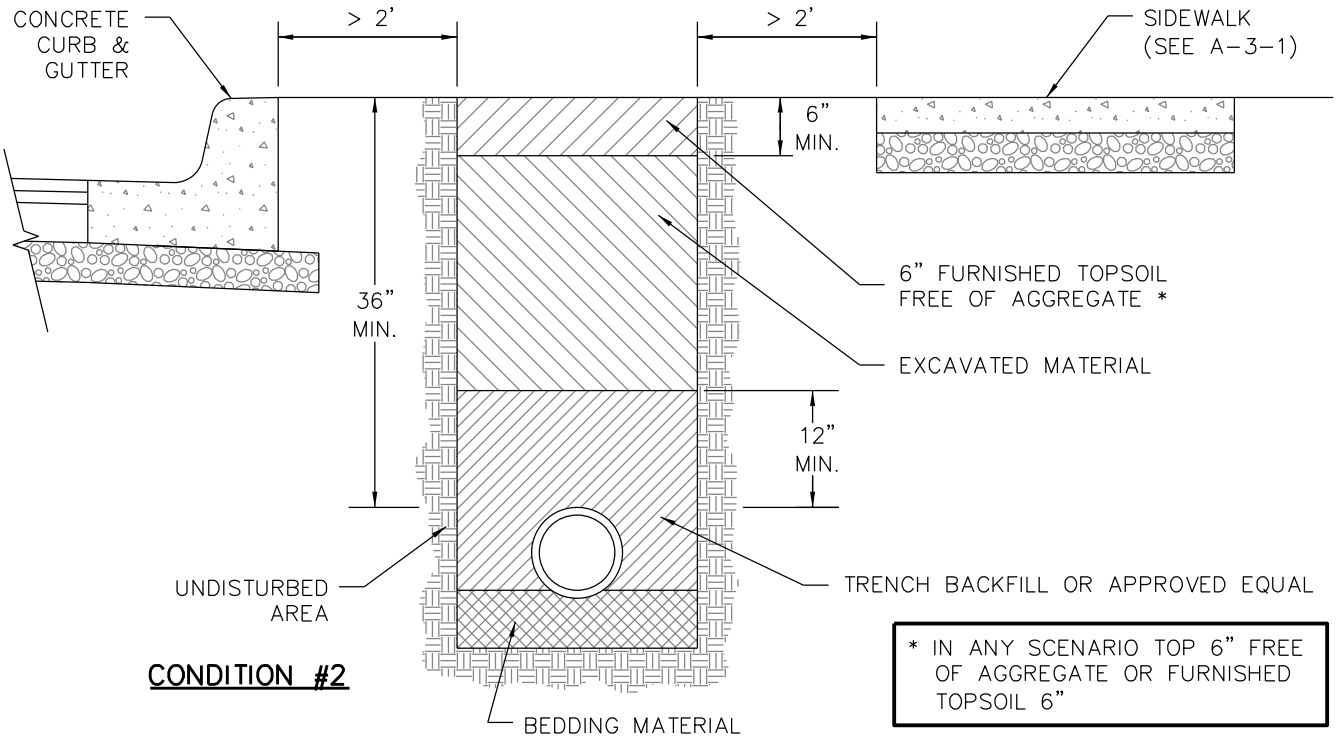
1. THE PORTLAND CEMENT CONCRETE BASE SHALL BE 8" OR MORE (SEE SECTION 4.2b FOR REQUIRED THICKNESS). FOR CONCRETE STREETS THE CONCRETE SHALL BE BROUGHT TO GRADE (INCLUDING 1'–0" OVERLAP) AND FINISHED AS REQUIRED IN THE IDOT SSRBC.
2. ALL EXISTING PAVEMENTS SHALL BE SAW CUT 1'–0" ON BOTH SIDES OF THE TRENCH OR PAVEMENT OPENING. UNDER NO CIRCUMSTANCES SHOULD EXISTING PAVEMENT, WHICH HAS BEEN UNDERMINED OR OTHERWISE DISTURBED, BE LEFT IN PLACE AND NOT RESTORED.
3. ALL STREET PAVEMENT WILL REQUIRE PLACEMENT OF #5 TIE BARS, 18 INCHES LONG DRILLED AND GROUTED (NON SHRINK) AT 30" CENTERS ON ALL SIDES. A MINIMUM OF TWO TIE BARS WILL BE REQUIRED ON EACH SIDE OF SAW CUT BOUNDARIES.
4. ALL TIE BARS AND DOWEL BARS ARE TO BE EPOXY COATED (INCIDENTAL).

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	PAVEMENT PATCHING AND PORTLAND CEMENT CONCRETE REPLACEMENT		
1/27/2016	REVISION 2			
		DATE	SHEET	DRAWN BY
		01/11/07	A-2-2C	CDOT



CONDITION #1

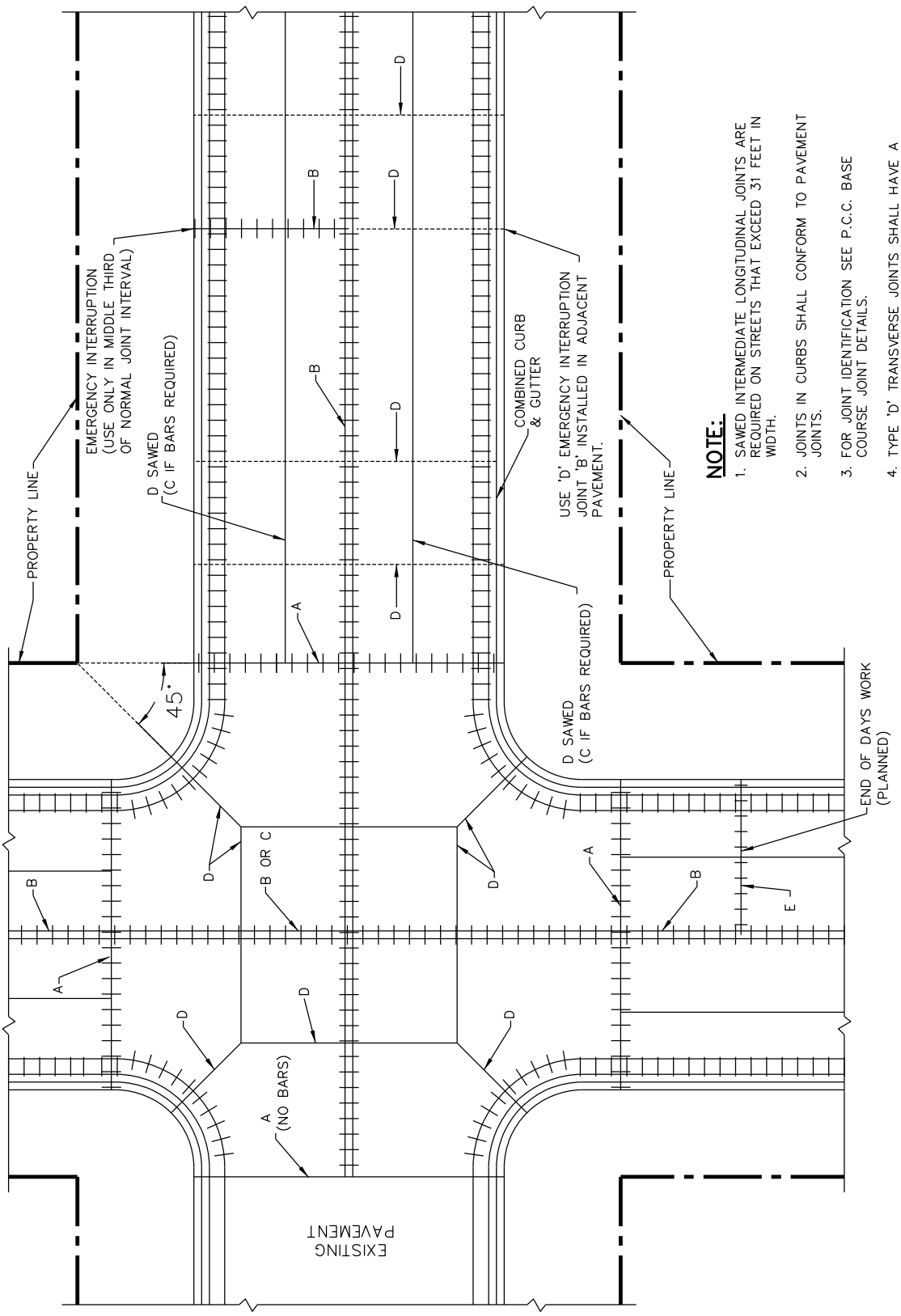


CONDITION #2

* IN ANY SCENARIO TOP 6" FREE OF AGGREGATE OR FURNISHED TOPSOIL 6"

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
		PARKWAY RESTORATION DETAIL		
		DATE	SHEET	DRAWN BY
		1/1/14	A-2-2D	CDOT



NOTE:

1. SAWED INTERMEDIATE LONGITUDINAL JOINTS ARE REQUIRED ON STREETS THAT EXCEED 31 FEET IN WIDTH.
2. JOINTS IN CURBS SHALL CONFORM TO PAVEMENT JOINTS.
3. FOR JOINT IDENTIFICATION SEE P.C.C. BASE COURSE JOINT DETAILS.
4. TYPE 'D' TRANSVERSE JOINTS SHALL HAVE A SPACING OF 20 FEET ON ALL LONGITUDINAL CUTS THAT EXCEED 20 FEET IN LENGTH.
5. SEE SPECIAL PROVISION FOR JOINING P.C.C. PAVEMENT AND P.C.C. BASE.

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION
1/1/2014	REVISION 1

CITY OF CHICAGO

TYPICAL JOINT LAYOUT FOR P.C. CONCRETE PAVEMENTS

DATE	SHEET	DRAWN BY
12/26/06	A-2-3A	CDOT

CHICAGO DEPARTMENT OF TRANSPORTATION

CDOT

CITY OF CHICAGO

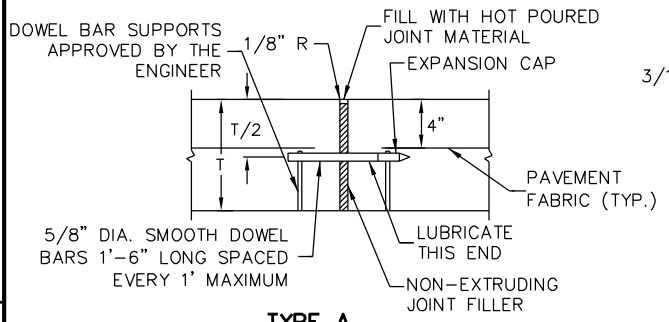
P.C.C. PAVEMENT JOINT DETAILS

DATE	REVISION
1/1/2014	REVISION 1

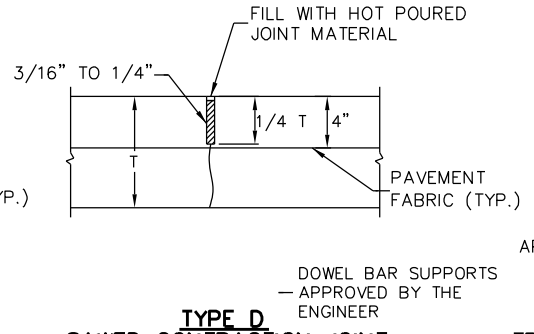
DATE 12/26/06

SHEET A-2-3B

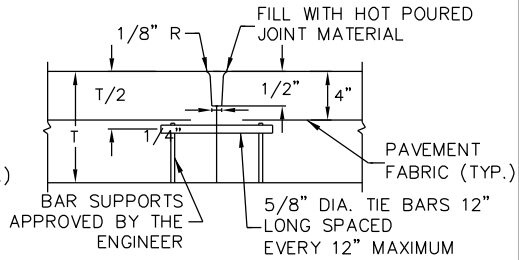
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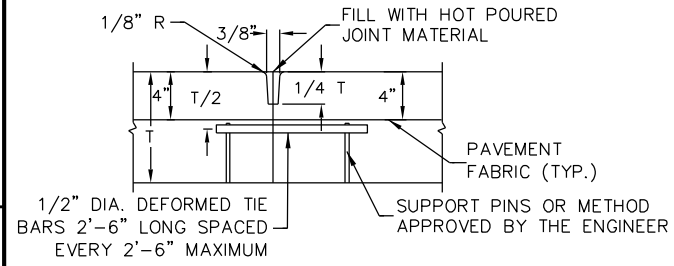
TYPE A
EXPANSION JOINT
(MAY BE CONSTRUCTION JOINT)



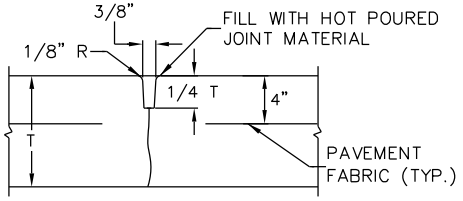
TYPE D
SAWED CONTRACTION JOINT
LONGITUDINAL OR TRANSVERSE



TYPE E
TRANSVERSE CONSTRUCTION JOINT



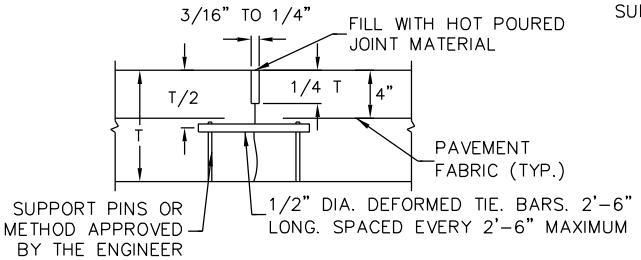
TYPE B
CONSTRUCTION JOINT
LONGITUDINAL OR TRANSVERSE



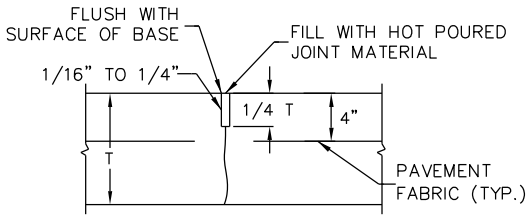
TYPE D
DUMMY GROOVE CONTRACTION JOINT
TRANSVERSE ONLY

NOTES:

1. DEFORMED TIE BARS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-31 OR M-53 WITH AN ELONGATION NOT LESS THAN 20%.
2. HOT POURED JOINT MATERIAL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO SPECIFICATION M-173-60 FOR CONCRETE JOINT SEALER.
3. ALL TIE BARS AND DOWEL BARS ARE TO BE EPOXY COATED.
4. SPLIT BOARD HEADERS WILL NOT BE ALLOWED.



TYPE C
SAWED LONGITUDINAL JOINT



TYPE D
PREMOLDED CONTRACTION JOINT
TRANSVERSE ONLY

CHICAGO DEPARTMENT OF TRANSPORTATION

CDOT

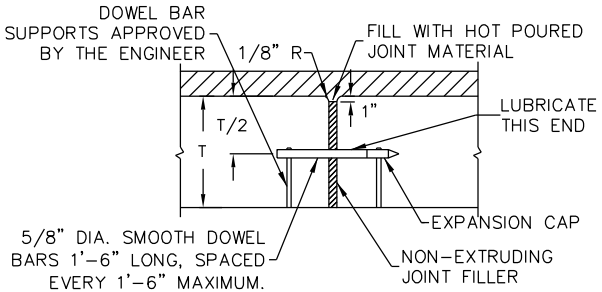
DATE	REVISION
1/1/2014	REVISION 1

CITY OF CHICAGO

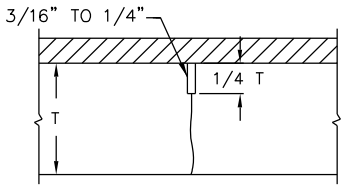
P.C.C. BASE COURSE JOINT DETAILS

DATE	SHEET
12/27/06	A-2-3C

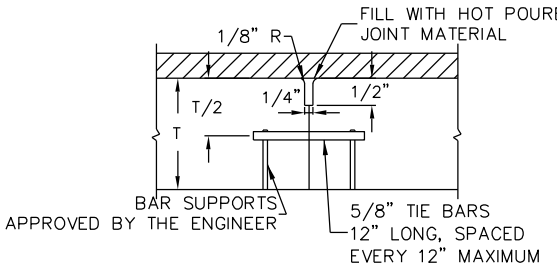
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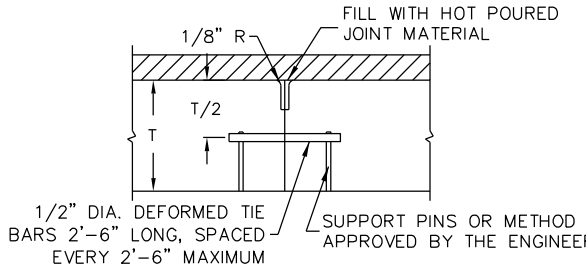
TYPE A
EXPANSION JOINT
(MAY BE CONSTRUCTION JOINT)



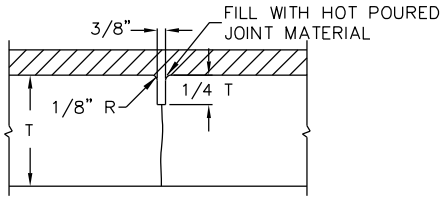
TYPE D
SAWED CONTRACTION JOINT
LONGITUDINAL OR TRANSVERSE



TYPE E
TRANSVERSE CONSTRUCTION JOINT



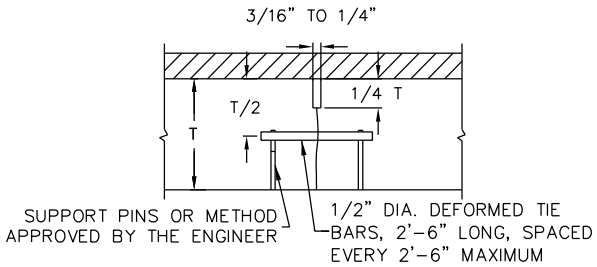
TYPE B
CONSTRUCTION JOINT
LONGITUDINAL OR TRANSVERSE



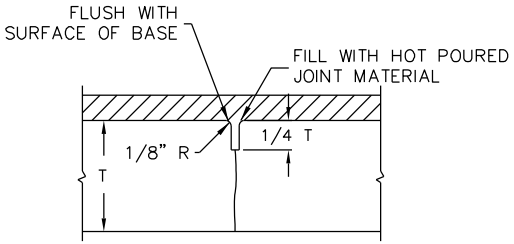
TYPE D
DUMMY GROOVE CONTRACTION JOINT
TRANSVERSE ONLY

NOTES:

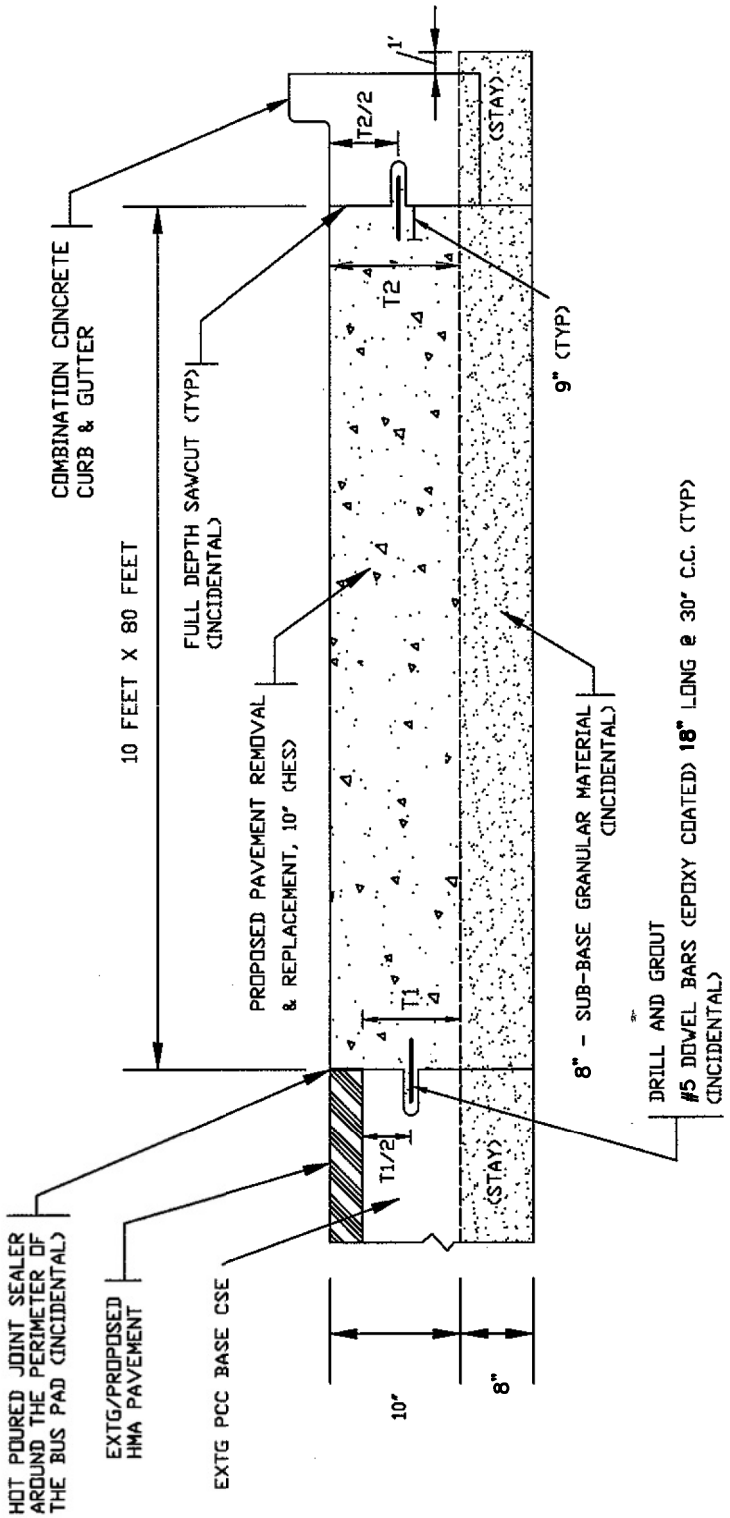
1. DEFORMED TIE BARS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-31 OR M-53 WITH AN ELONGATION NOT LESS THAN 20%.
2. HOT POURED JOINT MATERIAL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO SPECIFICATION M-173-60 FOR CONCRETE JOINT SEALER.
3. ALL TIE BARS AND DOWEL BARS ARE TO BE EPOXY COATED.
4. SPLIT BOARD HEADERS WILL NOT BE ALLOWED.



TYPE C
SAWED LONGITUDINAL JOINT



TYPE D
PREMOLDED CONTRACTION JOINT
TRANSVERSE ONLY



CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
		PROPOSED 10" BUS PAD PAVEMENT		
		DATE	SHEET	DRAWN BY
		1/1/14	A-2-3D	CDOT

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
		PROPOSED BUS PAD PAVEMENT AND TRAFFIC CONTROL LAYOUT		
		DATE	SHEET	DRAWN BY
		1/1/14	A-2-3E	CDOT

CHICAGO DEPARTMENT OF TRANSPORTATION

CITY OF CHICAGO

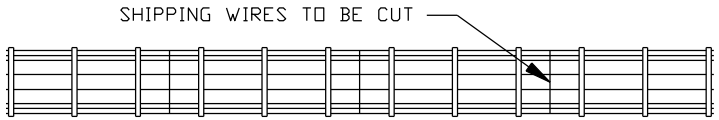
CONTRACTION JOINT ASSEMBLY FOR BUS PAD

DATE	REVISION

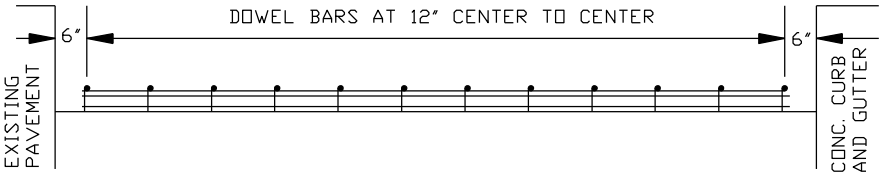
DATE 1/1/14

SHEET A-2-3F

DRAWN BY CDOT



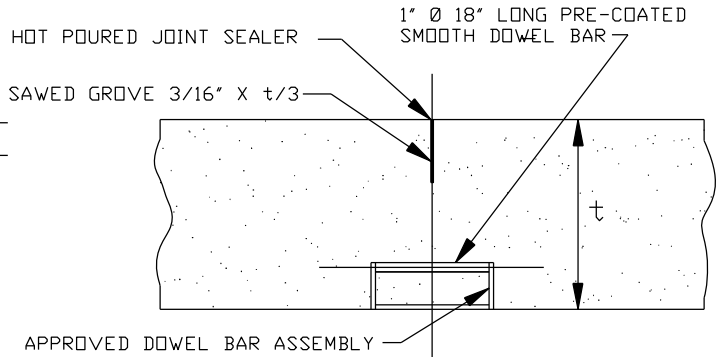
PLAN OF ASSEMBLY



ELEVATION OF ASSEMBLY

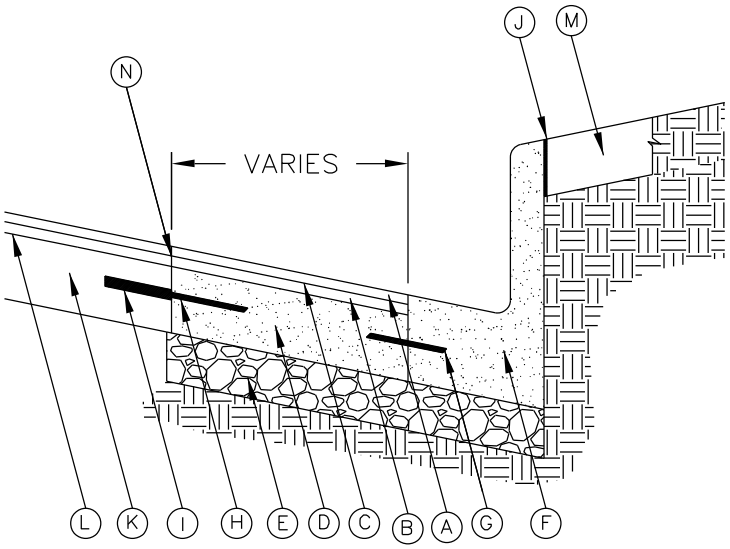
NOTE:

1. MINIMUM WIRE SIZES, W7 OUTSIDE SPACERS, BEARING MEMBERS AND UPRIGHT SUPPORT, W5 INSIDE SPACERS W3 TIE WIRES.
2. DOWELS MUST BE PLASTIC COATED, REBARS MUST BE EPOXY COATED.
3. DOWEL BASKET MUST BE INSTALLED EVERY 20 FEET.
4. TRANSVERSE JOINTS SHALL BE SPACED EVERY 20 FEET.
5. TRANSVERSE JOINTS MUST BE PROVIDED AT THE CENTER OF EVERY STRUCTURES IN THE BUS PAD.



SAWED CONTRACTION JOINT

(INCIDENTAL TO PAY ITEM: PAVEMENT REMOVAL & REPLACEMENT FOR 10-INCH, HES)



LEGEND:

- (A) HOT MIX ASPHALT SURFACE COURSE (SEE TABLE 4.3.1–1)
- (B) HOT MIX ASPHALT BINDER COURSE (SEE TABLE 4.3.1–1)
- (C) BITUMINOUS MATERIAL & AGGREGATE (PRIME COAT)
- (D) P.C. CONCRETE BASE COURSE (SEE TABLE 4.3.1–1)
- (D) SUBBASE GRANULAR MATERIAL (SEE TABLE 4.3.1–1)
- (F) TYPE 3 CURB AND GUTTER / TYPE 4 CURB
- (G) TIE BAR – SEE CONCRETE CURB & GUTTER STANDARD DETAILS (SEE A–2–6)
- (H) TIE BAR – #5 DOWEL BARS – 18" LONG @ 30" OC; DRILL & GROUT
- (I) DRILL AND GROUT INTO EXISTING CONCRETE BASE
- (J) 3/4" PREFORMED JOINT FILLER
- (K) EXISTING CONCRETE BASE
- (L) EXISTING BITUMINOUS SURFACE
- (M) PROPOSED WALK OR PARKWAY
- (N) SAW CUT EXISTING MATERIAL (FULL DEPTH)

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	PAVEMENT WIDENING ADJACENT TO NEW CONSTRUCTION		
1/27/2016	REVISION 2			
		DATE	SHEET	DRAWN BY
		12/12/06	A-2-4	CDOT

CHICAGO DEPARTMENT OF TRANSPORTATION

CDOT

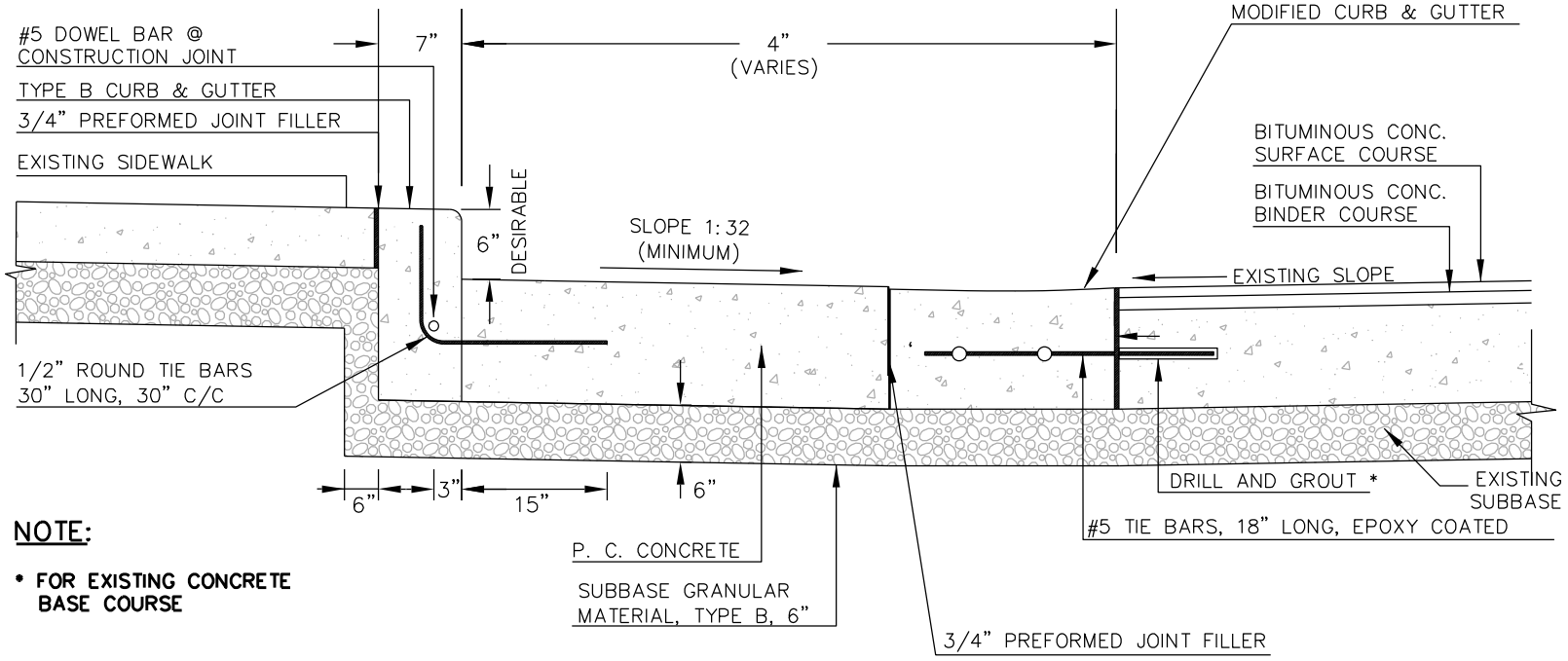
DATE	REVISION
1/1/2014	REVISION 1

CITY OF CHICAGO

STREET WIDENING
FOR DIAGONAL PARKING

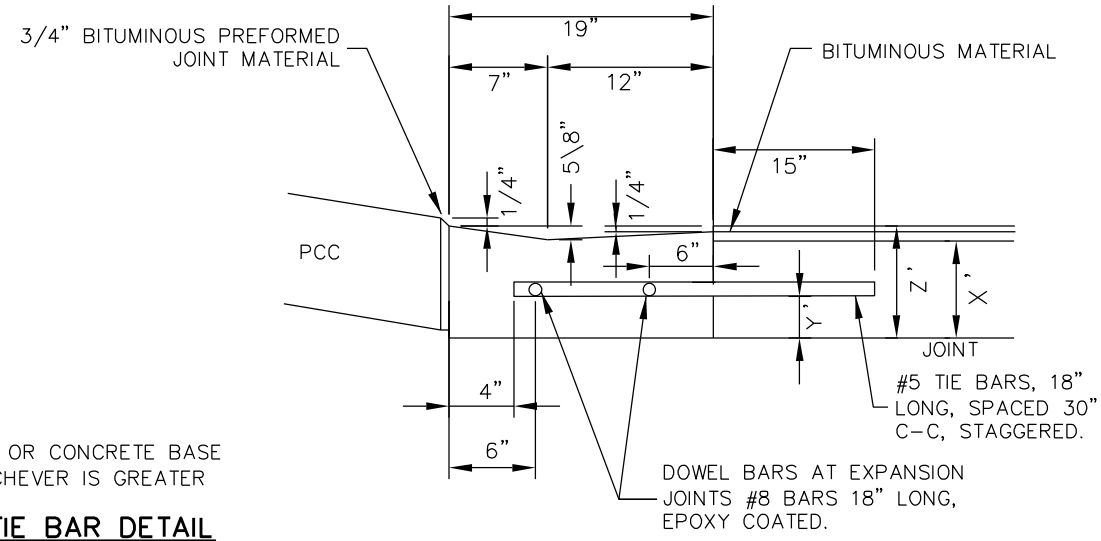
DATE	SHEET
12/12/06	A-2-5

DRAWN BY
CDOT



NOTE:

* **FOR EXISTING CONCRETE BASE COURSE**

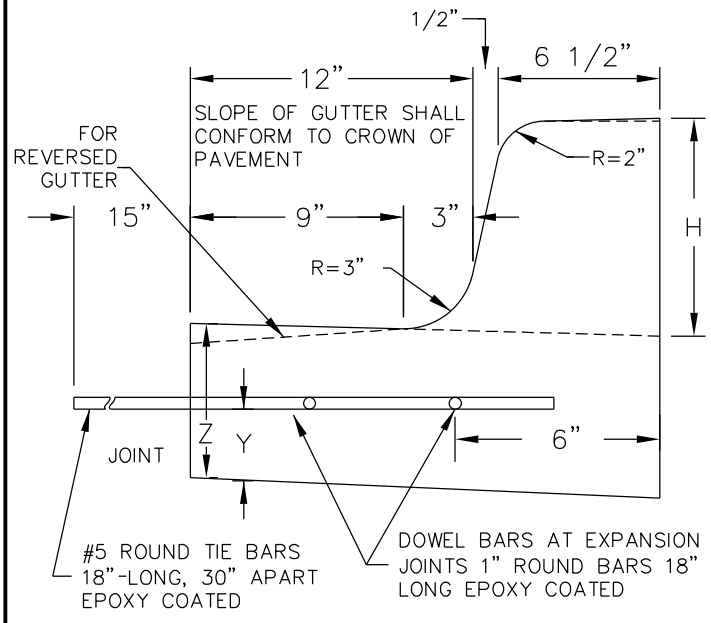


X=THICKNESS OF P.C.C. BASE
Y=1/2 THICKNESS OF CONCRETE PAVEMENT OR CONCRETE BASE
Z=10" OR THICKNESS OF PAVEMENT – WHICHEVER IS GREATER

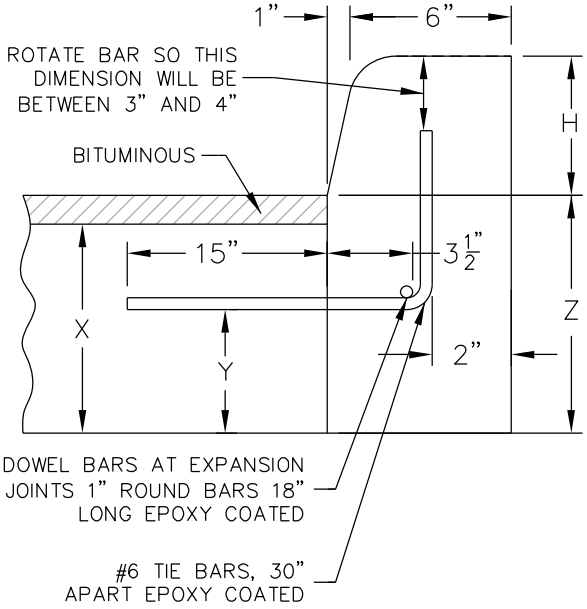
MODIFIED CURB & GUTTER AND TIE BAR DETAIL

NOTE: H = VARIABLE 3" TO 9"
X = THICKNESS OF PAVEMENT
Y = ONE HALF THE THICKNESS OF CONCRETE PAVEMENT OR CONCRETE BASE.
Z = 10" OR THICKNESS OF PAVEMENT – WHICHEVER IS GREATER

TYPE BV. 12 OR TYPE 3 CURB & GUTTER



TYPE B OR TYPE 4 CURB BARRIER CURB



JOINTS IN CURB, COMBINED CURB & GUTTER

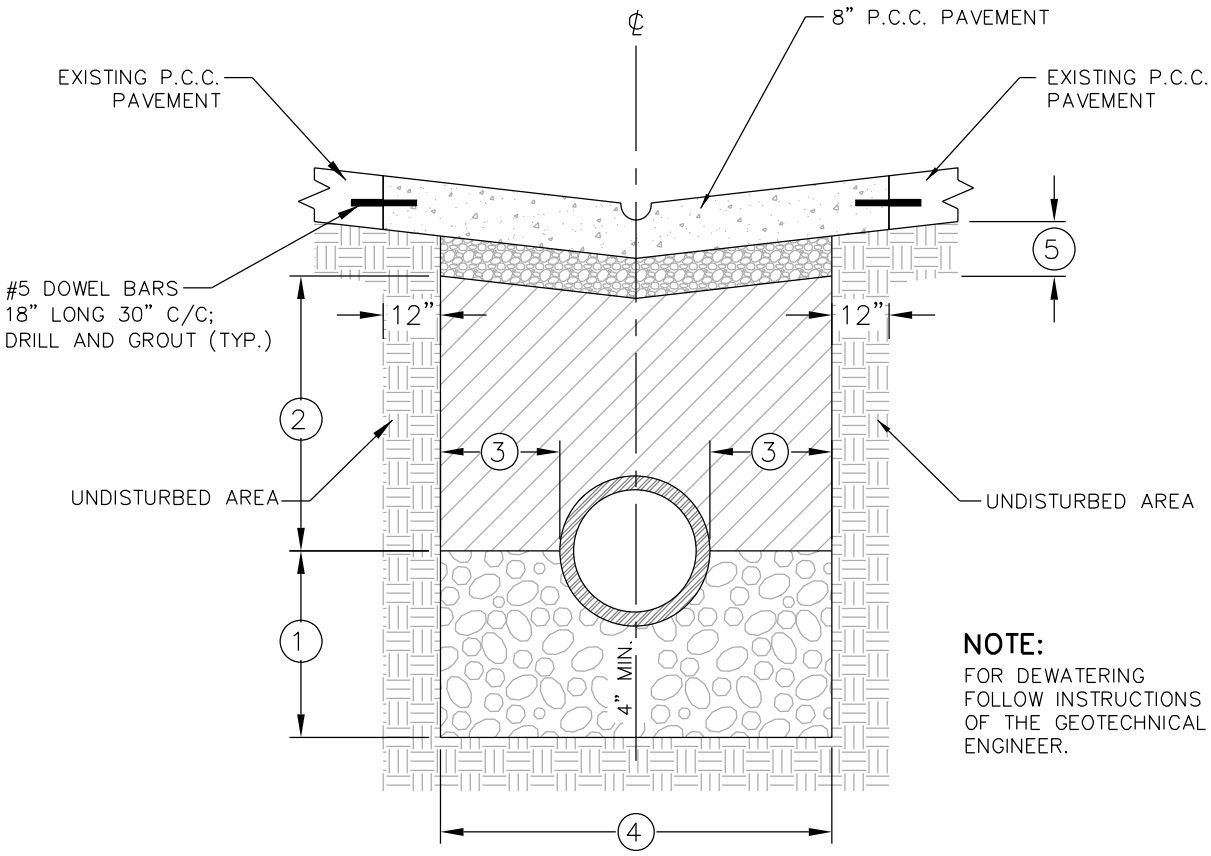
TRANSVERSE JOINTS OF A TYPE SIMILAR TO THAT USED IN THE ADJACENT PAVEMENT SHALL BE INSTALLED IN THE CURB, GUTTER AND COMBINED CURB & GUTTER IN PROLONGATION WITH THE JOINTS IN THE PAVEMENT. THE DETAILS OF THE TRANSVERSE JOINTS IN THE CURB, GUTTER AND COMBINED CURB & GUTTER SHALL BE APPROVED BY THE COMMISSIONER. CURB, GUTTER OR COMBINED CURB & GUTTER IS CONSTRUCTED ADJACENT TO A FLEXIBLE BASE PAVEMENT, 1" THICK EXPANSION JOINTS COMPOSED OF BITUMINOUS PERFORMED JOINT FILLER SHALL BE INSTALLED IN THE CURB AND/OR GUTTER AT POINTS OF CURVATURE AND AT CONSTRUCTION JOINTS. CONTRACTION JOINTS SHALL ALSO BE PLACED BETWEEN THESE EXPANSION JOINTS AT DISTANCES NOT EXCEEDING 20 FEET. ALL TIE BARS SHALL BE DEFORMED–ALL DOWEL BARS SHALL BE SMOOTH.

NOTE: ALL TIE BARS AND DOWEL BARS TO BE EPOXY COATED.

*AT LOCATIONS REQUIRING DEPRESSED CURBS SEE THE ADA STANDARDS FOR CONSTRUCTION DETAILS

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	CONCRETE CURB & GUTTER DETAIL		
		DATE	SHEET	DRAWN BY
		12/12/06	A-2-6	CDOT

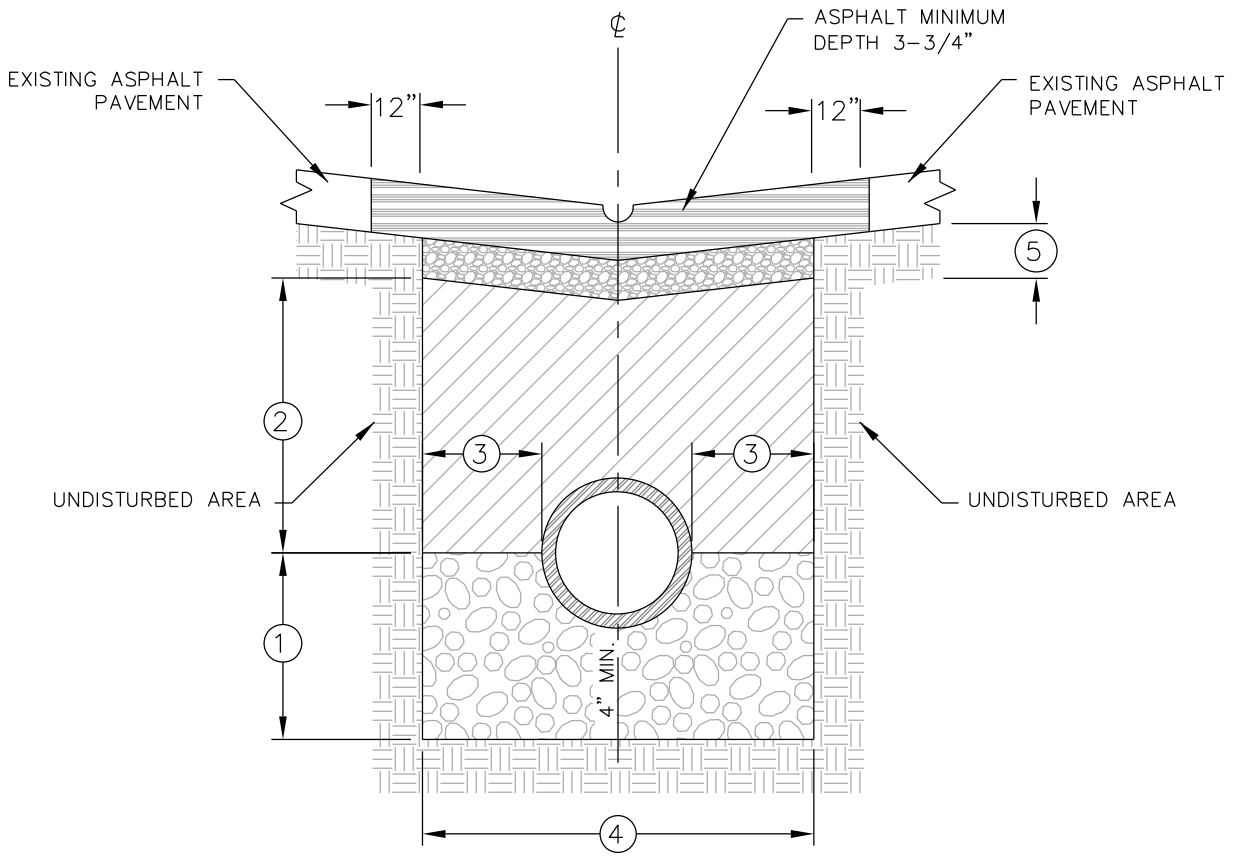


NOTE:
FOR DEWATERING FOLLOW INSTRUCTIONS OF THE GEOTECHNICAL ENGINEER.

(1) BEDDING	CA 11 CRUSHED STONE
(2) BACKFILL	APPROVED TRENCH BACKFILL TO SUB-BASE, REFER TO LOCAL AND STATE STANDARDS FOR CODES. COMPACT TO 95% MODIFIED PROCTOR AT OPTIMUM MOISTURE CONTENT.
(3) CLEARANCE	9" MAX. WHEN TRENCH ≤ 5 FT DEEP; 18" MAX. WHEN TRENCH > 5FT DEEP.
(4) TRENCH WIDTH	NOT TO EXCEED O.D. OF PIPE PLUS 6 FEET. IF SIDES OF TRENCH OPENING CANNOT BE HELD BY NATURAL REPOSE, SHEET AND/OR BRACE AS APPROVED BY COMMISSIONER.
(5) SUBBASE	6" SUBBASE GRANULAR MATERIAL, TYPE B

CHICAGO DEPARTMENT OF TRANSPORTATION

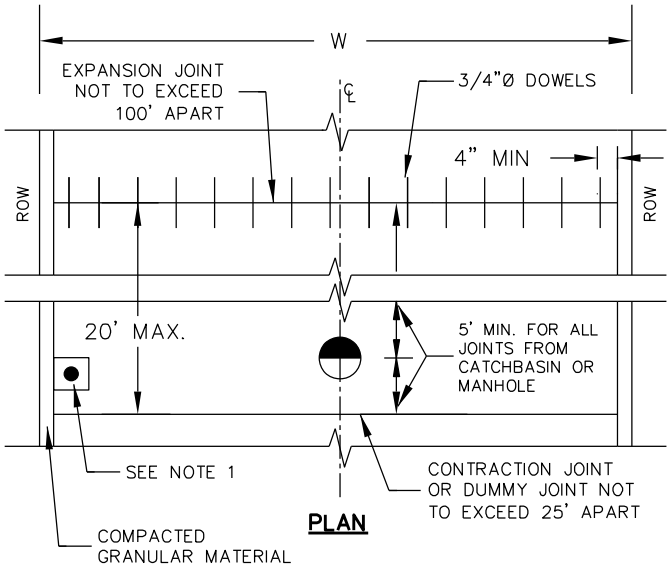
DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	P.C.C. ALLEY PAVEMENT RESTORATION PIPE OR CONDUIT TRENCH DETAIL, CONCRETE ALLEY		
		DATE	SHEET	DRAWN BY
		12/20/06	A-2-7	CDOT



① BEDDING	CA–11 CRUSHED STONE
② BACKFILL	APPROVED TRENCH BACKFILL TO SUB–BASE, REFER TO LOCAL AND STATE STANDARDS FOR CODES. COMPACT TO 95% MODIFIED PROCTOR AT OPTIMUM MOISTURE CONTENT.
③ CLEARANCE	9" MAX. WHEN TRENCH ≤ 5 FT DEEP; 18" MAX. WHEN TRENCH > 5FT DEEP.
④ TRENCH WIDTH	NOT TO EXCEED O.D. OF PIPE PLUS 6 FEET. IF SIDES OF TRENCH OPENING CANNOT BE HELD BY NATURAL REPOSE, SHEET AND/OR BRACE AS APPROVED BY COMMISSIONER.
⑤ SUBBASE	6" SUBBASE GRANULAR MATERIAL, TYPE B

CHICAGO DEPARTMENT OF TRANSPORTATION

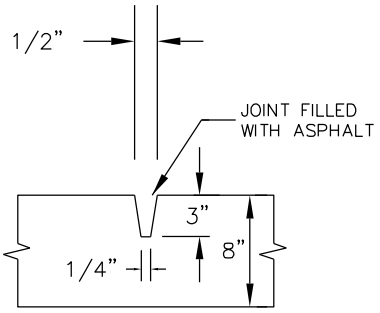
DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	ASPHALT ALLEY PAVEMENT RESTORATION PIPE OR CONDUIT TRENCH DETAIL		
		DATE	SHEET	DRAWN BY
		12/20/06	A-2-8	CDOT



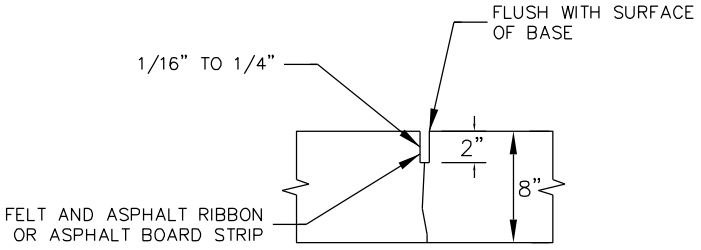
PLAN

NOTE 1:

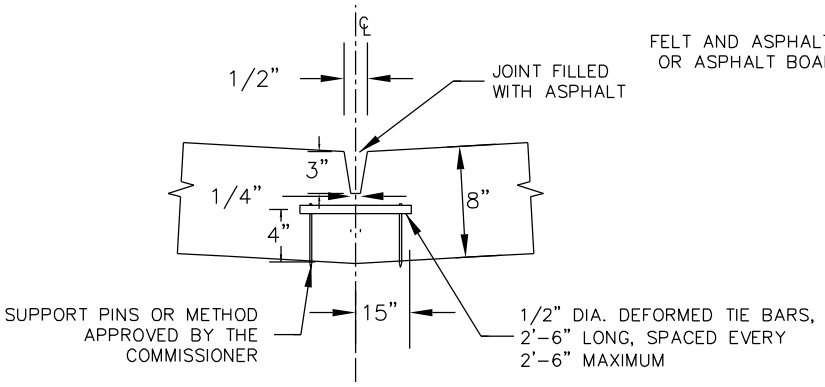
1. 1/2" EXPANSION JOINT WITHOUT DOWELS WITH BITUMINOUS PREFORMED JOINT FILLER TO BE PLACED THREE (3") INCHES FROM THREE SIDES OF STRUCTURES OR AS DIRECTED BY THE COMMISSIONER.



DUMMY GROOVE CONTRACTION JOINT
TRANSVERSE ONLY



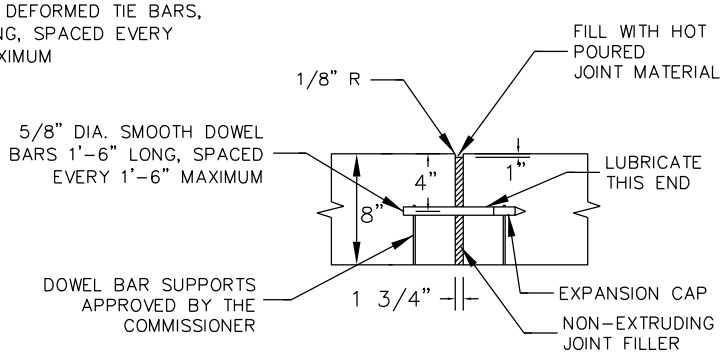
PREMOLDED CONTRACTION JOINT
TRANSVERSE ONLY



LONGITUDINAL CONSTRUCTION JOINT
REQUIRED FOR W 18' OR MORE

NOTES:

1. DEFORMED TIE BARS SHALL CONFORM TO THE REQUIREMENTS OF THE IDOT SSRBC.
2. HOT POURED JOINT MATERIAL SHALL CONFORM TO THE REQUIREMENTS OF THE IDOT SSRBC.
3. ALL TIE BARS AND DOWEL BARS ARE TO BE EPOXY COATED.

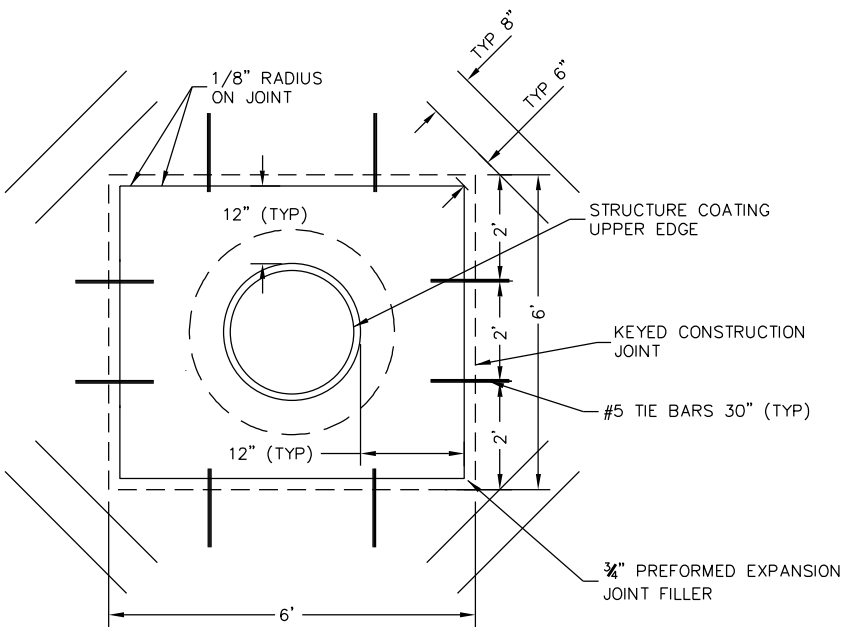


TRAVERSE EXPANSION JOINT
(MAY BE CONSTRUCTION JOINT)

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	PORTLAND CEMENT CONCRETE ALLEY		
		DATE	SHEET	DRAWN BY
		12/21/06	A-2-9	CDOT

2-#4 DEFORMED TIE BARS 30" LONG AT A MID DEPTH (TYPICAL) SEE SPECIAL CONDITION BELOW.



SPECIAL CONDITIONS:

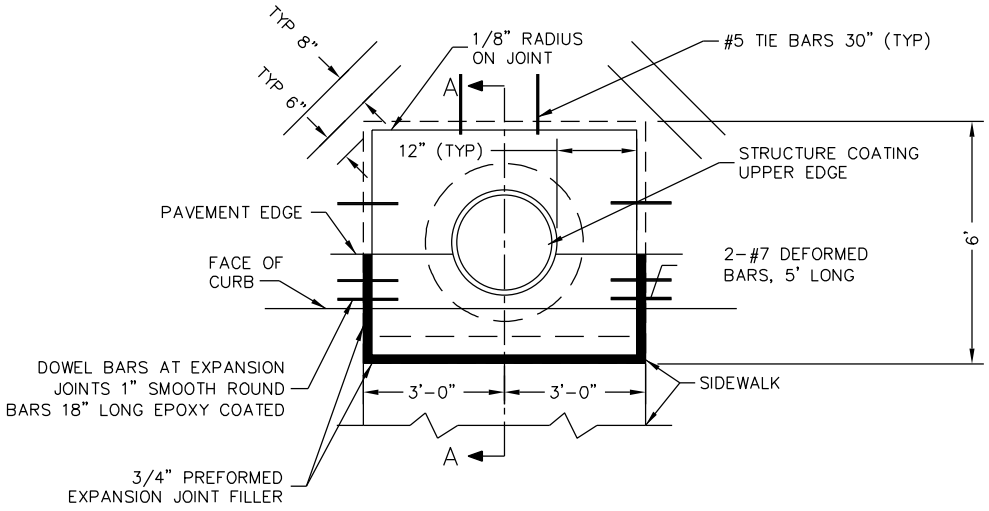
TIE BARS SHALL NOT BE INSTALLED AT ISOLATION BOX CORNERS WHERE EITHER SIDE OF THE BOX FORMING SAID CORNER IS A LONGITUDINAL OR TRAVERSE JOINT. MOREOVER, AT NO TIME SHALL A TIE BAR CROSS A JOINT (ALREADY FORMED OR PROPOSED) IN THE VICINITY OF THE ISOLATION BOX. IF THIS SITUATION OCCURS, THE TIE BAR SHALL BE ADJUSTED PARALLEL TO THE AXIS OF THE BAR SO THAT THE END OF THE BAR IS NO CLOSER THAN 1 1/2" TO THE JOINT.

ONLY BY THE DIRECTION OR APPROVAL OF THE COMMISSIONER SHALL THE DISTANCE BETWEEN THE UPPER EXTERNAL CASTING EDGE AND THE EDGE OF STANDARD ISOLATION BOX, SHOWN AS 12", BE INCREASED SO THAT AN IMMOVABLE LONGITUDINAL JOINT AND (OR) TRAVERSE JOINT WILL THEN THENCE FORM (O) SIDE (S) OF THE BOX. THIS ADJUSTMENT WILL BE ALLOWED ONLY WHEN THE DISTANCE BETWEEN THE SIDE OF THE STANDARD ISOLATION BOX AND IMMOVABLE JOINT IS 18" OR LESS.

BACKFILL MATERIAL AROUND STRUCTURE WILL BE COMPACTED TO 95% MODIFIED PROCTOR PRIOR TO THE PLACEMENT OF CONCRETE WITHIN THE ISOLATION BOX.

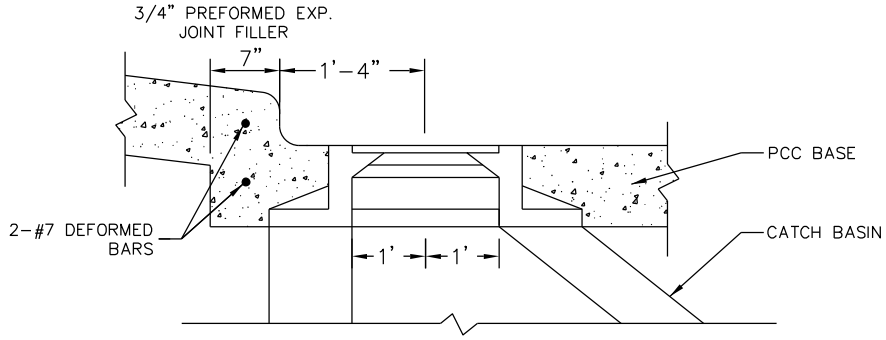
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	DETAILS OF STRUCTURE CASTING ISOLATION BOX		
		DATE	SHEET	DRAWN BY
		12/21/06	A-2-10A	CDOT



NOTES:

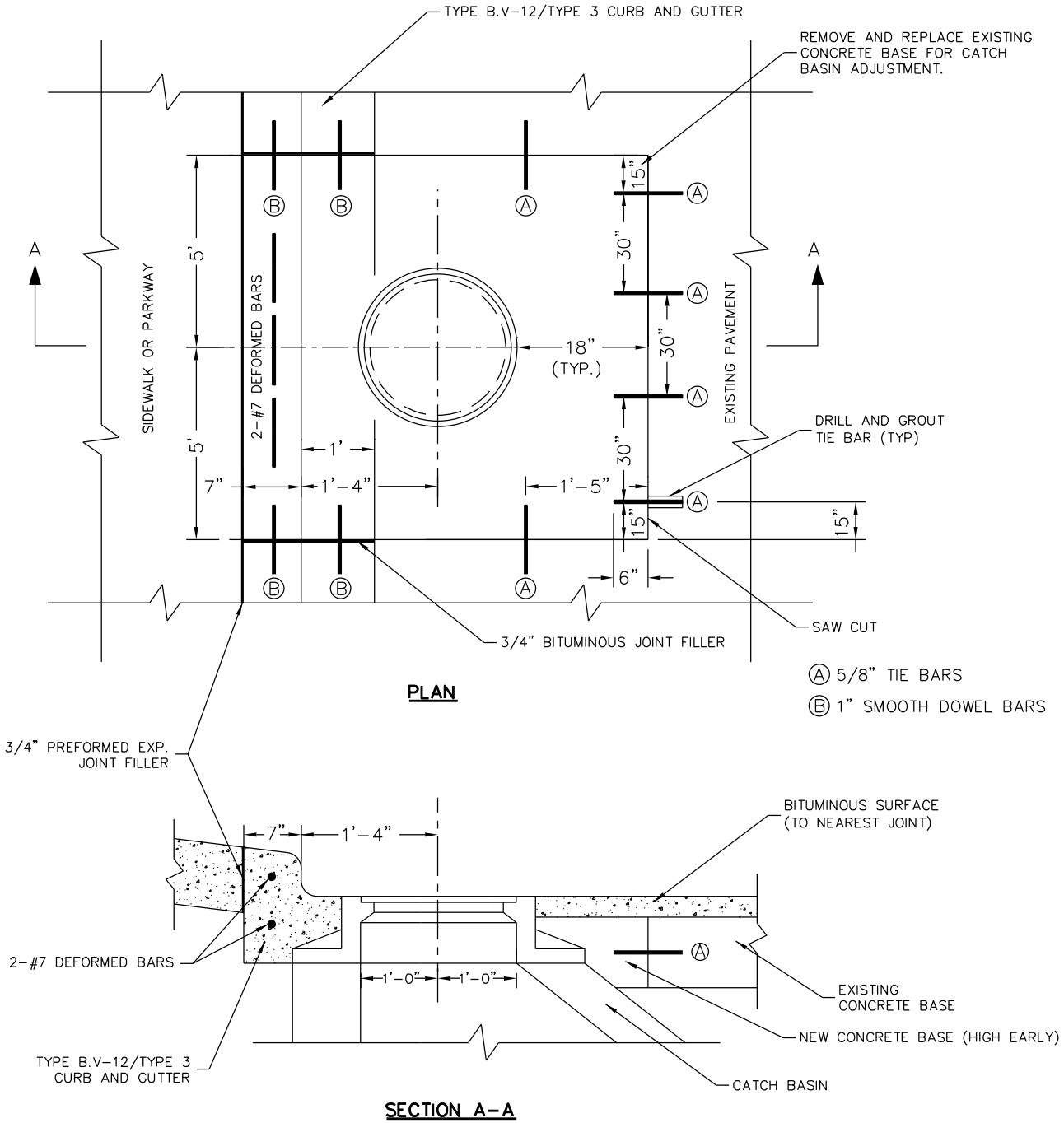
1. STRUCTURE CASTING MAY BE ROUND OR RECTANGUALR.
2. CONCRETE WITHIN THE ISOLATION BOX WILL BE OF THE SAME TYPE AND THICKNESS AS CONCRETE IN THE ADJACENT PAVEMENT.



SECTION A-A

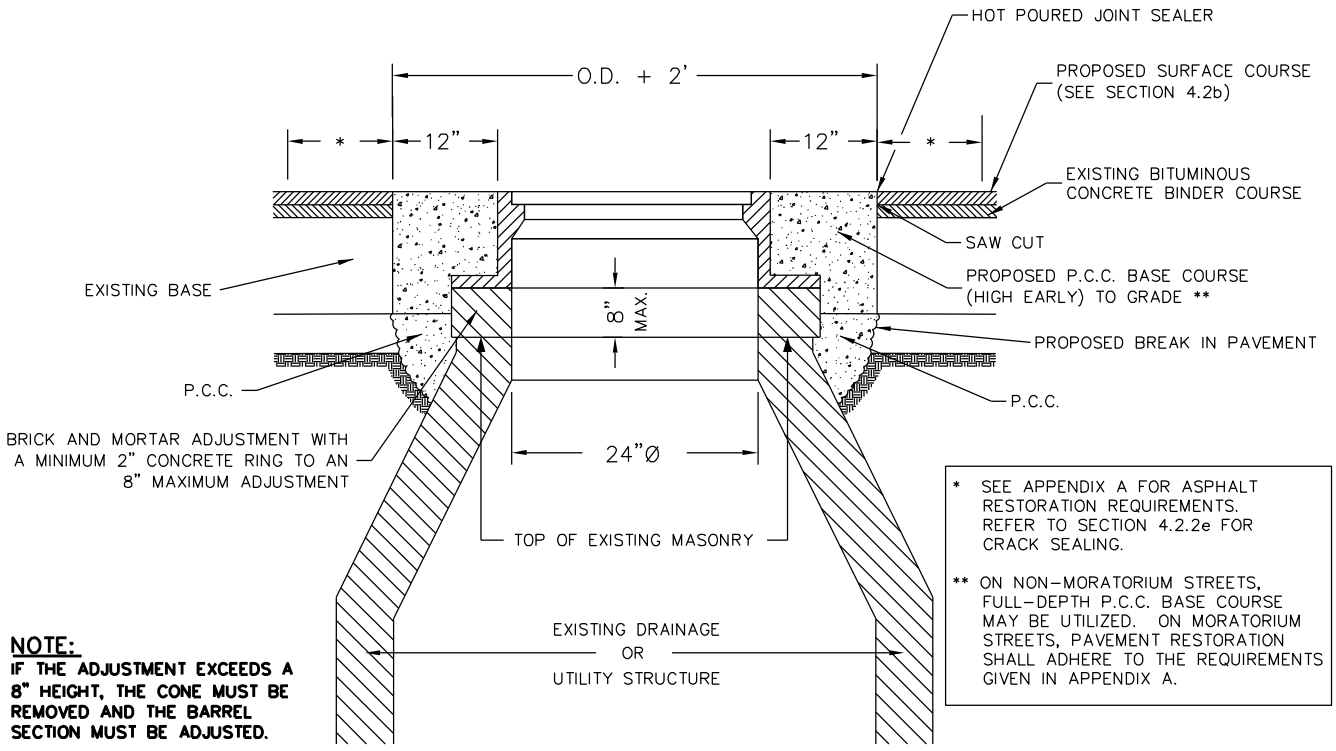
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	DETAILS OF STRUCTURE CASTING ISOLATION BOX FOR P.C.C. PAVEMENT AND BASE COURSE		
		DATE	SHEET	DRAWN BY
		12/22/06	A-2-10B	CDOT



CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	CATCH BASIN ADJUSTMENT IN EXISTING PAVEMENT		
		DATE	SHEET	DRAWN BY
		12/22/06	A-2-11	CDOT

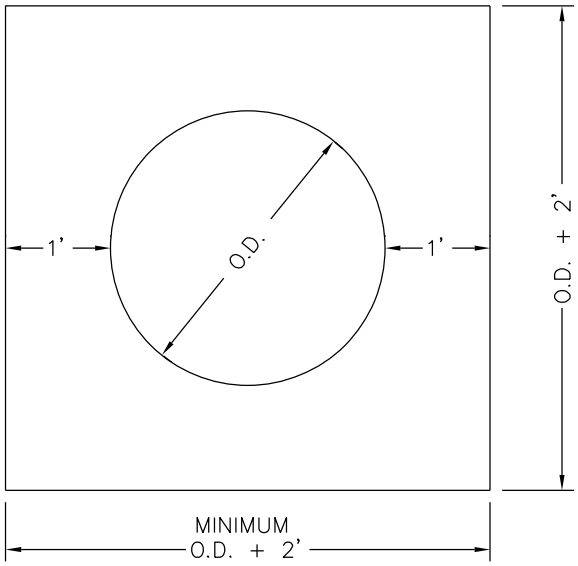


NOTE:
IF THE ADJUSTMENT EXCEEDS A 8" HEIGHT, THE CONE MUST BE REMOVED AND THE BARREL SECTION MUST BE ADJUSTED.

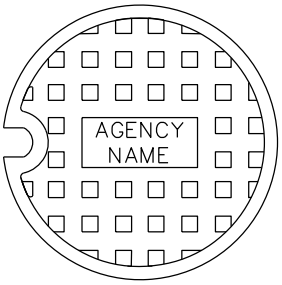
* SEE APPENDIX A FOR ASPHALT RESTORATION REQUIREMENTS. REFER TO SECTION 4.2.2e FOR CRACK SEALING.

** ON NON-MORATORIUM STREETS, FULL-DEPTH P.C.C. BASE COURSE MAY BE UTILIZED. ON MORATORIUM STREETS, PAVEMENT RESTORATION SHALL ADHERE TO THE REQUIREMENTS GIVEN IN APPENDIX A.

PLAN VIEW (BASE TO GRADE)

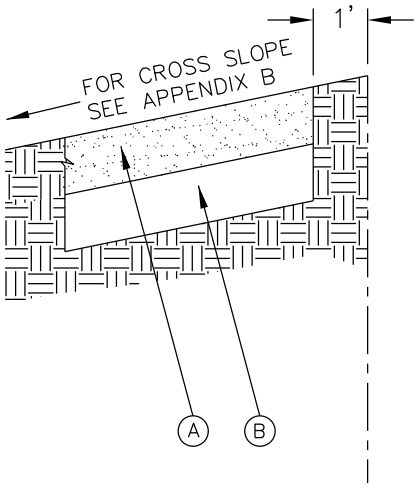


MANHOLE COVER FRONT VIEW



CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	FRAME ADJUSTMENT IN PAVEMENT		
1/27/2016	REVISION 2			
		DATE	SHEET	DRAWN BY
		12/22/06	A-2-12	CDOT



LEGEND:

(A) PROPOSED 5" P.C.C. SIDEWALK *

(B) SUBBASE GRANULAR MATERIAL, TYPE B OR C, 4"

* CURB RAMP & KEYSTONE 8" P.C.C. AT SIGNALIZED AND INDUSTRIAL STREET INTERSECTIONS

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	ADA COMPLIANT SIDEWALK CONSTRUCTION DETAILS		
		DATE	SHEET	DRAWN BY
		12/20/06	A-3-1	CDOT

SECTION A-A

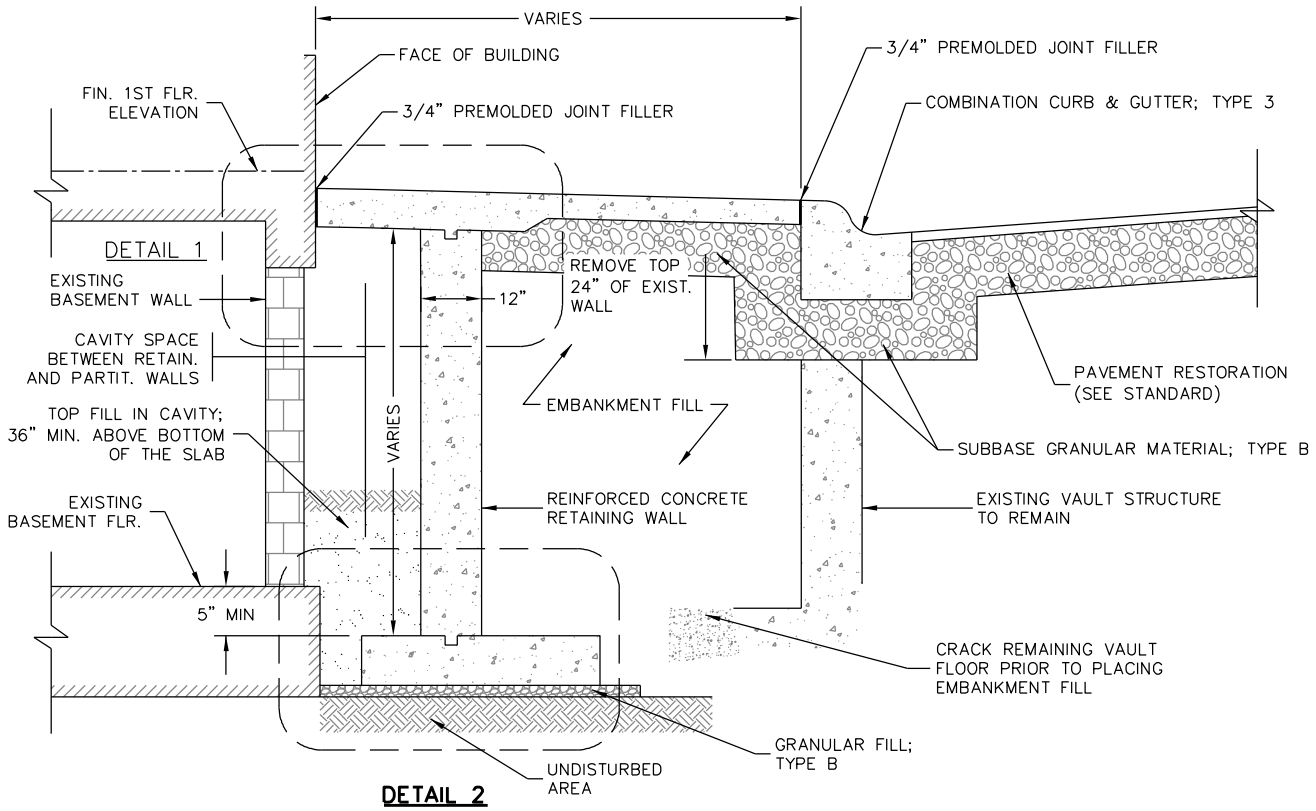
ALL SIDEWALK, RAMPS, ETC. WILL BE CONSTRUCTED PER APPENDIX B DETAILS.

SIDEWALKS TO BE REPLACED WILL BE CONSTRUCTED ON THE EXISTING BASE. NEW SIDEWALKS WILL BE CONSTRUCTED ON A 4" SUBBASE GRANULAR MATERIAL.

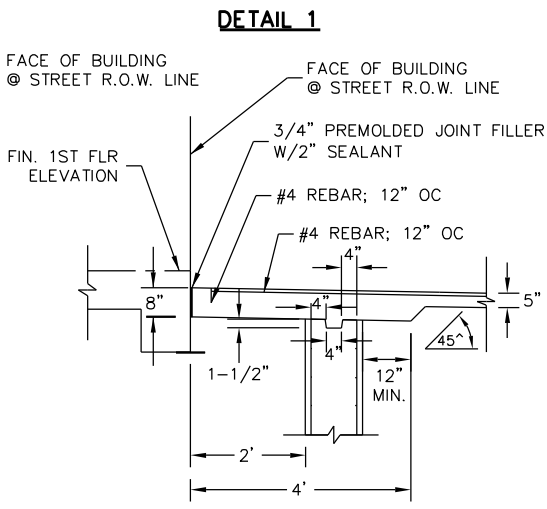
* THE 1/2" AND 3/4" DIMENSIONS REFER TO THE THICKNESS OF THE BITUMINOUS PREFORMED JOINT FILLER REQUIRED AT THE VARIOUS LOCATIONS.

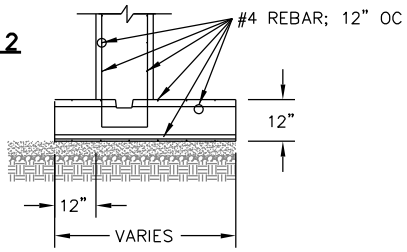
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	DETAILS OF PORTLAND CEMENT CONCRETE CONSTRUCTION		
		DATE	SHEET	DRAWN BY
		12/22/06	A-3-2	CDOT



FINAL DESIGN, CERTIFIED BY A REGISTERED STRUCTURAL ENGINEER, TO BE SUBMITTED TO THE DEPARTMENT OR TRANSPORTATION FOR REVIEW AND COMMENT PRIOR TO APPLICATION FOR PUBLIC WAY PERMIT.





CONCRETE RETAINING WALL NOTES

1. CONTRACTOR TO VERIFY THE CONDITION OF BUILDING FOUNDATION AND THE LOCATION OF WATER, GAS, AND OTHER UTILITIES WITHIN THE VAULTED AREA.
2. CONTRACTOR RESPONSIBLE FOR NOTIFYING THE UTILITIES OF THE ELIMINATION OF THE VAULT.
3. SEAL ALL EXISTING OPENINGS TO VAULT AREA WITHIN THE C.M.U.
4. COMPACT EXISTING FILL TO NOT LESS THAN 95% OF MODIFIED LABORATORY DENSITY.
5. CONTRACTOR SHOULD EXERCISE UTMOST CAUTION TO ENSURE THEIR OPERATIONS DO NOT CAUSE DAMAGES TO ADJACENT STRUCTURES. THEY ARE RESPONSIBLE FOR IMMEDIATE REPAIRS TO THE SATISFACTION OR PROPERTY OWNERS.
6. CONTRACTOR TO SECURE IMMEDIATE AREA DURING CONSTRUCTION OF VAULTED TO PREVENT PUBLIC ACCESS INTO ADJACENT BUILDING.

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	ELIMINATION OF VAULTED SIDEWALK ADJACENT TO BUILDING		
		DATE	SHEET	DRAWN BY
		01/02/07	A-3-3	CDOT

CHICAGO DEPARTMENT OF TRANSPORTATION

CDOT

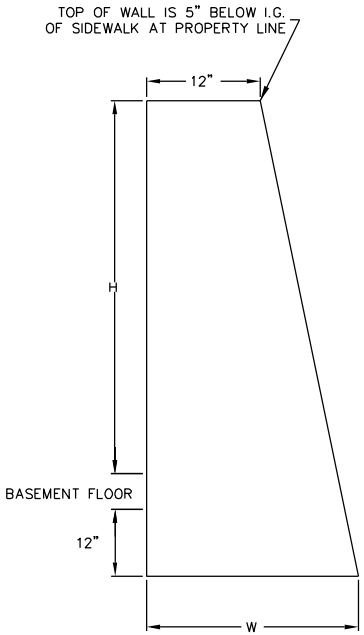
CITY OF CHICAGO

ELIMINATION OF VAULTED SIDEWALK ADJACENT TO BUILDING

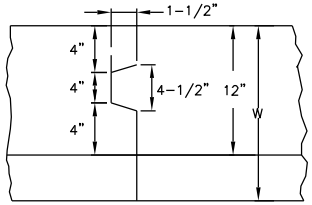
DATE	REVISION	DATE
1/1/2014	REVISION 1	01/11/07

SHEET A-3-3A

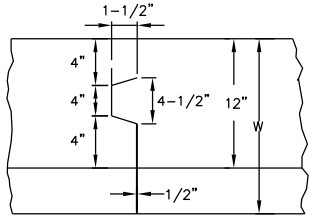
DRAWN BY CDOT



SIDEWALK EXTENDING MORE THAN 12" BEYOND PROPERTY LINE WALL MUST BE REINFORCED OR SUPPORTED ON BRACKETS.



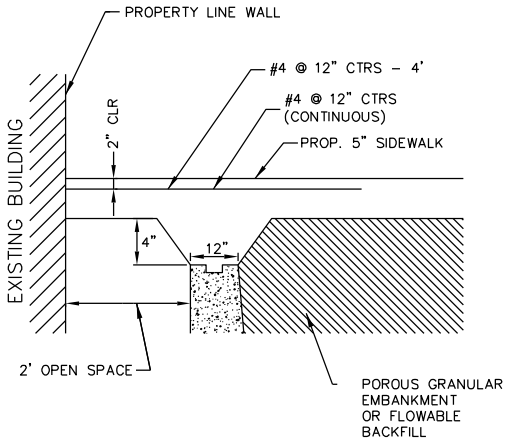
CONSTRUCTION KEY JOINT TO BE BUILT WHENEVER REQUIRED BY STOPPAGE OF WORK IN CURB WALL OR P.L. WALL



EXPANSION JOINT, USING 3 STRIPS OF BITUMINATED FELT, TO BE CONSTRUCTED IN WALLS OF MORE THAN 50' CONTINUOUS LENGTH AND SPACED NOT MORE THAN 50' APART.

NOTES:

1. THE CONTRACTOR WILL SET IN THE WALL, PRIOR TO CONCRETING, ANY BOX OR TUBE FURNISHED BY A UTILITY COMPANY TO ACCOMMODATE SERVICES TO BE EXTENDED FROM THE STREET THROUGH THE WALL ONTO THE ADJOINING PROPERTY. THE COST OF THIS INCIDENTAL WORK TO BE INCLUDED IN UNIT PRICE FOR PLAIN OR MASS WALL, NO DEDUCTION OF CONCRETE TO BE MADE FOR SPACE OCCUPIED BY SUCH BOX OR TUBE.
2. MUST BE APPROVED BY CDOT AND DOB PRIOR TO PERMIT ISSUANCE.



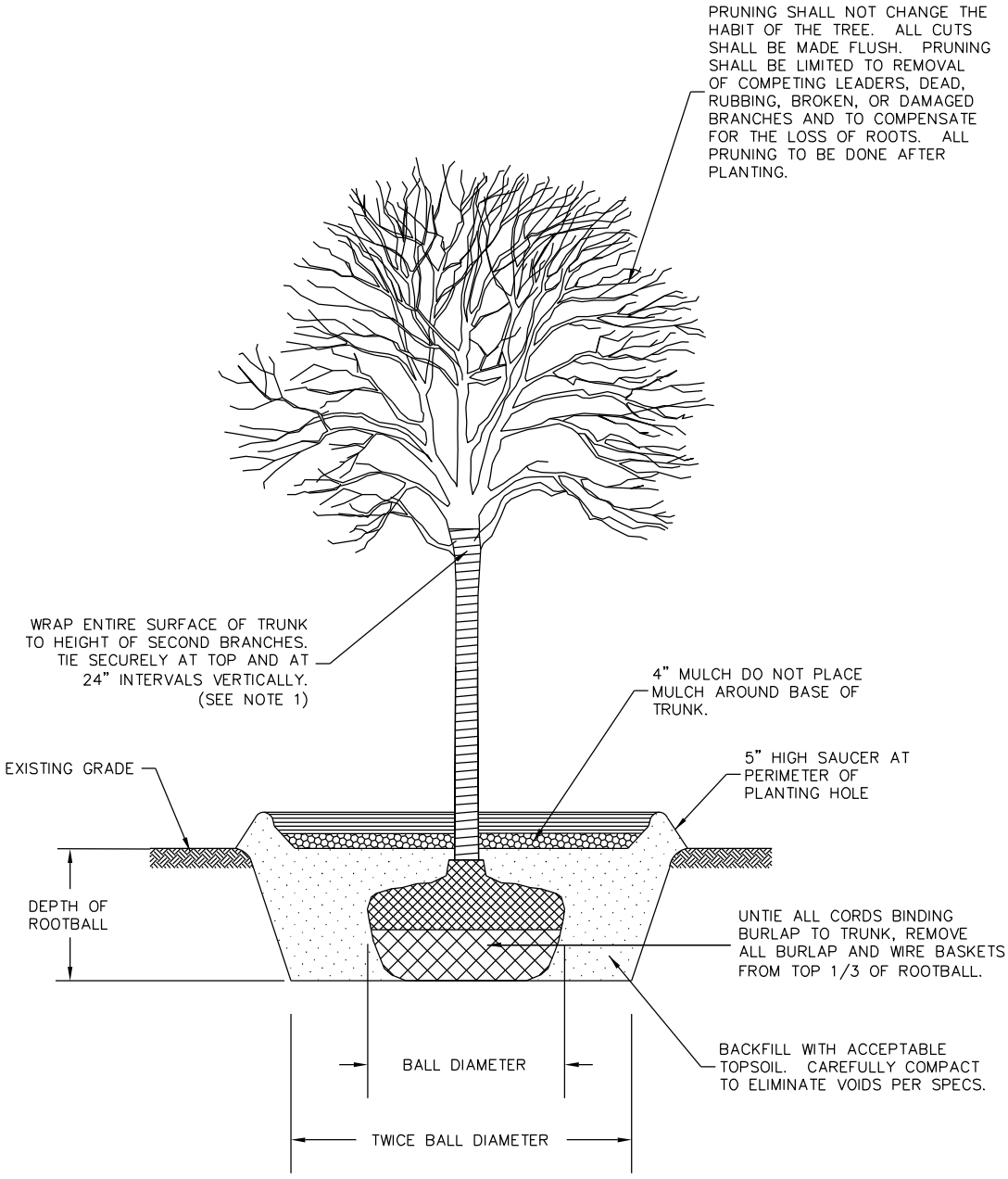
TYPICAL SECTION

TABLE FOR P. LINE WALL		
H + 12"	W	CU. YDS. PER LIN. FT.
3'	1.75	.153
4'	2.00	.222
5'	2.25	.301
6'	2.50	.388
7'	3.00	.518
8'	3.50	.667
9'	4.25	.875
10'	5.00	1.111
11'	5.75	1.374
12'	6.50	1.667
13'	7.25	1.986
14'	8.00	2.333

For standard details see Regulations of Sewer Construction and Stormwater Management:
http://www.cityofchicago.org/city/en/depts/water/provdrs/engineer/svcs/2009_sewer_constructionandstormwatermanagementrequirements.html

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	SEWER CONSTRUCTION AND STORMWATER MANAGEMENT REQUIREMENTS		
		DATE	SHEET	DRAWN BY
		12/28/06	A-4-1	CDOT



NOTES:

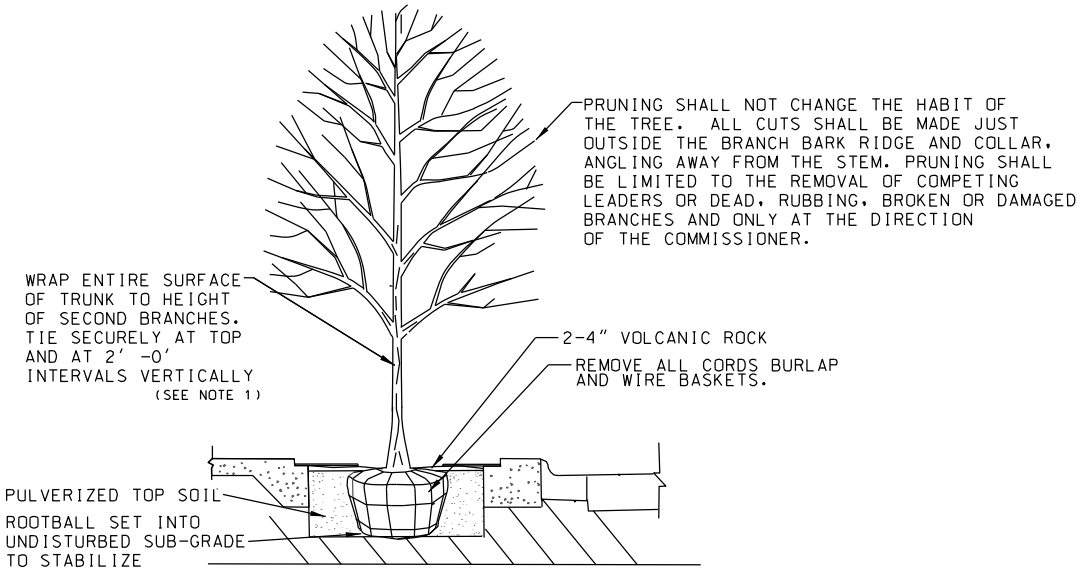
1. TREE WRAP SHOULD ONLY BE INSTALLED DURING THE FALL PLANTING SEASON. ON SPECIES SUSCEPTIBLE TO FROST, CRACKING OR SUN SCALD SUCH AS, BUT NOT LIMITED TO, THE FOLLOWING: ACER, POPULAS, TILIA, LIRIODENDRON AND FRAXINUS AMERICANA.

2. CONTRACTOR SHALL NOT LIFT TREE BY WIRE BASKET OR TRUNK.

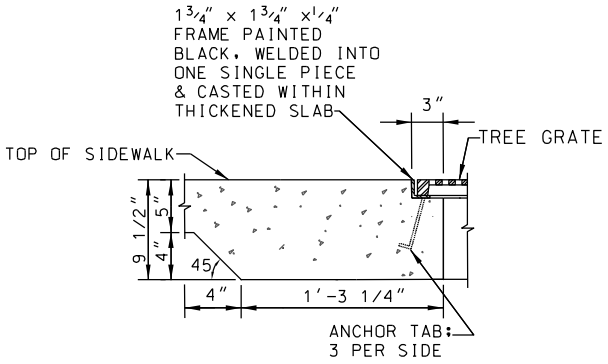
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	TREE PLANTING DETAIL IN PARKWAY		
		DATE	SHEET	DRAWN BY
		01/11/07	A-5-1	CDOT

TREE PIT OPENING 5'-0" X 5'-0"



TREE PLANTING - CROSS SECTION
N.T.S.



DETAIL A - GRATE FRAME AT THICKENED SLAB
N.T.S.

NOTES:

1. TREE WRAP SHOULD ONLY BE INSTALLED DURING THE FALL PLANTING SEASON ON SPECIES SUSCEPTIBLE TO FROST, CRACKING OR SUN SCALD SUCH AS, BUT NOT LIMITED TO, THE FOLLOWING : ACER, POPULAS, TILIA, LIRIODENDRON AND FRAXINUS AMERICANA.

2. SEE PLANTING SPECIFICATION FOR BACKFILL MATERIAL.

3. CONTRACTOR SHALL NOT LIFT TREE BY WIRE BASKET OR TRUNK.

4. VOLCANIC ROCK MULCH AND PULVERIZED TOPSOIL ARE ALL INCIDENTAL TO TREE (IN PARKWAY OR TREEPIT).

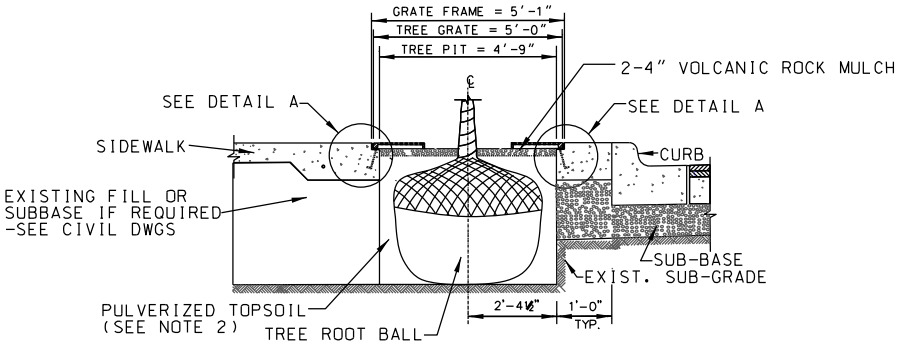
5. STRUCTURAL SOIL IS TO BE PLACED ON EXISTING SUBGRADE AT 12" THICK BELOW THE PROPOSED SIDEWALK. IT SHALL BE PLACED IN 5' BANDS BETWEEN A GROUPING OF TREE PITS ENDING 6' PAST THE CENTER OF THE LAST TREES IN THE GROUP.

6. HAND EXCAVATION IS REQUIRED AT LEAST 18 INCHES ON EITHER SIDE OF A MARKED FACILITY. CONTRACTOR/EXCAVATOR IS EXPECTED TO HONOR ALL TIME/MARKING REQUIREMENTS AND DIG IN A REASONABLE AND PRUDENT MANNER, TAKING ALL REASONALBE AND REQUIRED PRECAUTIONS TO AVOID DAMAGING UNDERGROUND FACILITIES. IF DAMAGE TO AN UNDERGROUND FACILITY SHOULD OCCUR, IMMEDIATELY CALL CUAN AT (312) 744-7000 TO REPORT THE DAMAGE. THE CONTRACTOR MUST ALSO IMMEDIATELY NOTIFY THE OWNER OF THE DAMAGED FACILITY.

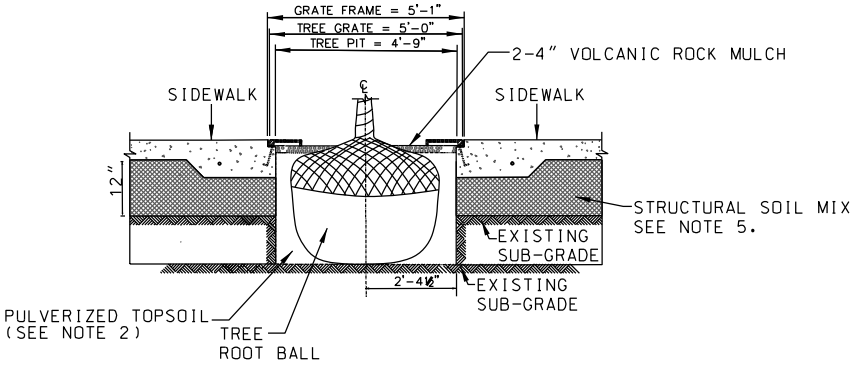
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	TREE PIT DETAIL		
		DATE	SHEET	DRAWN BY
		01/11/07	A-5-2	CDOT

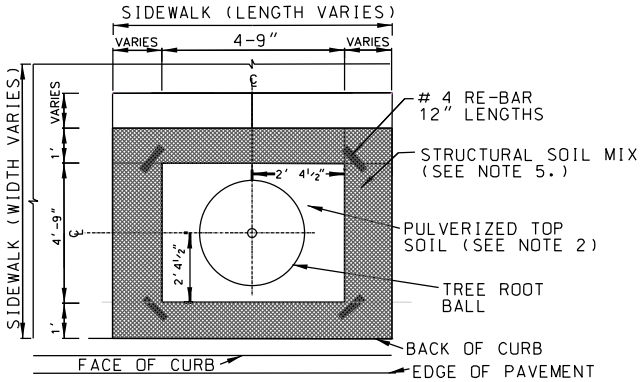
TREE PIT OPENING 5'-0" X 5'-0"



TREE PIT - CROSS SECTION (WITH STEEL TREE GRATE FRAME)
N.T.S.



TREE PIT - LONGITUDINAL SECTION (WITH STEEL TREE GRATE FRAME)
N.T.S.



TREE PIT - PLAN VIEW STRUCTURAL SOIL
N.T.S.

NOTES:

1. TREE WRAP SHOULD ONLY BE INSTALLED DURING THE FALL PLANTING SEASON ON SPECIES SUSCEPTIBLE TO FROST. CRACKING OR SUN SCALD SUCH AS. BUT NOT LIMITED TO. THE FOLLOWING : ACER. POPULAS. TILIA. LIRIODENDRON AND FRAXINUS AMERICANA.

2. SEE PLANTING SPECIFICATION FOR BACKFILL MATERIAL.

3. CONTRACTOR SHALL NOT LIFT TREE BY WIRE BASKET OR TRUNK.

4. VOLCANIC ROCK MULCH AND PULVERIZED TOPSOIL ARE ALL INCIDENTAL TO TREE (IN PARKWAY OR TREEPIT).

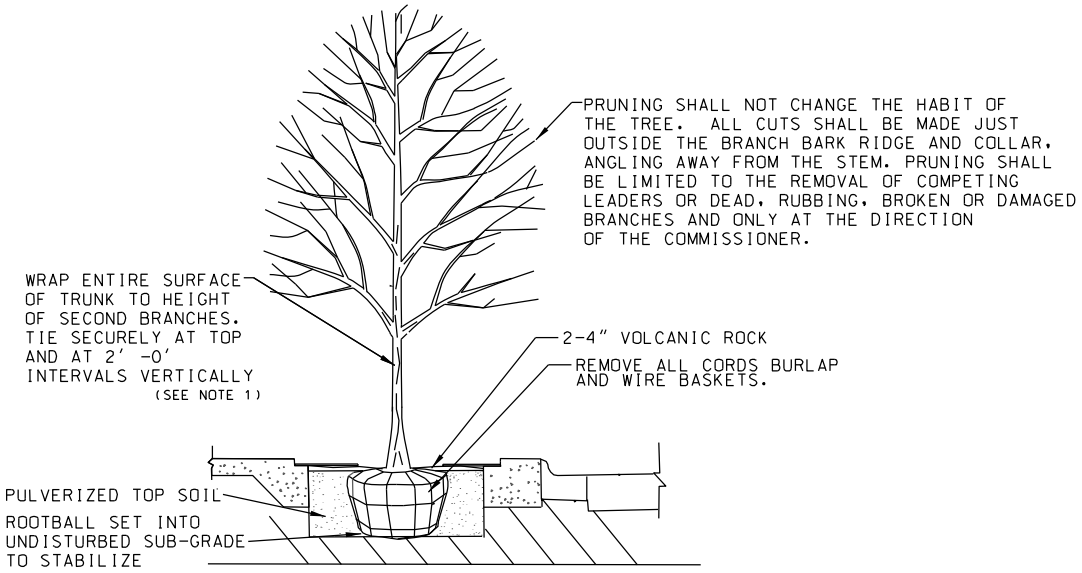
5. STRUCTURAL SOIL IS TO BE PLACED ON EXISTING SUBGRADE AT 12" THICK BELOW THE PROPOSED SIDEWALK. IT SHALL BE PLACED IN 5' BANDS BETWEEN A GROUPING OF TREE PITS ENDING 6' PAST THE CENTER OF THE LAST TREES IN THE GROUP.

6. HAND EXCAVATION IS REQUIRED AT LEAST 18 INCHES ON EITHER SIDE OF A MARKED FACILITY. CONTRACTOR/EXCAVATOR IS EXPECTED TO HONOR ALL TIME/MARKING REQUIREMENTS AND DIG IN A REASONABLE AND PRUDENT MANNER. TAKING ALL REASONALBE AND REQUIRED PRECAUTIONS TO AVOID DAMAGING UNDERGROUND FACILITIES. IF DAMAGE TO AN UNDERGROUND FACILITY SHOULD OCCUR. IMMEDIATELY CALL CUAN AT (312) 744-7000 TO REPORT THE DAMAGE. THE CONTRACTOR MUST ALSO IMMEDIATELY NOTIFY THE OWNER OF THE DAMAGED FACILITY.

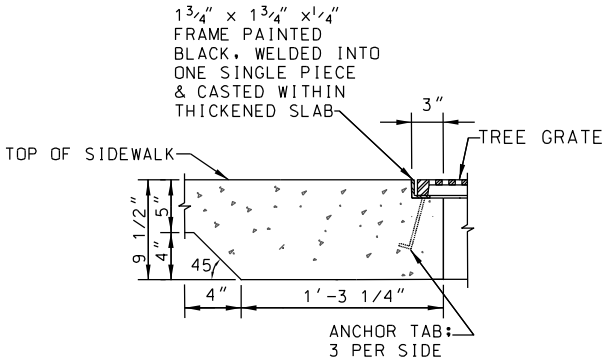
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	TREE PIT DETAIL		
		DATE	SHEET	DRAWN BY
		01/03/07	A-5-2A	CDOT

TREE PIT OPENING 5'-0" X 10'-0"



TREE PLANTING - CROSS SECTION
N.T.S.



DETAIL A - GRATE FRAME AT THICKENED SLAB
N.T.S.

NOTES:

1. TREE WRAP SHOULD ONLY BE INSTALLED DURING THE FALL PLANTING SEASON ON SPECIES SUSCEPTIBLE TO FROST, CRACKING OR SUN SCALD SUCH AS, BUT NOT LIMITED TO, THE FOLLOWING : ACER, POPULAS, TILIA, LIRIODENDRON AND FRAXINUS AMERICANA.

2. SEE PLANTING SPECIFICATION FOR BACKFILL MATERIAL.

3. CONTRACTOR SHALL NOT LIFT TREE BY WIRE BASKET OR TRUNK.

4. VOLCANIC ROCK MULCH AND PULVERIZED TOPSOIL ARE ALL INCIDENTAL TO TREE (IN PARKWAY OR TREEPIT).

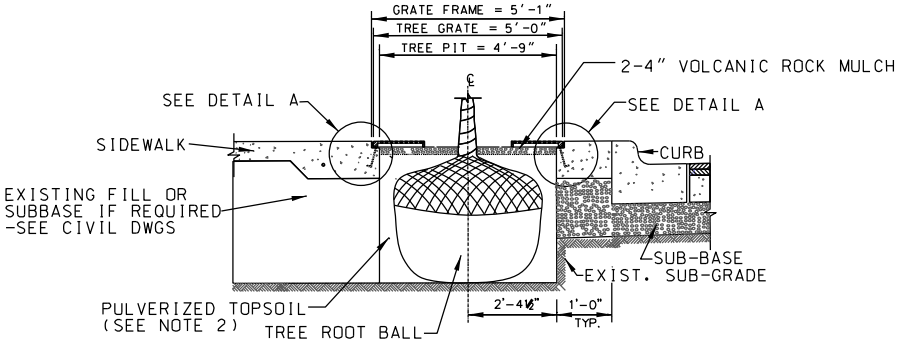
5. STRUCTURAL SOIL IS TO BE PLACED ON EXISTING SUBGRADE AT 12" THICK BELOW THE PROPOSED SIDEWALK. IT SHALL BE PLACED IN 5' BANDS BETWEEN A GROUPING OF TREE PITS ENDING 6' PAST THE CENTER OF THE LAST TREES IN THE GROUP.

6. HAND EXCAVATION IS REQUIRED AT LEAST 18 INCHES ON EITHER SIDE OF A MARKED FACILITY. CONTRACTOR/EXCAVATOR IS EXPECTED TO HONOR ALL TIME/MARKING REQUIREMENTS AND DIG IN A REASONABLE AND PRUDENT MANNER, TAKING ALL REASONALBE AND REQUIRED PRECAUTIONS TO AVOID DAMAGING UNDERGROUND FACILITIES. IF DAMAGE TO AN UNDERGROUND FACILITY SHOULD OCCUR, IMMEDIATELY CALL CUAN AT (312) 744-7000 TO REPORT THE DAMAGE. THE CONTRACTOR MUST ALSO IMMEDIATELY NOTIFY THE OWNER OF THE DAMAGED FACILITY.

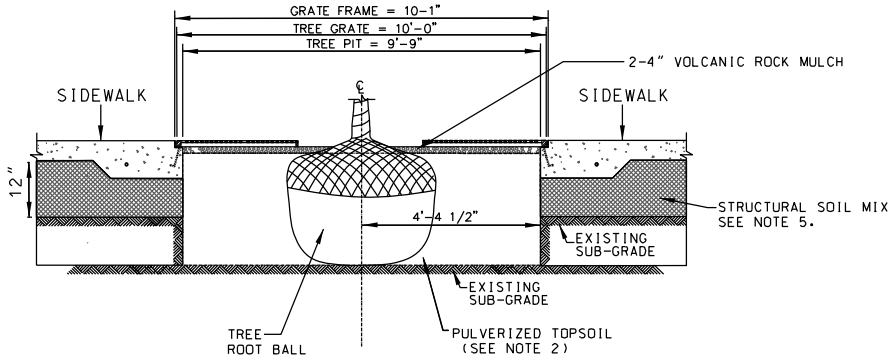
CDOT
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	TREE PIT DETAIL		
		DATE	SHEET	DRAWN BY
		01/03/07	A-5-2B	CDOT

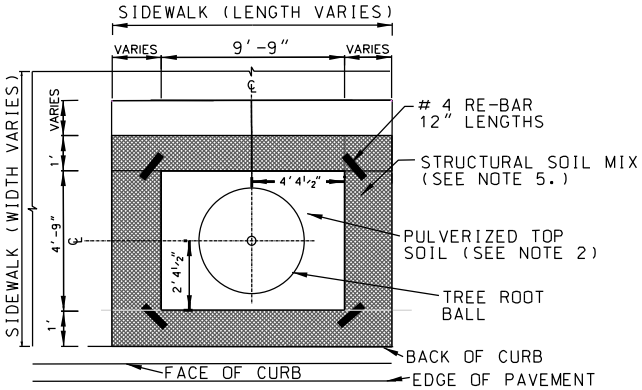
TREE PIT OPENING 5'-0" X 10'-0"



TREE PIT - CROSS SECTION
(WITH STEEL TREE GRATE FRAME)
N.T.S.



TREE PIT - LONGITUDINAL SECTION
(WITH STEEL TREE GRATE FRAME)
N.T.S.



TREE PIT - PLAN VIEW STRUCTURAL SOIL
N.T.S.

NOTES:

1. TREE WRAP SHOULD ONLY BE INSTALLED DURING THE FALL PLANTING SEASON ON SPECIES SUSCEPTIBLE TO FROST. CRACKING OR SUN SCALD SUCH AS. BUT NOT LIMITED TO. THE FOLLOWING : ACER. POPULAS. TILIA. LIRIODENDRON AND FRAXINUS AMERICANA.

2. SEE PLANTING SPECIFICATION FOR BACKFILL MATERIAL.

3. CONTRACTOR SHALL NOT LIFT TREE BY WIRE BASKET OR TRUNK.

4. VOLCANIC ROCK MULCH AND PULVERIZED TOPSOIL ARE ALL INCIDENTAL TO TREE (IN PARKWAY OR TREEPIT).

5. STRUCTURAL SOIL IS TO BE PLACED ON EXISTING SUBGRADE AT 12" THICK BELOW THE PROPOSED SIDEWALK. IT SHALL BE PLACED IN 5' BANDS BETWEEN A GROUPING OF TREE PITS ENDING 6' PAST THE CENTER OF THE LAST TREES IN THE GROUP.

6. HAND EXCAVATION IS REQUIRED AT LEAST 18 INCHES ON EITHER SIDE OF A MARKED FACILITY. CONTRACTOR/EXCAVATOR IS EXPECTED TO HONOR ALL TIME/MARKING REQUIREMENTS AND DIG IN A REASONABLE AND PRUDENT MANNER. TAKING ALL REASONALBE AND REQUIRED PRECAUTIONS TO AVOID DAMAGING UNDERGROUND FACILITIES. IF DAMAGE TO AN UNDERGROUND FACILITY SHOULD OCCUR. IMMEDIATELY CALL CUAN AT (312) 744-7000 TO REPORT THE DAMAGE. THE CONTRACTOR MUST ALSO IMMEDIATELY NOTIFY THE OWNER OF THE DAMAGED FACILITY.

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	TREE PIT DETAIL		
		DATE	SHEET	DRAWN BY
		01/03/07	A-5-2C	CDOT

TREE DIAMETER	DISTANCE OF TUNNEL FROM TREE TRUNK	DISTANCE OF OPEN BYPASS TRENCH FROM TREE TRUNK
INCHES	FEET	FEET
2	2	3
3	3	6
6	5*	10
12	6*	12
18	7*	14
24+	8*	16

* DEPENDENT ON PARKWAY WIDTH

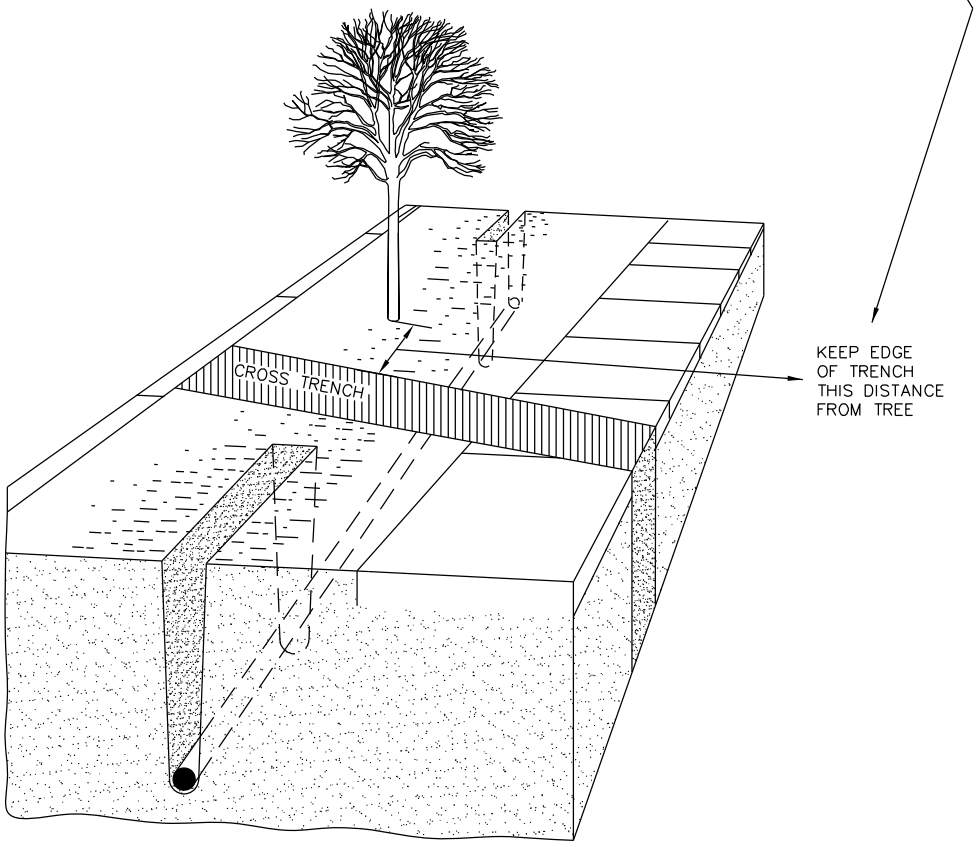
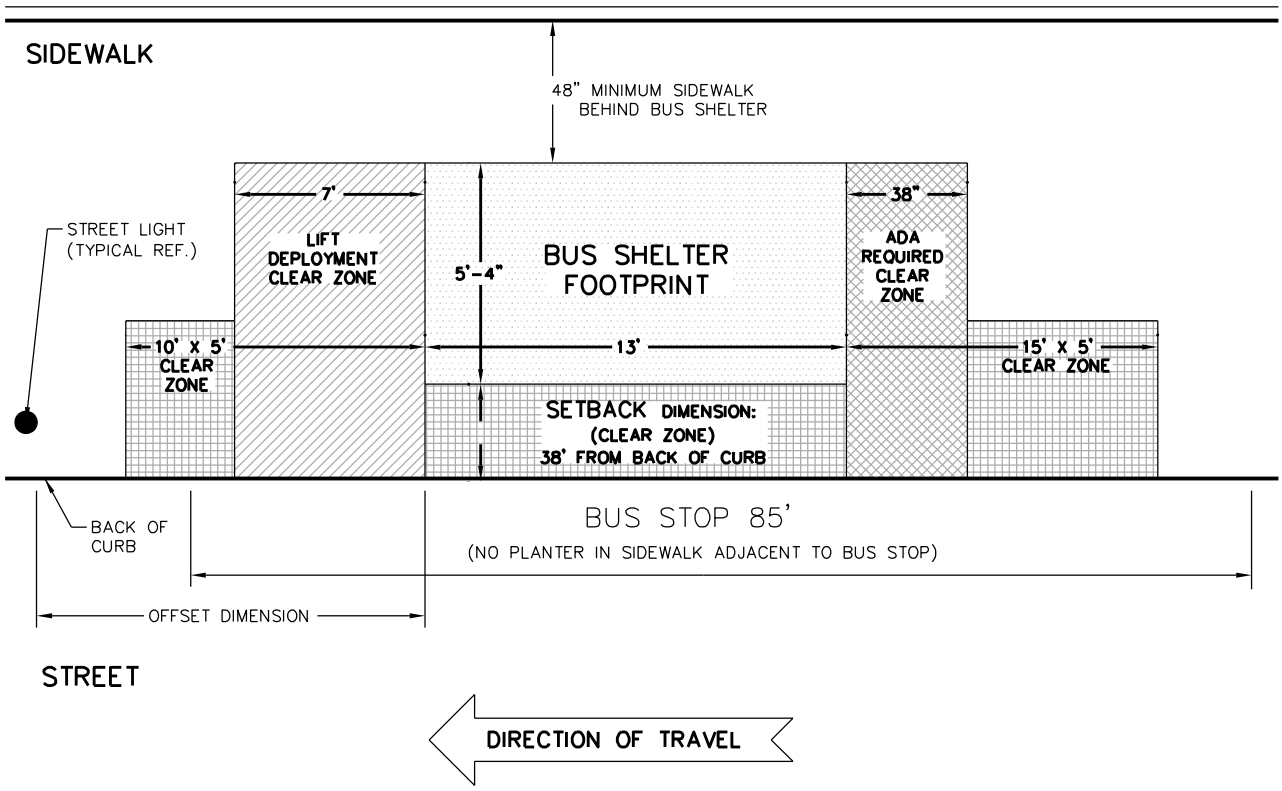


DIAGRAM ILLUSTRATING THE USE OF SOIL AUGERS IN THE PRESENCE OF TREES.

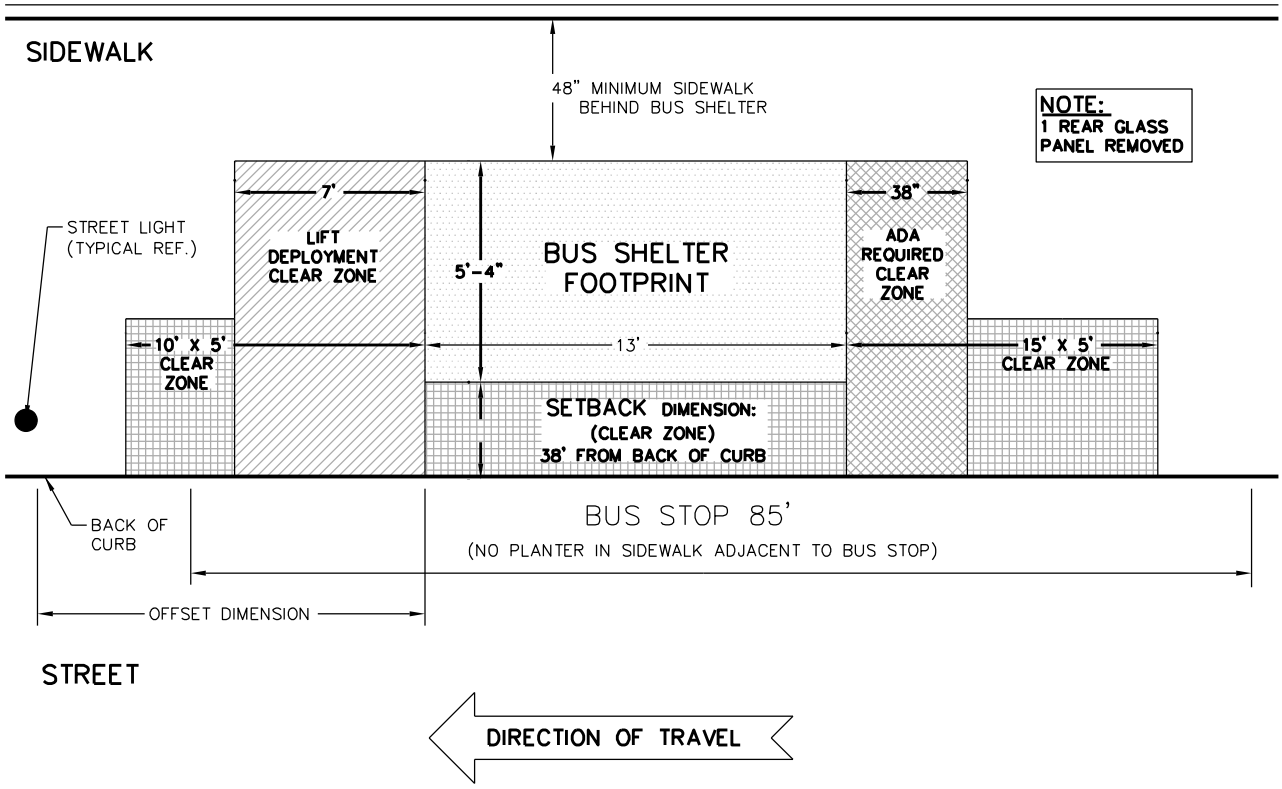
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	TRENCH GUIDELINES FOR INSTALLATION OF UNDERGROUND UTILITIES ADJACENT TO TREES		
		DATE	SHEET	DRAWN BY
		01/11/07	A-5-3	CDOT



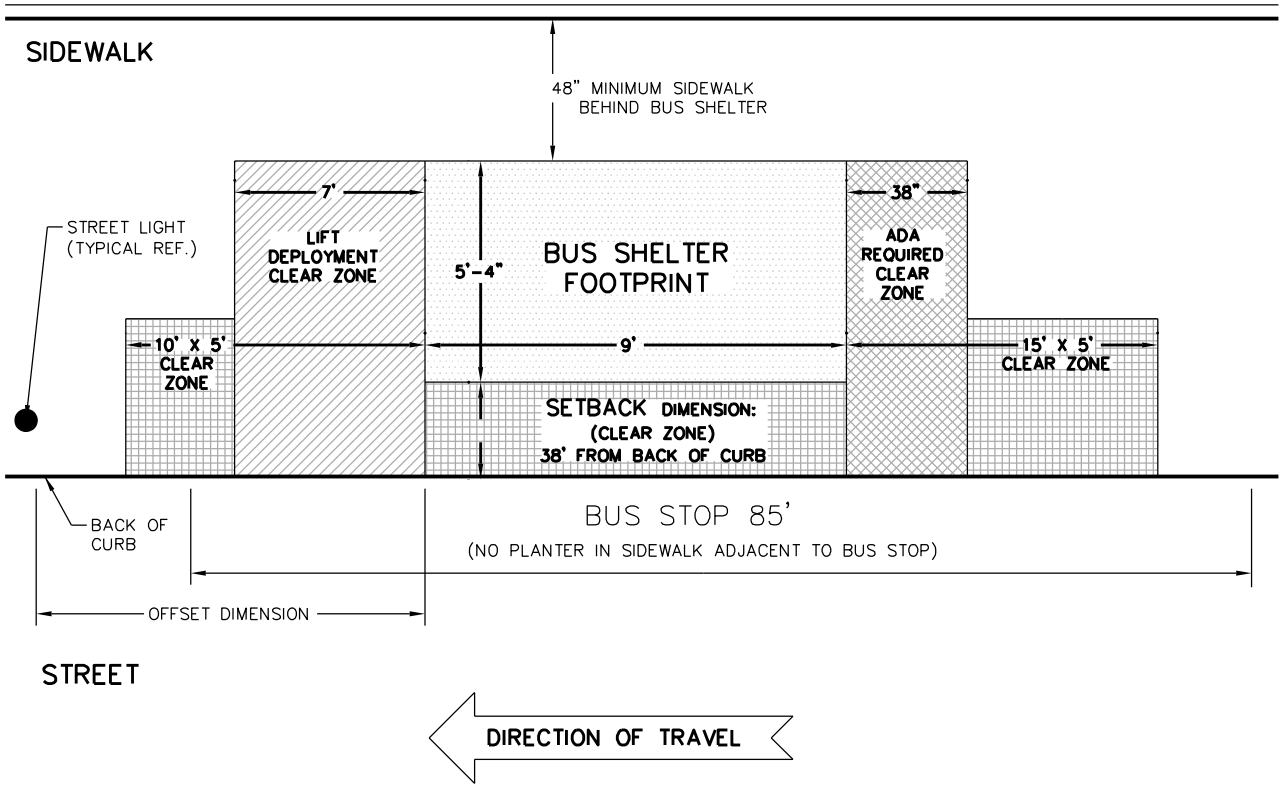
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	BUS SHELTER 3 SECTION-FULL SIZE NEW INSTALLATION		
		DATE	SHEET	DRAWN BY
		01/02/07	A-5-4A	CDOT



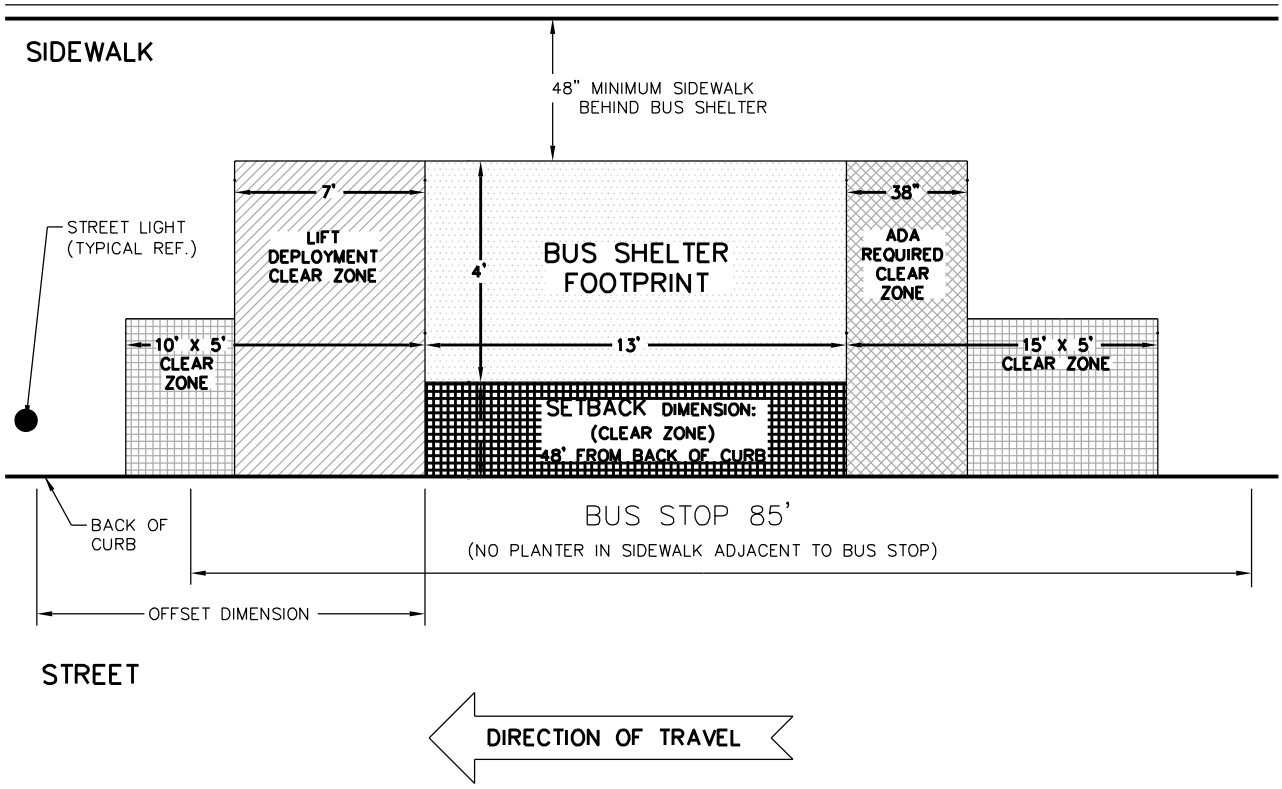
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	BUS SHELTER 3 SECTION - 1 GLASS PANEL REMOVED NEW INSTALLATION		
		DATE	SHEET	DRAWN BY
		01/02/07	A-5-4B	CDOT



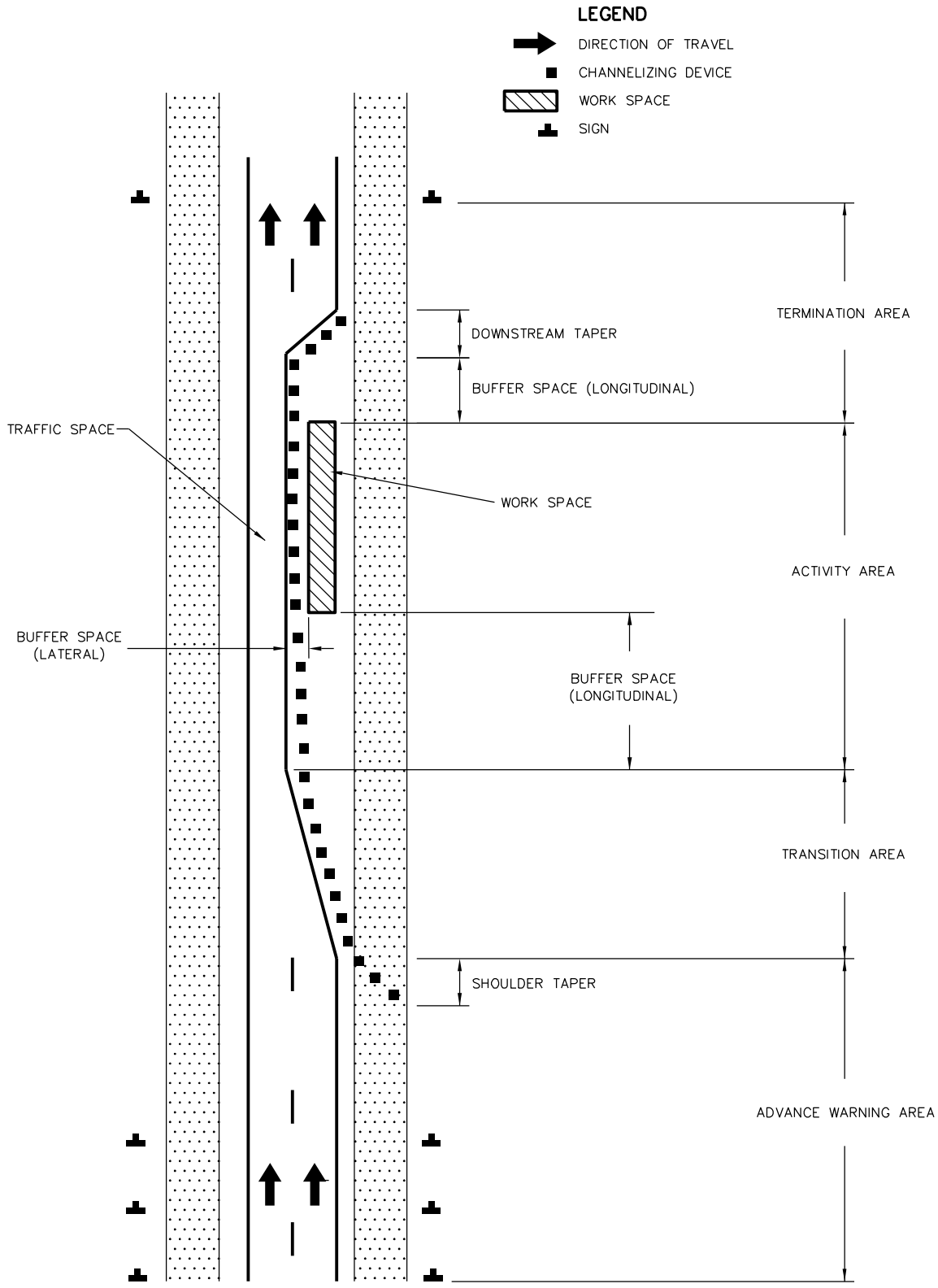
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	BUS SHELTER 2 SECTION - FULL SIZE NEW INSTALLATION		
		DATE	SHEET	DRAWN BY
		01/02/07	A-5-4C	CDOT



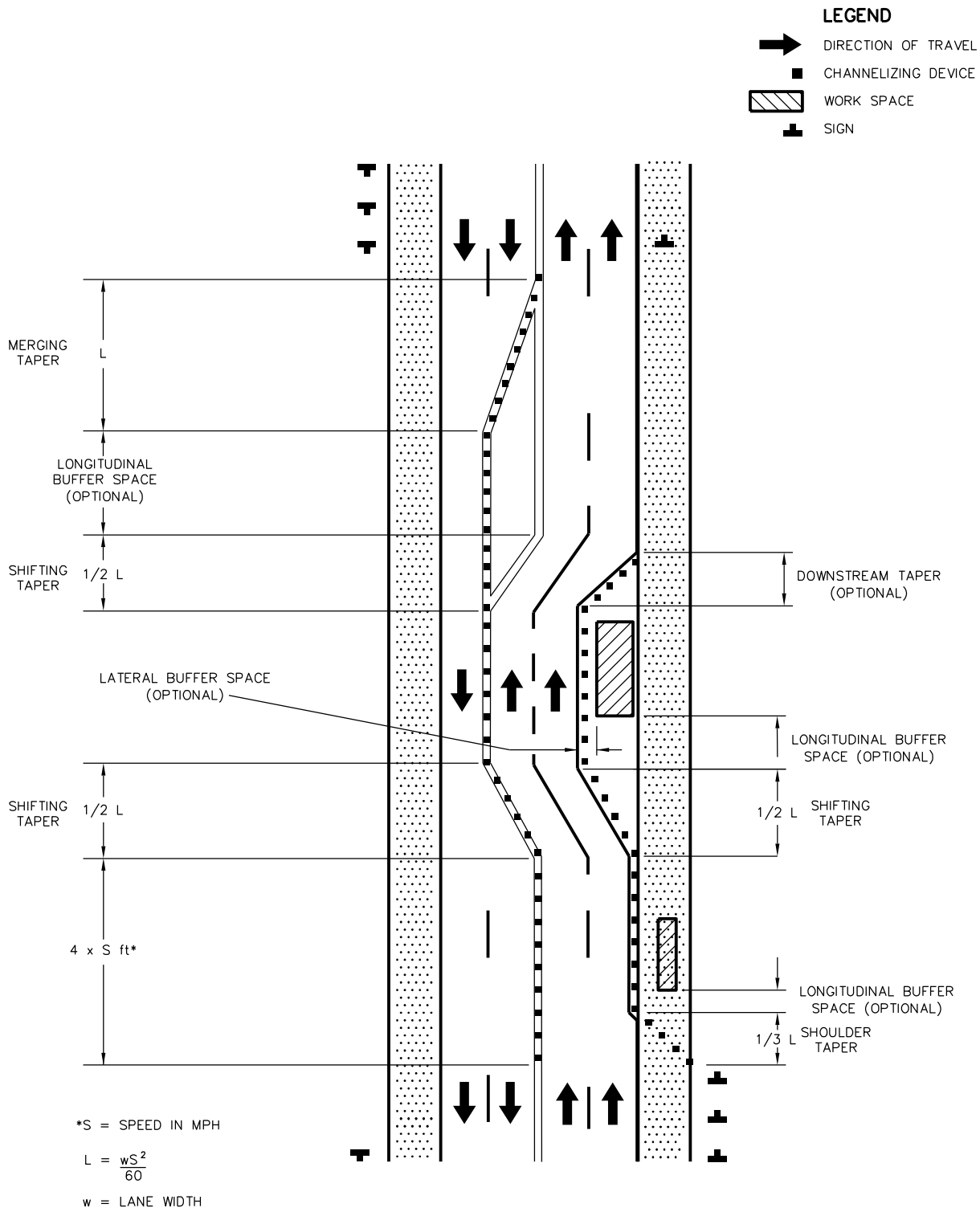
DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	BUS SHELTER 3 SECTION - NARROW SIZE NEW INSTALLATION		
		DATE	SHEET	DRAWN BY
		01/02/07	A-5-4D	CDOT

CHICAGO DEPARTMENT OF TRANSPORTATION



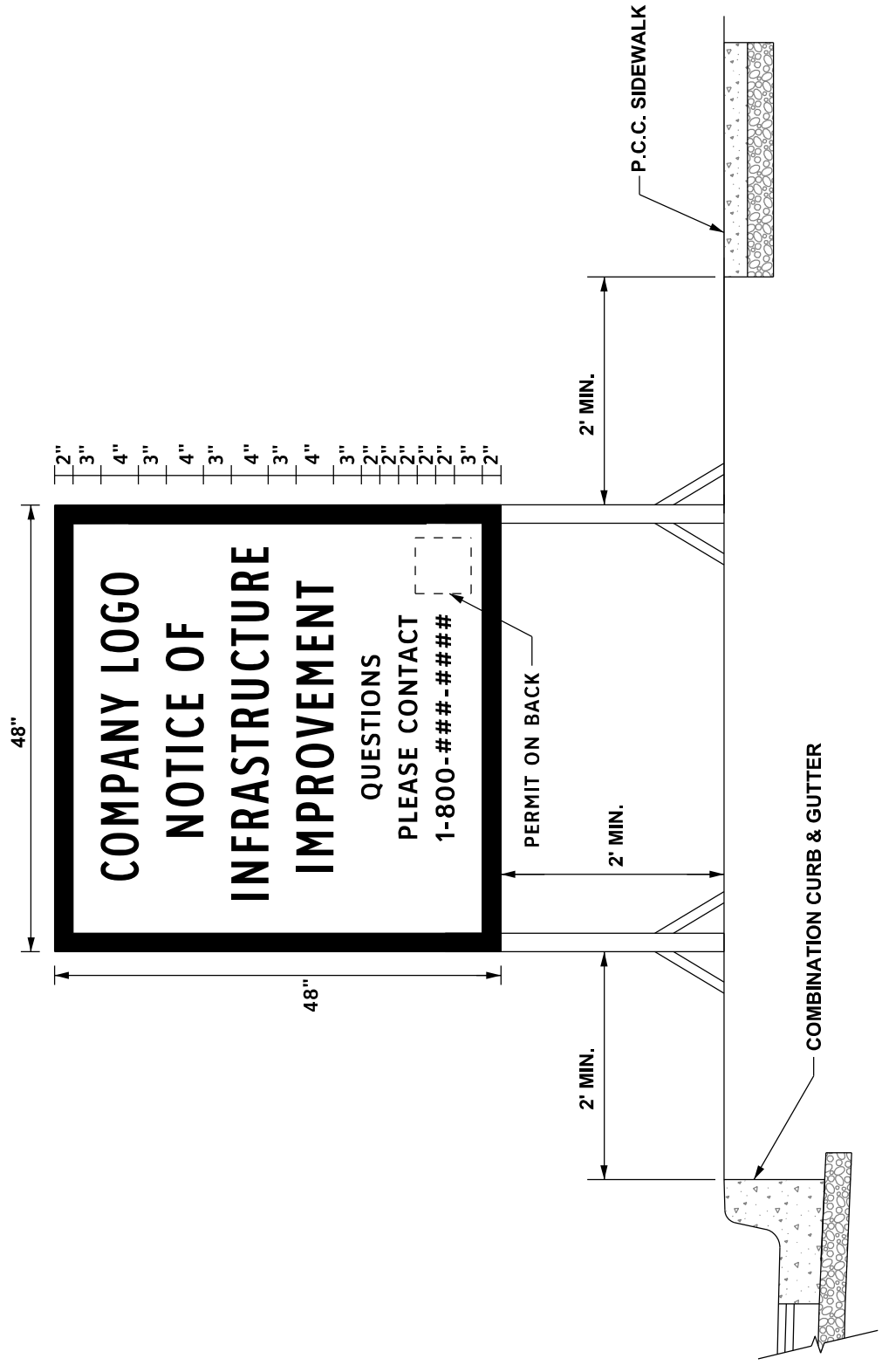
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
		COMPONENT PARTS OF A TEMPORARY TRAFFIC CONTROL ZONE		
		DATE	SHEET	DRAWN BY
		1/1/14	A-6-1A	CDOT



CHICAGO DEPARTMENT OF TRANSPORTATION

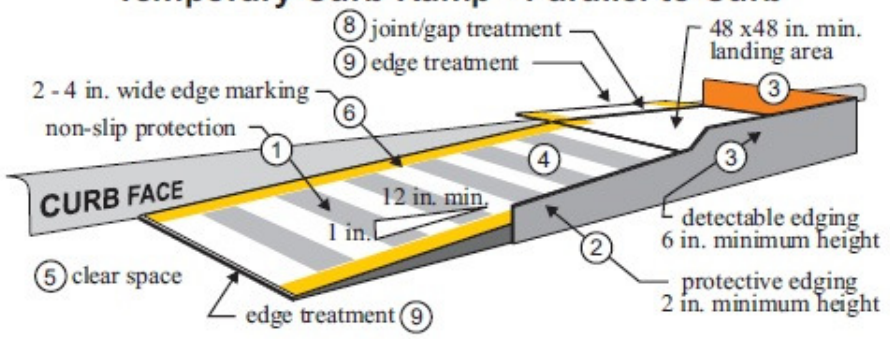
DATE	REVISION	CITY OF CHICAGO		
		COMPONENT PARTS OF A TEMPORARY TRAFFIC CONTROL ZONE		
		DATE	SHEET	DRAWN BY
		1/1/14	A-6-1B	CDOT



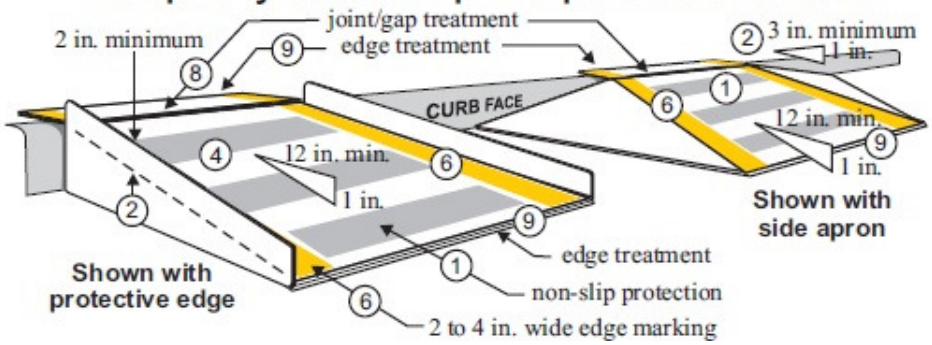
CDOT
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	TYPICAL CONSTRUCTION SIGN & PLACEMENT DETAIL		
		DATE	SHEET	DRAWN BY
		01/03/07	A-6-2	CDOT

Temporary Curb Ramp - Parallel to Curb



Temporary Curb Ramp - Perpendicular to Curb

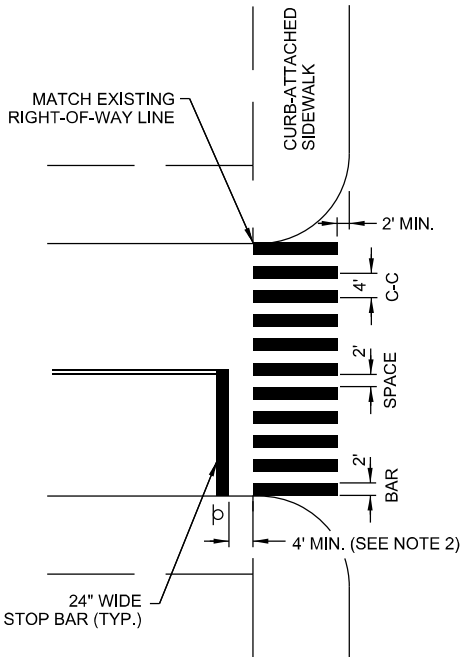


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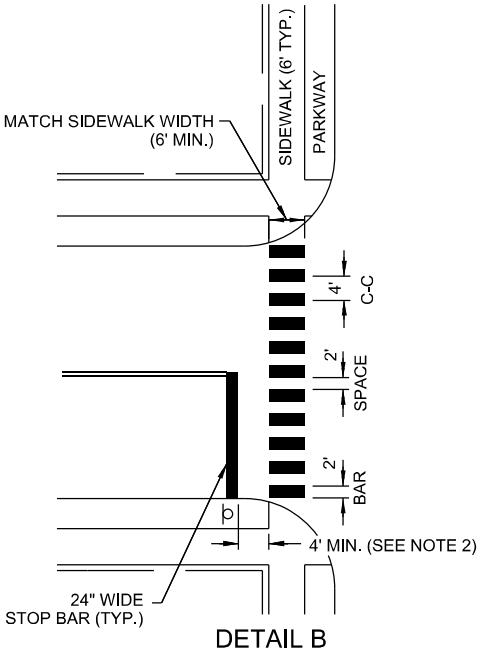
1. Curb ramps shall be 48 in. minimum width with a firm, stable and non-slip surface.
2. Protective edging with a 2 in. minimum height shall be installed when the curb ramp or landing platform has a vertical drop of 6 in. or greater or has a side apron slope steeper than 1:3 (33%). Protective edging should be considered when curb ramps or landing platforms have a vertical drop of 3 in. or more.
3. Detectable edging with 6 in. minimum height and contrasting color shall be installed on all curb ramp landings where the walkway changes direction (turns).
4. Curb ramps and landings should have a 1:50 (2%) max cross-slope.
5. Clear space of 48 x 48 in. minimum shall be provided above and below the curb ramp.
6. The curb ramp walkway edge shall be marked with a contrasting color 2 to 4 in. wide marking. The marking is optional where color contrasting edging is used.
7. Water flow in the gutter system shall have minimal restriction.
8. Lateral joints or gaps between surfaces shall be less than 0.5 in. width.
9. Changes between surface heights should not exceed 0.5 in. Lateral edges should be vertical up to 0.25 in. high, and beveled at 1:2 between 0.25 in. and 0.5 in. height.

CHICAGO DEPARTMENT OF TRANSPORTATION

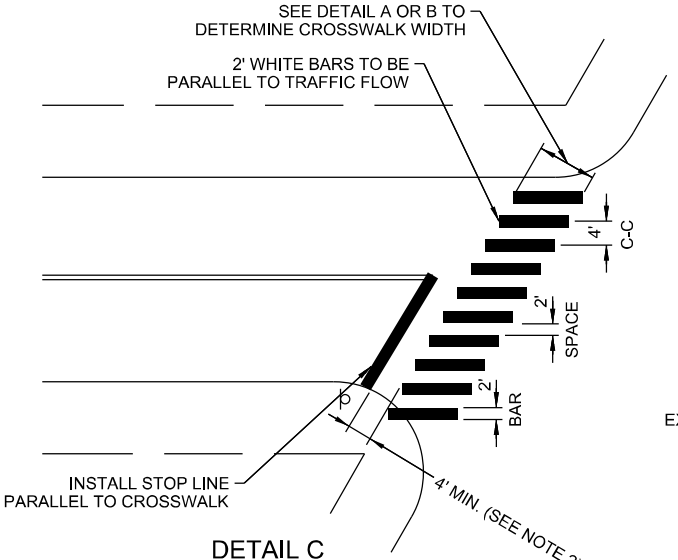
DATE	REVISION	CITY OF CHICAGO		
		TYPICAL TEMPORARY ADA RAMP		
		DATE	SHEET	DRAWN BY
		01/01/14	A-6-3	CDOT



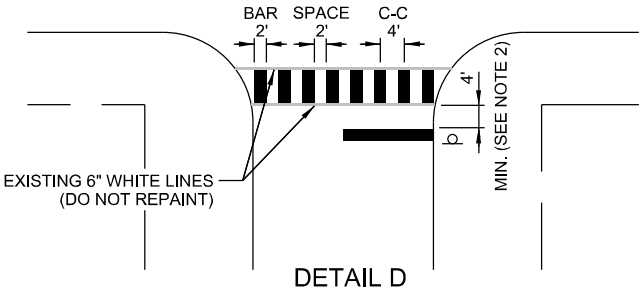
DETAIL A
CONTINENTAL CROSSWALK
CURB-ATTACHED SIDEWALK



DETAIL B
CONTINENTAL CROSSWALK
SIDEWALK AND PARKWAY



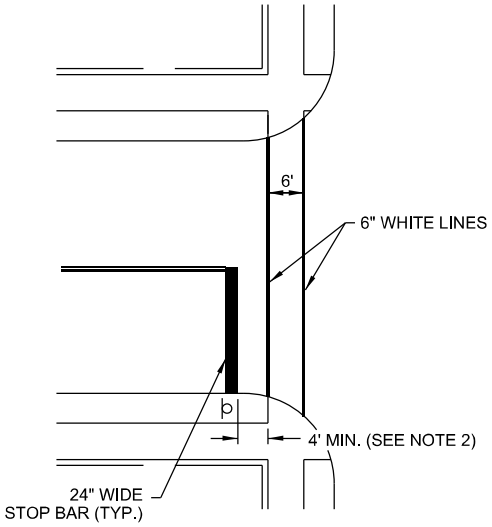
DETAIL C
CONTINENTAL CROSSWALK
SKEWED INTERSECTION



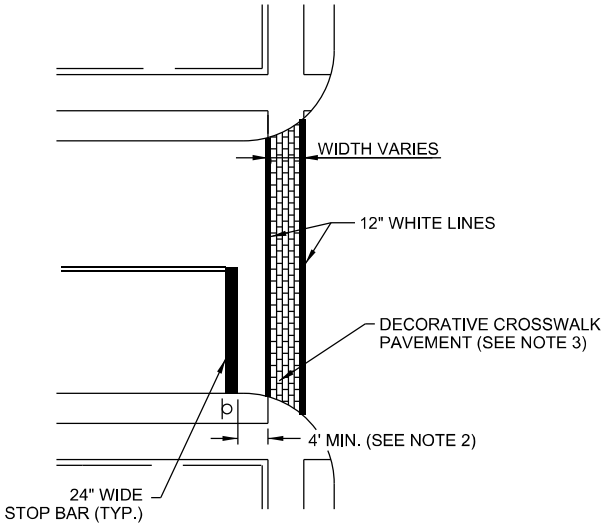
DETAIL D
LADDER CROSSWALK

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	CROSSWALK MARKING DETAIL		
		DATE	SHEET	DRAWN BY
		06/25/12	A-7-1A	CDOT



DETAIL E
TRANSVERSE LINE CRSSWALK



DETAIL F
DECORATIVE CRSSWALK

GENERAL NOTES:

1. DO NOT INSTALL NEW CROSSWALKS ACROSS ARTERIAL OR COLLECTOR STREETS WITHOUT COORDINATING WITH CDOT TRAFFIC ENGINEERS.

2. STOP LINE SHOULD BE PLACED A MINIMUM OF 4' IN ADVANCE OF A CROSSWALK. AT THE ENGINEER'S DISCRETION, THE STOP BAR MAY BE MORE THAN 4' FROM THE CROSSWALK TO AVOID ENCROACHMENT BY TURNING VEHICLES.

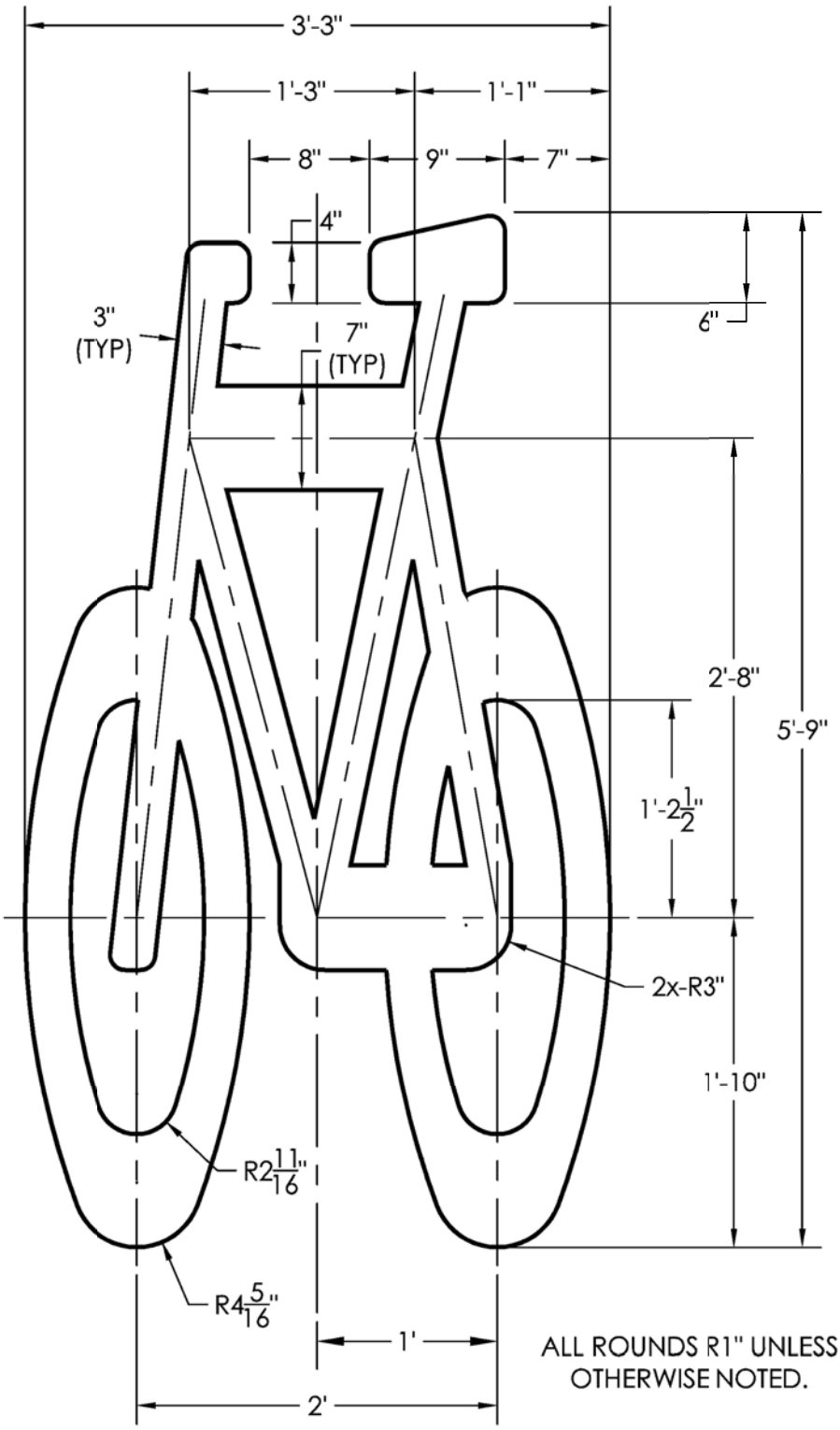
3. ALL RESTORATION OF DECORATIVE CROSSWALK PAVEMENT SHALL BE COORDINATED WITH CDOT PROJECT DEVELOPMENT

4. STRIPING SHOULD BE PLACED TO AVOID WHEEL PATHS FOR LONGEVITY.

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	CROSSWALK MARKING DETAIL		
		DATE	SHEET	DRAWN BY
		06/25/12	A-7-1B	CDOT

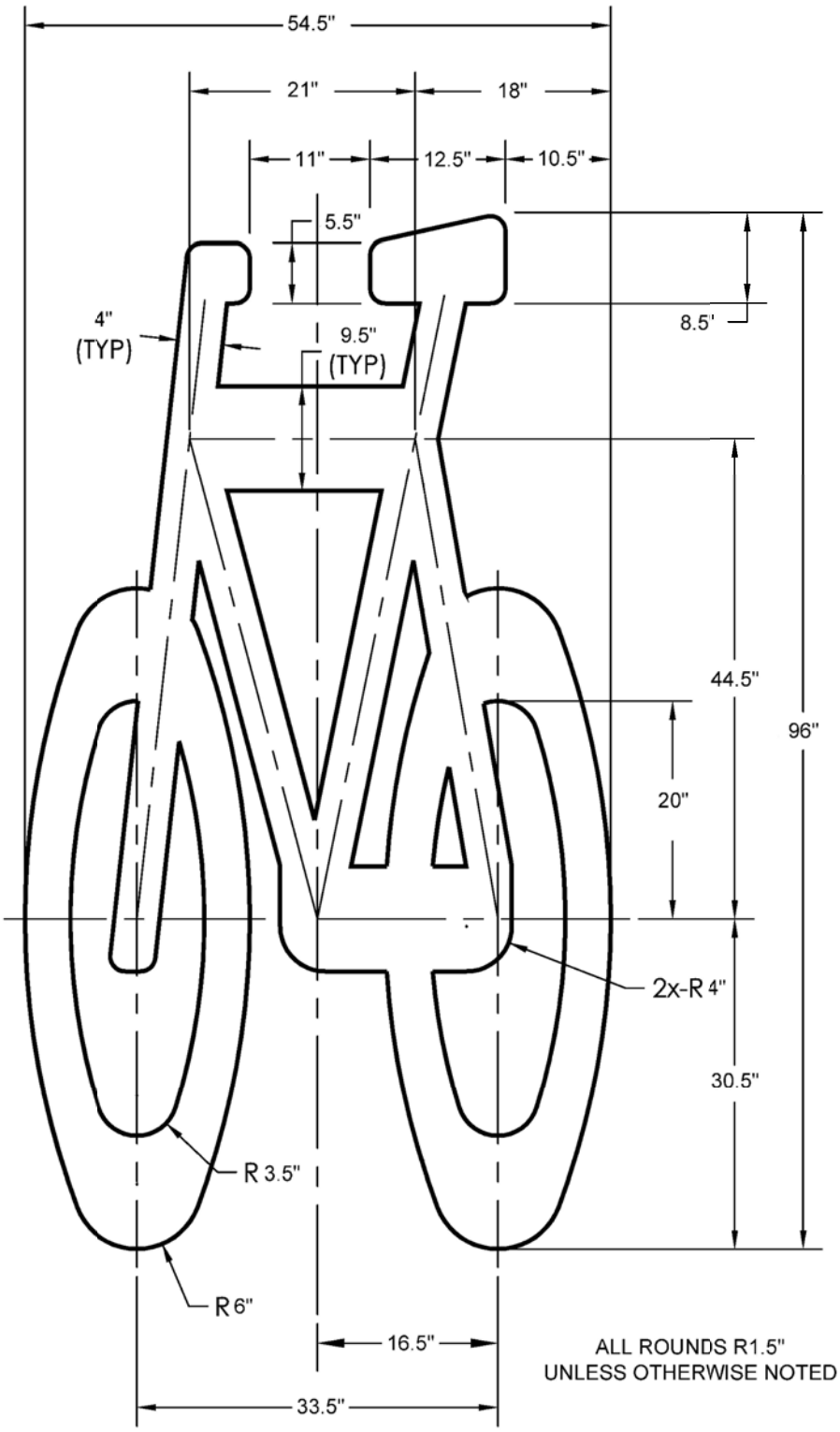
AREA = 8.36 ft²



CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	6' BIKE SYMBOL		
		DATE	SHEET	DRAWN BY
		06/25/12	A-7-2	CDOT

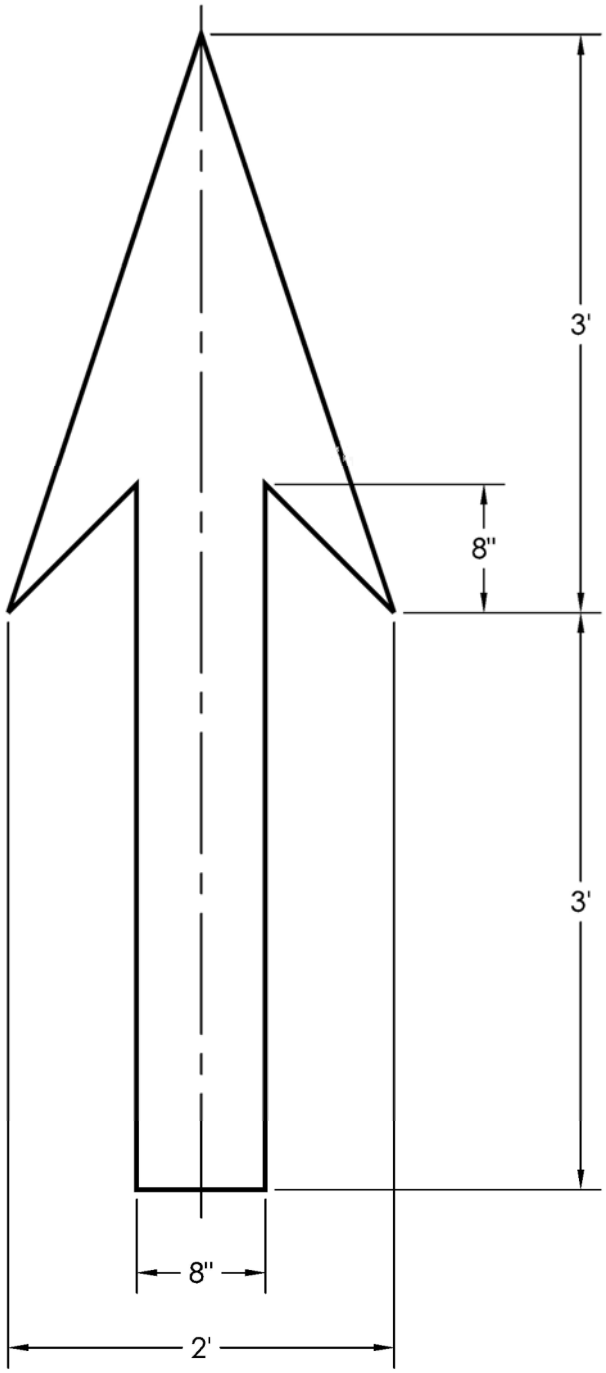
AREA = 16.2 ft²



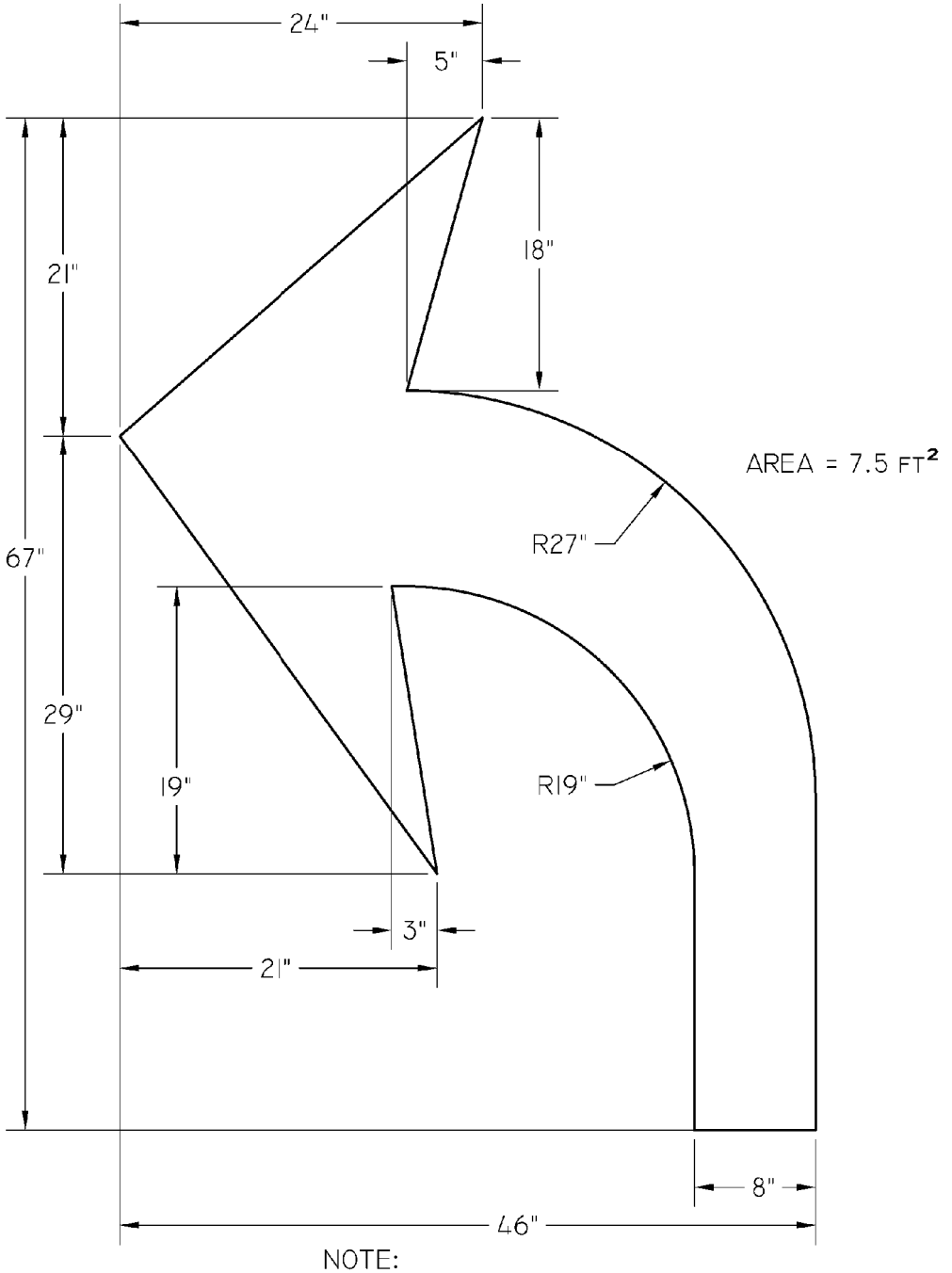
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	8' BIKE SYMBOL		
		DATE	SHEET	DRAWN BY
		06/25/12	A-7-3	CDOT

AREA = 4.56 ft²



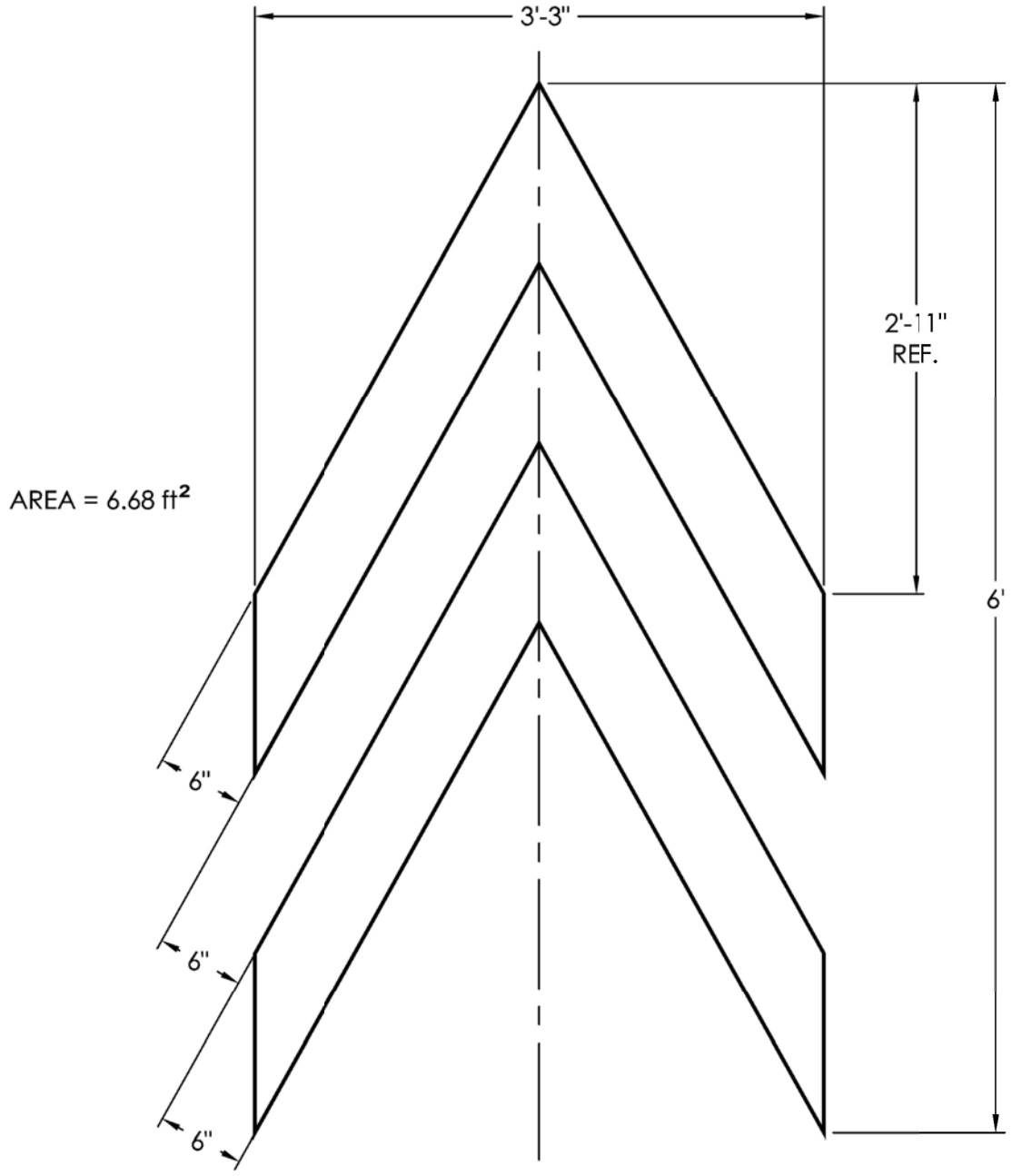
	DATE	REVISION	CITY OF CHICAGO		
CDOT CHICAGO DEPARTMENT OF TRANSPORTATION	1/1/2014	REVISION 1	BIKE ARROW		
			DATE	SHEET	DRAWN BY
			06/25/12	A-7-4	CDOT



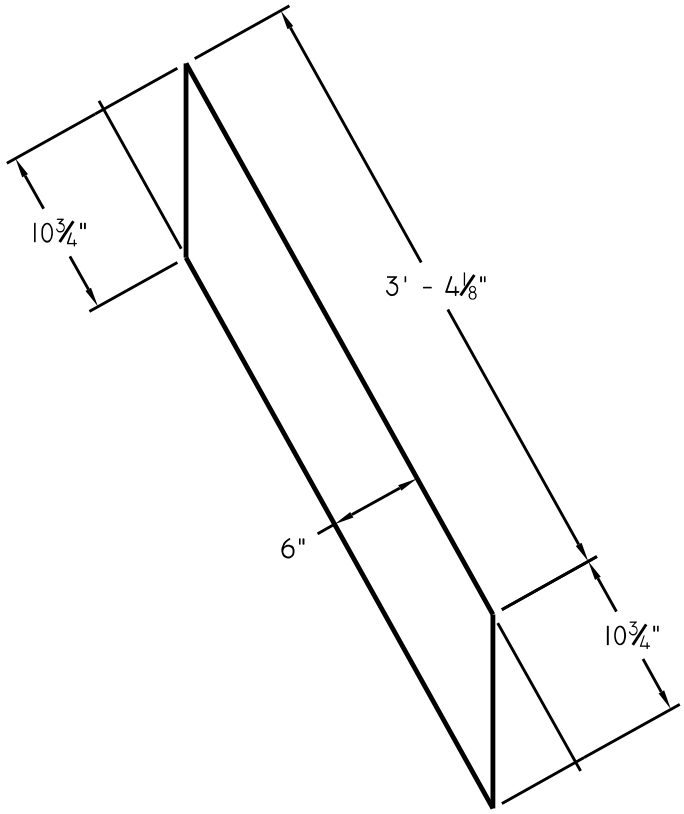
NOTE:
THIS SPECIFICATION REPRESENTS THE BIKE LEFT TURN ARROW. FOR A BIKE RIGHT TURN ARROW, USE A MIRROR IMAGE.

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	BIKE TURN ARROW		
		DATE	SHEET	DRAWN BY
		06/25/12	A-7-5	CDOT



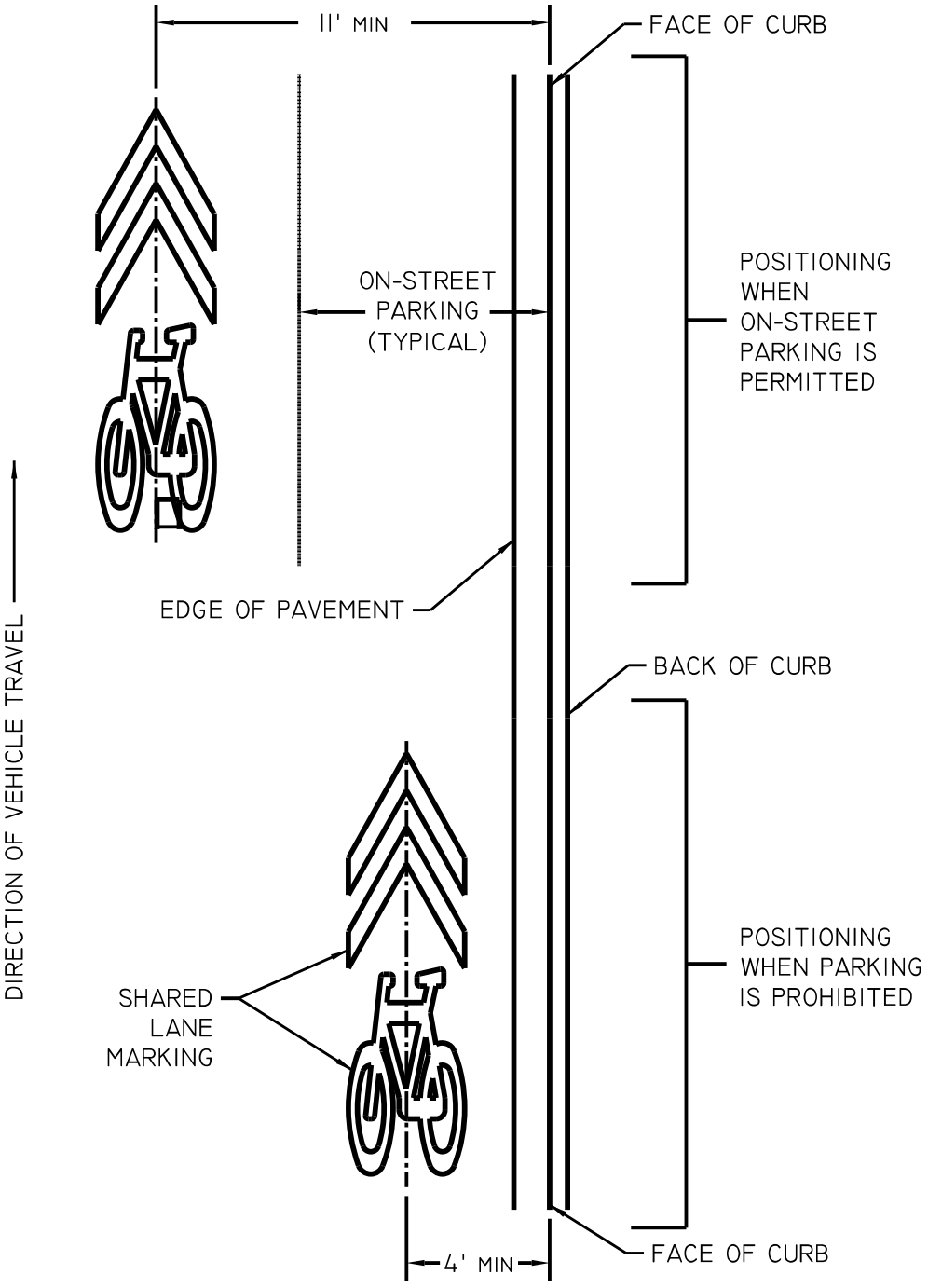
	DATE	REVISION	CITY OF CHICAGO		
CDOT CHICAGO DEPARTMENT OF TRANSPORTATION	1/1/2014	REVISION 1	BIKE CHEVRON		
			DATE	SHEET	DRAWN BY
			06/25/12	A-7-6	CDOT



NOTE:
1. THESE DIMENSIONS SHOULD BE CONSIDERED AN APPROXIMATION, TO BE USED WHEN THE CHEVRON IS CUT, IN THE FIELD, FROM 6" PREFORMED THERMOPLASTIC MARKING.
2. THIS DRAWING REPRESENTS THE RIGHT LEG OF THE CHEVRON. MIRROR THIS DRAWING FOR THE CHEVRON'S LEFT LEG.

CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	SHARED LANE MARKING CHEVRON RIGHT LEG DETAIL		
		DATE	SHEET	DRAWN BY
		10/24/05	A-7-7	CDOT



CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	SHARED LANE MARKING LATERAL POSITIONING		
		DATE	SHEET	DRAWN BY
		09/15/05	A-7-8	CDOT



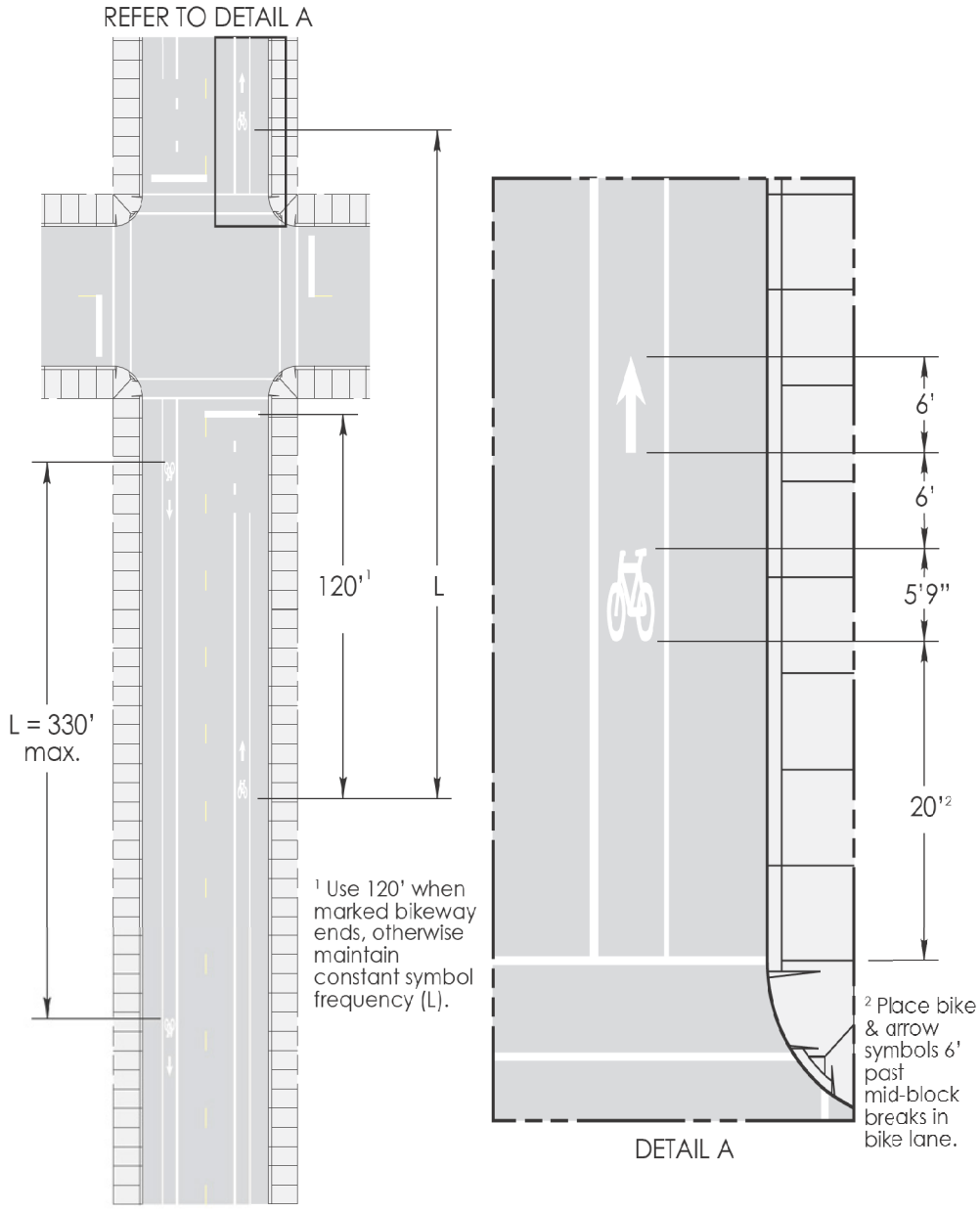
* FHWA Series 2000 Standard Alphabets

Refer to FHWA Standard Highway Signs manual for symbol detail.

Colors: Legend -Black
Background -Orange

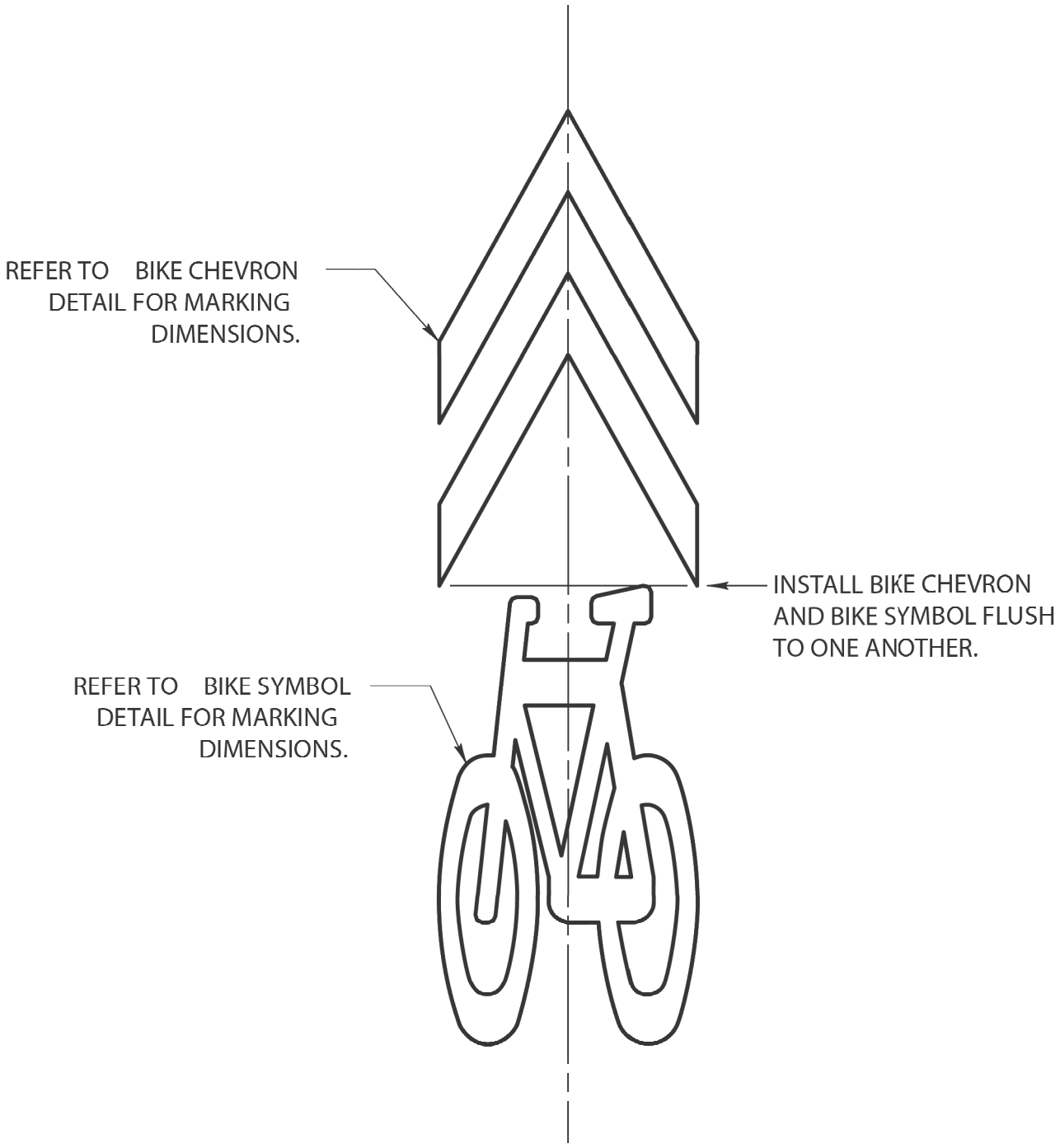
CDOT
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
		SHARED LANE YIELD TO BIKES SIGN		
		DATE	SHEET A-7-9	DRAWN BY
		1/1/14		CDOT



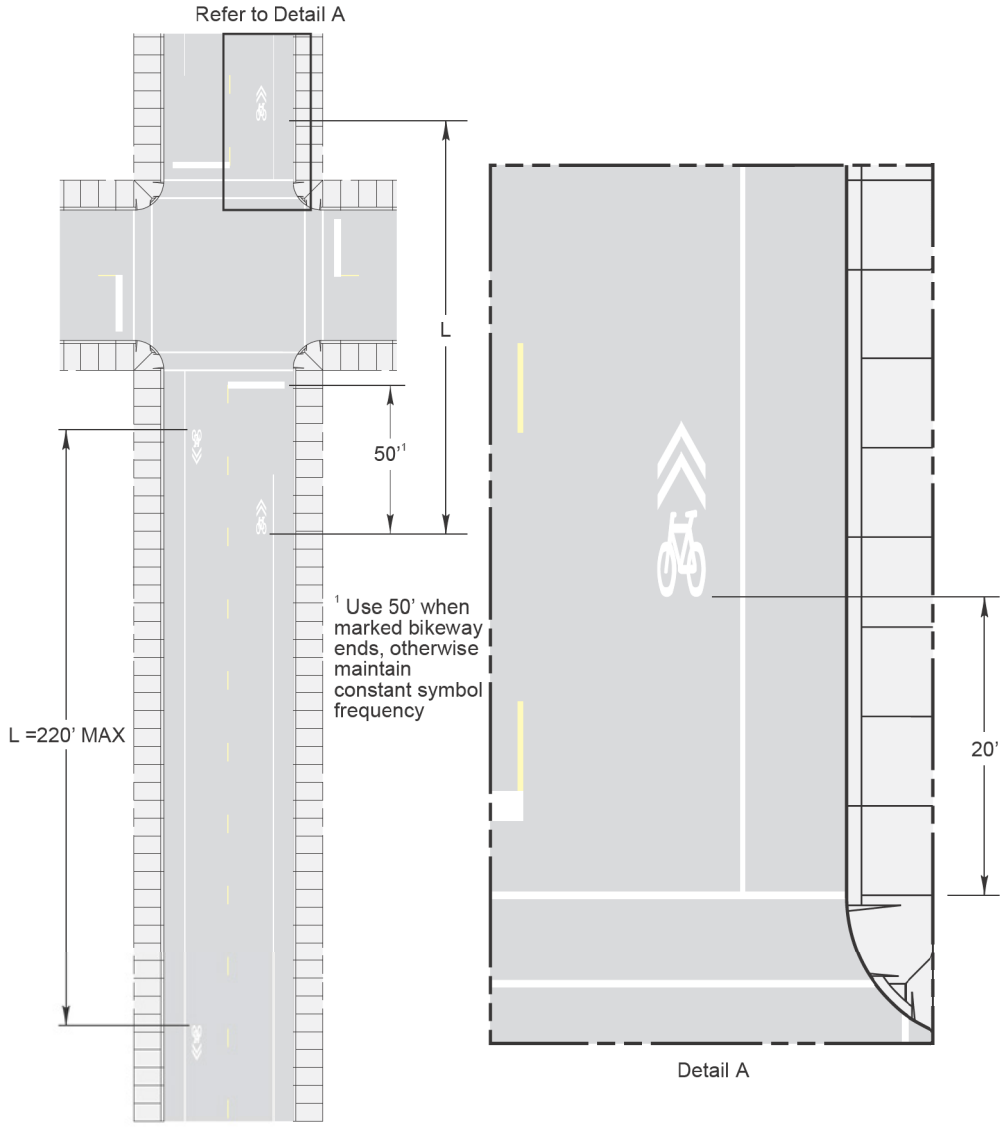
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	BIKE AND ARROW SYMBOL SPACING		
		DATE	SHEET	DRAWN BY
		09/02/05	A-7-10	CDOT



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DATE	REVISION	CITY OF CHICAGO		
1/1/2014	REVISION 1	SHARED LANE MARKING		
		DATE	SHEET	DRAWN BY
		10/02/07	A-7-11	CDOT



	DATE	REVISION	CITY OF CHICAGO		
CDOT CHICAGO DEPARTMENT OF TRANSPORTATION	1/1/2014	REVISION 1	SHARED LANE MARKING - LONGITUDINAL SPACING		
			DATE	SHEET A-7-12	DRAWN BY
			12/12/07		CDOT

APPENDIX B:
ADA STANDARDS

Provided hereinafter are the latest Department of Transportation ADA Standards which must be followed for infrastructure construction in the Public Way. Please be advised that these may be revised without notice because of new standards and regulations imposed by the Federal, State and Local Governments.

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APPENDIX B
REQUIREMENTS FOR OPENINGS, CONSTRUCTION AND REPAIR IN THE PUBLIC WAY

ADA STANDARDS

Department of Transportation

REVISION		REVISION	
1.	DATE - 02/20/2007	5.	DATE - 08/10/2012
2.	DATE - 11/15/2007	6.	DATE - 01/01/14
3.	DATE - 11/14/2008		
4.	DATE - 11/02/2009		

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APPENDIX B - ADA STANDARDS
TABLE OF CONTENTS

SECTION 1 - PLAN SHEETS

SHEET#	SHEET NAME
B-1-1	TYPICAL CORNER RAMP LAYOUTS
B-1-2	2 PERPENDICULAR RAMPS AT CORNER
B-1-3	2 PERPENDICULAR RAMPS AT CORNER WITH RAMPS IN CURB RADIUS
B-1-4	PERPENDICULAR RAMP AT CORNER IN CURB RADIUS WITH SINGLE CROSSING
B-1-5	PERPENDICULAR RAMP AT CORNER IN CURB RADIUS WITH DETECTABLE WARNING SETBACK GREATER THAN 5'
B-1-6	COMBINATION RAMP AT CORNER (PARALLEL AND PERPENDICULAR RAMPS)
B-1-7	BLENDED TRANSITION AT CORNER
B-1-8	BLENDED TRANSITION AT CORNER WITH SINGLE CROSSING
B-1-9	FLUSH TRANSITION AT CORNER
B-1-10	SHARED (DIAGONAL) PERPENDICULAR RAMP AT CORNER
B-1-11	RAMPS AT CORNER WITH DIFFERENT SIDEWALK WIDTHS
B-1-12	PERPENDICULAR RAMPS AT CORNER WITH LARGE CURB RADIUS
B-1-13	BLENDED TRANSITION AT CORNER WITH LARGE CURB RADIUS
B-1-14	RAMPS THAT DO NOT ALIGN WITH CROSSWALK
B-1-15	PERPENDICULAR RAMP AT MID-BLOCK LOCATION
B-1-16	PARALLEL RAMP AT MID-BLOCK LOCATION
B-1-17	PARALLEL RAMP (ONE DIRECTION) AT MID-BLOCK LOCATION
B-1-18	COMBINATION RAMP (PARALLEL AND PERPENDICULAR RAMPS) AT MID-BLOCK LOCATION
B-1-19	MEDIAN PASS-THROUGH
B-1-20	MEDIAN PASS-THROUGH WITH RAMPS
B-1-21	ON-GRADE RAMP AT BRIDGE OR OVERPASS

SECTION 2 - ALLEY AND DRIVEWAY SHEETS

SHEET#	SHEET NAME
B-2-1	ALLEY RETURN PLAN VIEW
B-2-2	ALLEY RETURN SECTIONS
B-2-3	DRIVEWAY CONSTRUCTION PLAN VIEWS
B-2-4	DRIVEWAY CONSTRUCTION SECTIONS
B-2-5	ALLEY & DRIVEWAY DETAIL FOR REDUCED WIDTH PEDESTRIAN ACCESS ROUTE

SECTION 3 - NOTES

SHEET#	SHEET NAME
B-3-1	CONVERSION CHARTS
B-3-2	GENERAL NOTES
B-3-3	GENERAL NOTES (CONTINUED)
B-3-4	ADA COMPLIANCE AND TRANSITION GUIDELINES
B-3-5	SEAL

SECTION 4 - DETAILS

SHEET#	SHEET NAME
B-4-1	DETECTABLE WARNING UNIT SIZES
B-4-2	DETECTABLE WARNING DETAILS
B-4-3	CURB & GUTTER DETAILS

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Department of Transportation
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CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION
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11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

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TABLE OF CONTENTS

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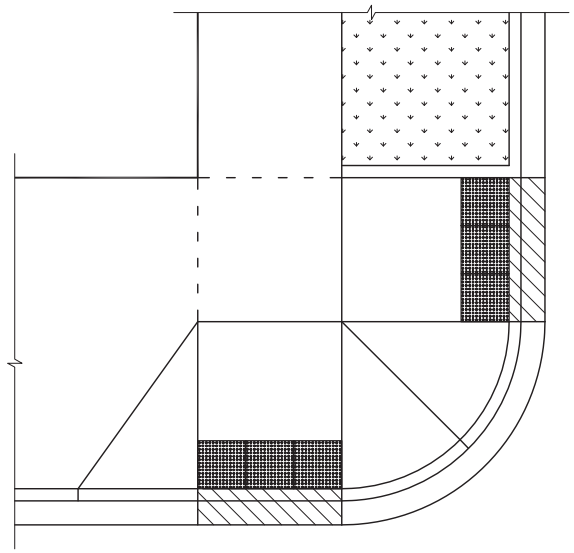
CURB RAMP LAYOUT B-1-2 IS PREFERRED WHEREVER POSSIBLE. WHERE RAMPS ARE LOCATED IN THE CORNER RADIUS, LAYOUT B-1-3 SHALL BE USED.

CURB RAMP PLACEMENT SHALL BE COORDINATED AS REQUIRED TO ALLOW FOR A 4' MINIMUM WIDTH SIDEWALK AROUND EACH CORNER OF INTERSECTION. SIDEWALK NOT TO BE OBSTRUCTED BY CURB RAMPS OR OTHER BARRIERS AND SHALL HAVE A CROSS SLOPE OF 1:64 MAXIMUM.

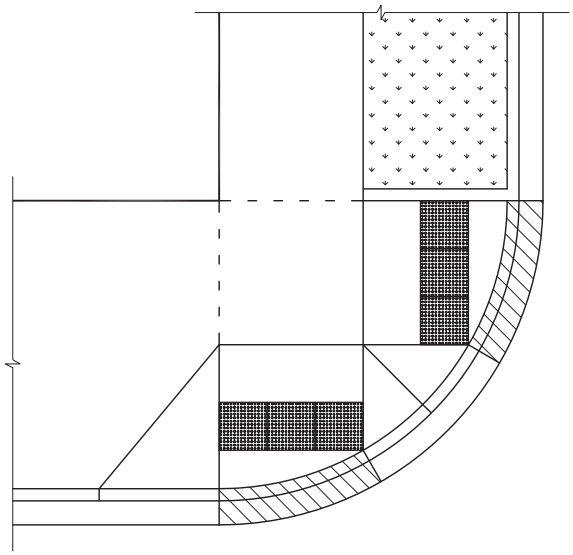
THE BLENDED TRANSITION LAYOUT B-1-7 (AND SIMILAR) MAY BE USED WHERE TWO RAMPS ARE NOT POSSIBLE DUE TO GEOMETRIC CONSTRAINTS, SUCH AS LIMITED SIDEWALK WIDTH OR GRADE ELEVATIONS. THE BLENDED TRANSITION SHALL NOT BE USED IF ACCESS TO AN EXISTING FACILITY WOULD BE REDUCED.

THE SHARED PERPENDICULAR RAMP AT CORNER LAYOUT B-1-10 IS NOT PREFERRED AND MAY ONLY BE USED WITH PERMISSION FROM THE COMMISSIONER.

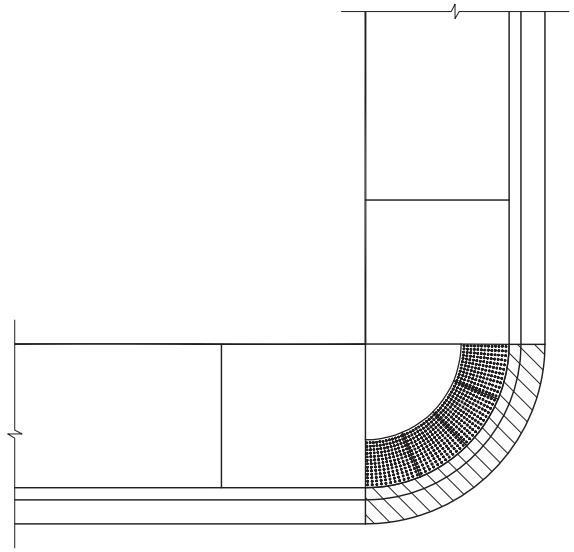
SEE SHEET B-3-3 FOR TRANSITION PANEL GUIDELINES.



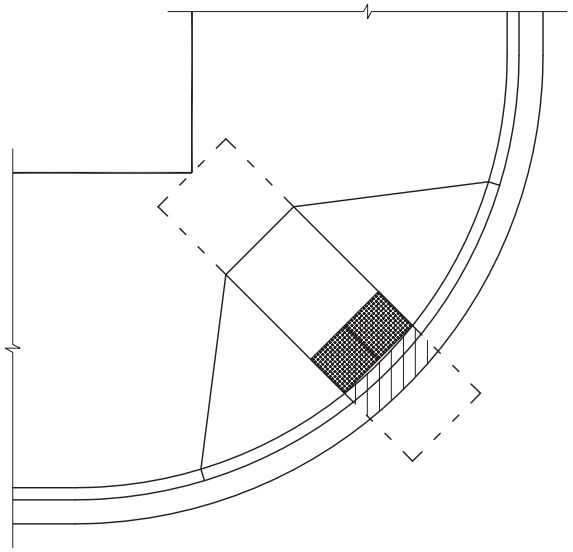
SHEET B-1-2: 2 PERPENDICULAR RAMPS



SHEET B-1-3: 2 RAMPS IN RADIUS



SHEET B-1-7: BLENDED TRANSITION



SHEET B-1-10: SHARED PERPENDICULAR RAMP AT CORNER

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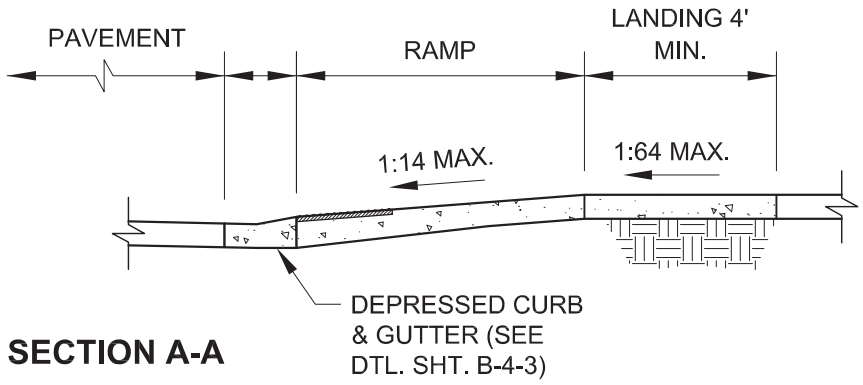
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11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

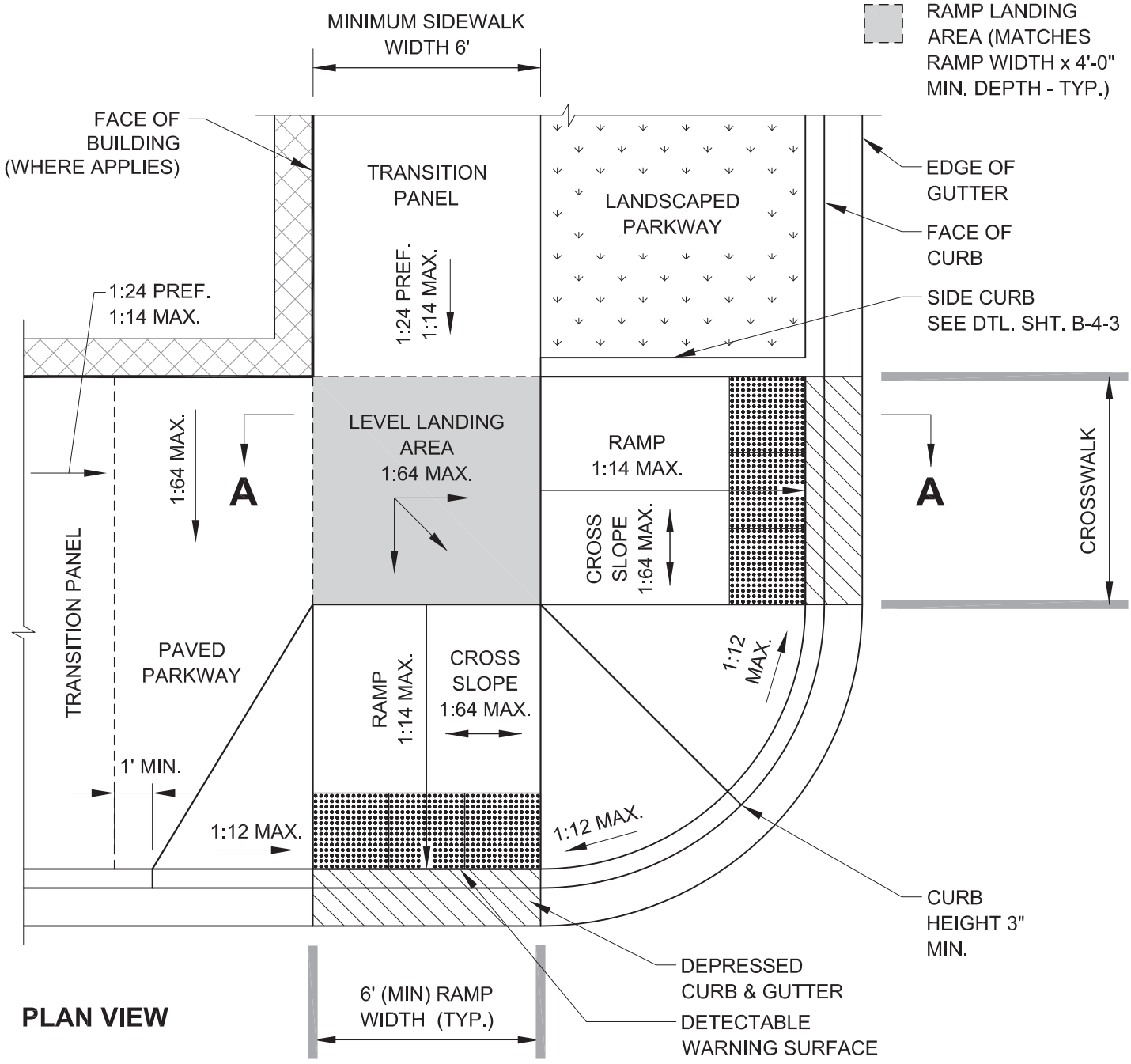
CITY OF CHICAGO
TYPICAL CORNER RAMP LAYOUTS
SHEET B-1-1

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SECTION A-A



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DATE	REVISION
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11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

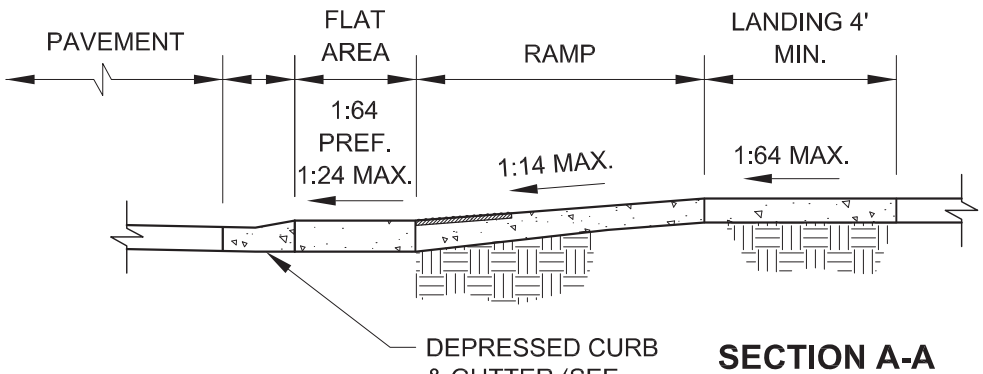
CITY OF CHICAGO
2 PERPENDICULAR RAMPS AT CORNER
SHEET B-1-2

SCALE: NOT TO SCALE
DATE: 10/23/2006

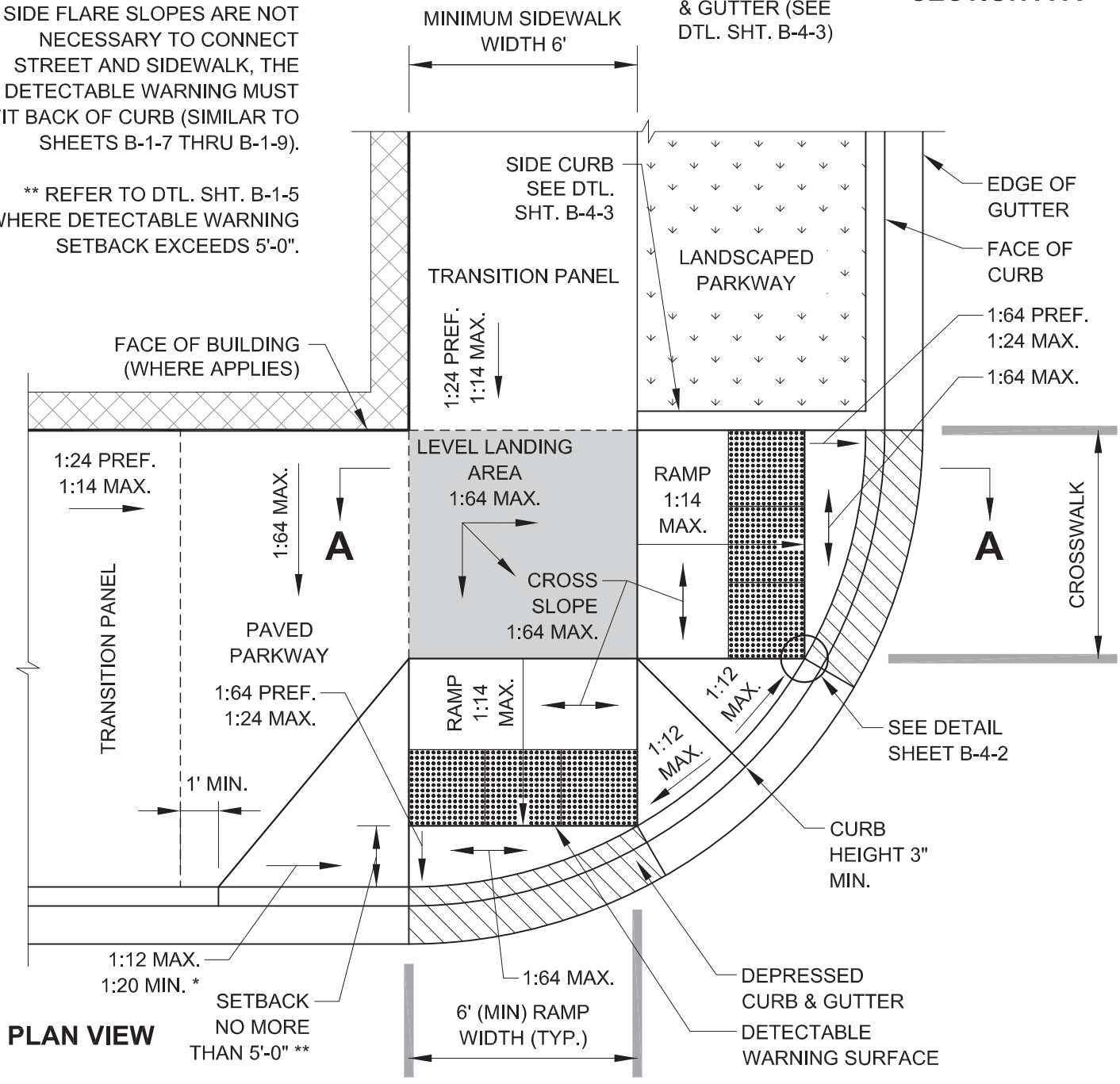
DRAWN BY: CDOT
CHECKED BY: LCM

* SIDE FLARES WITH A MINIMUM SLOPE OF 1:20 (MEASURED PARALLEL TO CURB) ARE NECESSARY FOR DETECTION BY THE BLIND AND VISUALLY IMPAIRED AT PAVED PARKWAYS WHERE DETECTABLE WARNING IS SET BACK FROM BACK OF CURB (TO BE POSITIONED PERPENDICULAR TO THE PATH OF TRAVEL). WHERE RAMP AND SIDE FLARE SLOPES ARE NOT NECESSARY TO CONNECT STREET AND SIDEWALK, THE DETECTABLE WARNING MUST FIT BACK OF CURB (SIMILAR TO SHEETS B-1-7 THRU B-1-9).

** REFER TO DTL. SHT. B-1-5 WHERE DETECTABLE WARNING SETBACK EXCEEDS 5'-0".



SECTION A-A



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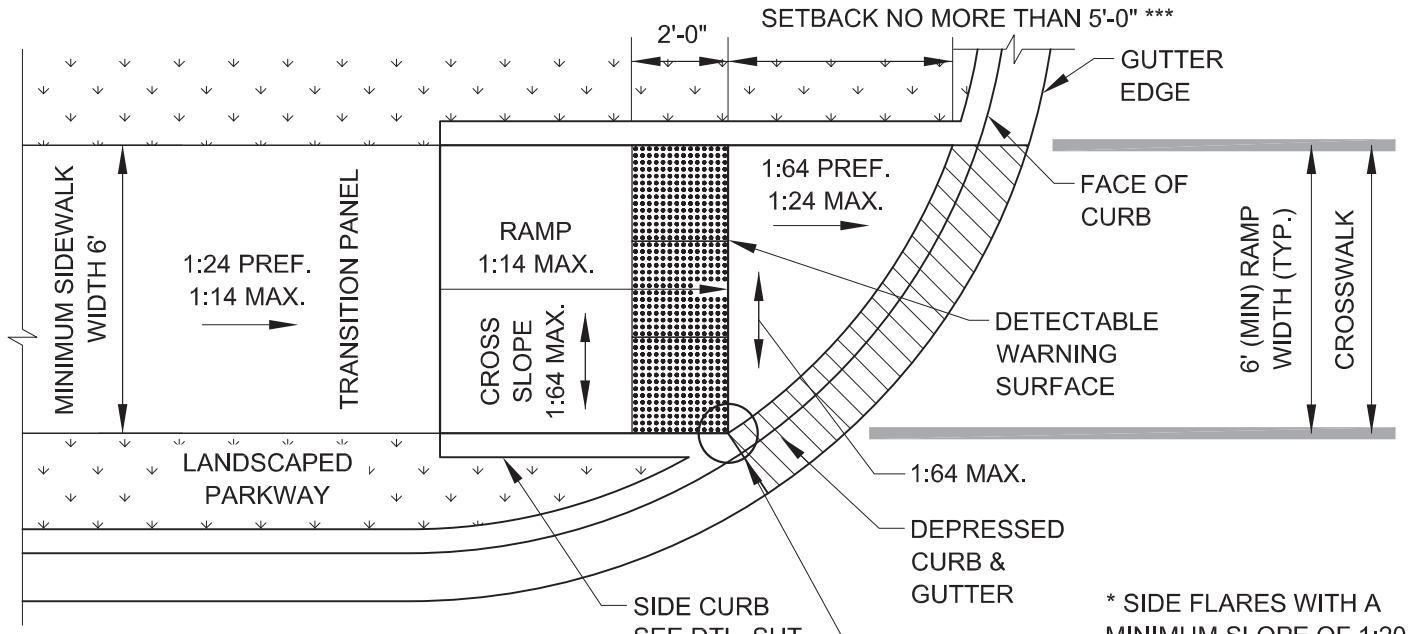
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02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

CITY OF CHICAGO
2 PERPENDICULAR RAMPS AT CORNER WITH RAMPS IN CURB RADIUS

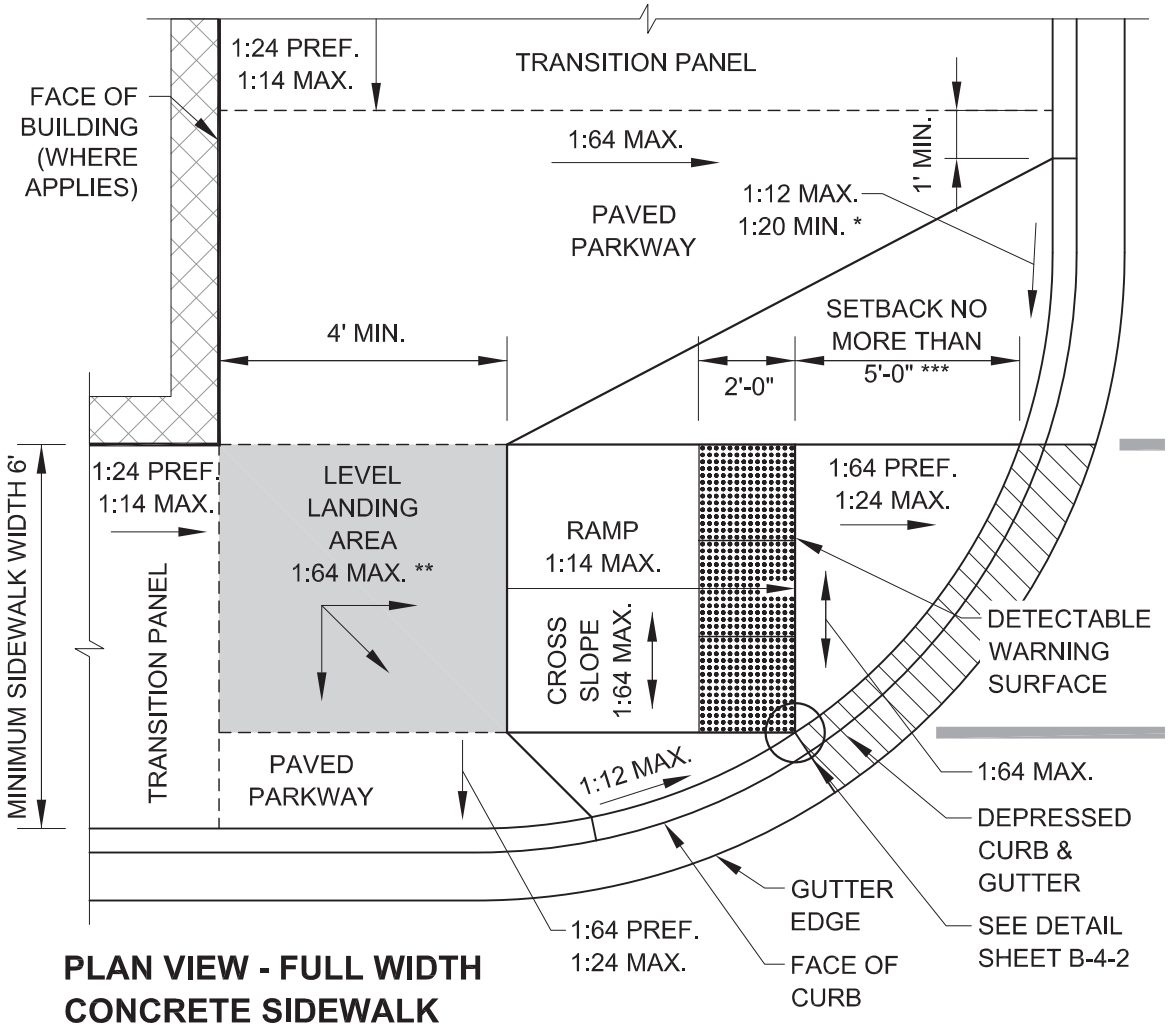
SCALE: NOT TO SCALE
DATE: 10/23/2006

SHEET B-1-3

DRAWN BY: CDOT
CHECKED BY: LCM



PLAN VIEW - SIDEWALK THROUGH PARKWAY



PLAN VIEW - FULL WIDTH CONCRETE SIDEWALK

* SIDE FLARES WITH A MINIMUM SLOPE OF 1:20 (MEASURED PARALLEL TO CURB) ARE NECESSARY FOR DETECTION BY THE BLIND AND VISUALLY IMPAIRED AT PAVED PARKWAYS WHERE DETECTABLE WARNING IS SET BACK FROM BACK OF CURB (TO BE POSITIONED PERPENDICULAR TO THE PATH OF TRAVEL). WHERE RAMP AND SIDE FLARE SLOPES ARE NOT NECESSARY TO CONNECT STREET AND SIDEWALK, THE DETECTABLE WARNING MUST FIT BACK OF CURB (SIMILAR TO SHEETS B-1-7 THRU B-1-9).

** LEVEL LANDING AREA REQUIRED WHERE SIDEWALKS INTERSECT AT TOP OF RAMP.

*** REFER TO DTL. SHT. B-1-5 WHERE DETECTABLE WARNING SETBACK EXCEEDS 5'-0".

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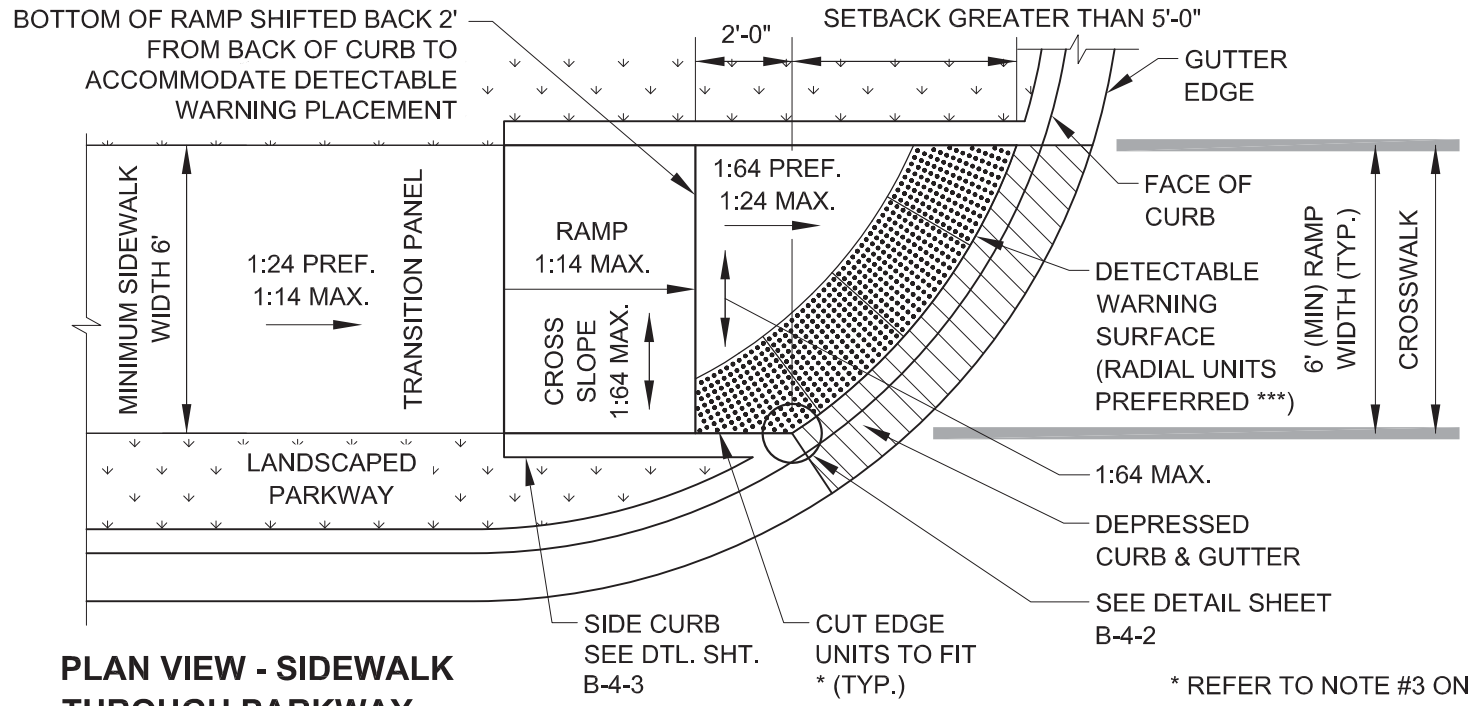
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11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

CITY OF CHICAGO
PERPENDICULAR RAMP AT CORNER
IN CURB RADIUS WITH SINGLE CROSSING

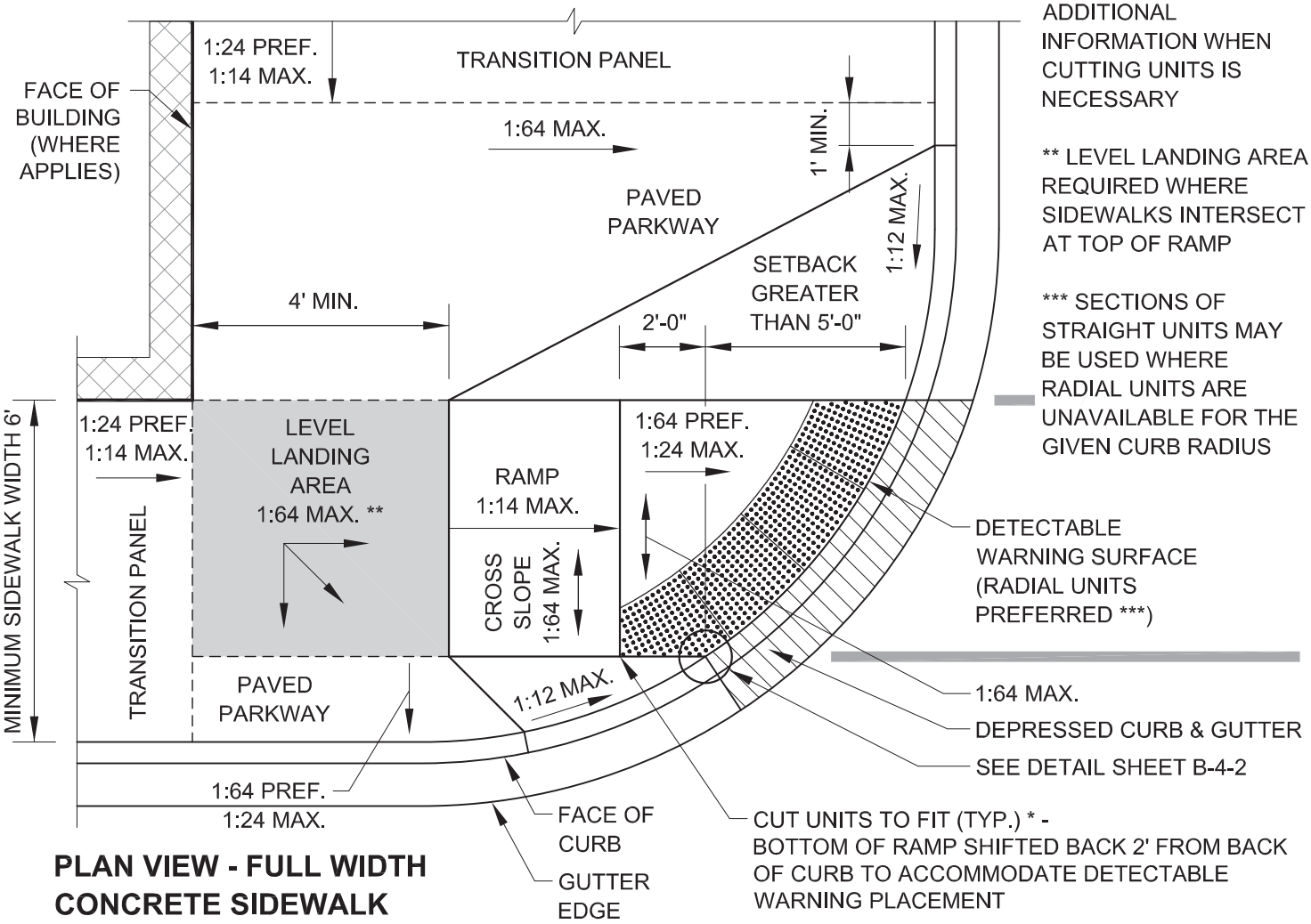
SCALE: NOT TO SCALE
DATE: 10/23/2006

SHEET B-1-4

DRAWN BY: CDOT
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PLAN VIEW - SIDEWALK THROUGH PARKWAY



PLAN VIEW - FULL WIDTH CONCRETE SIDEWALK

* REFER TO NOTE #3 ON SHEET B-3-2 FOR ADDITIONAL INFORMATION WHEN CUTTING UNITS IS NECESSARY

** LEVEL LANDING AREA REQUIRED WHERE SIDEWALKS INTERSECT AT TOP OF RAMP

*** SECTIONS OF STRAIGHT UNITS MAY BE USED WHERE RADIAL UNITS ARE UNAVAILABLE FOR THE GIVEN CURB RADIUS

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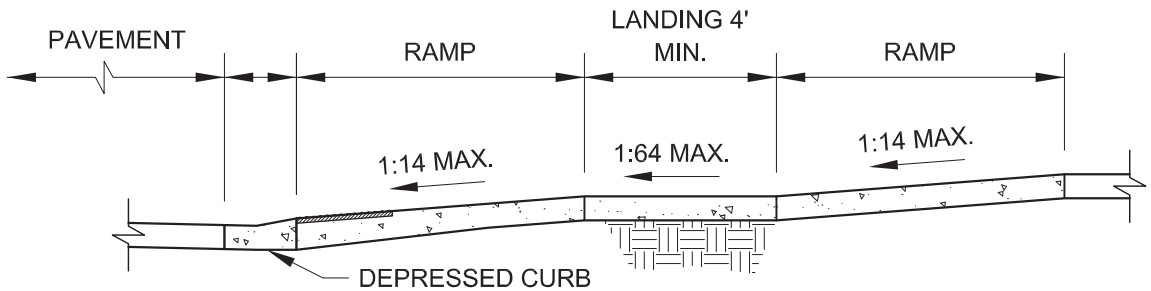
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11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

CITY OF CHICAGO
PERPENDICULAR RAMP AT CORNER IN CURB RADIUS WITH DETECTABLE WARNING SETBACK GREATER THAN 5'

SCALE: NOT TO SCALE
DATE: 10/23/2006

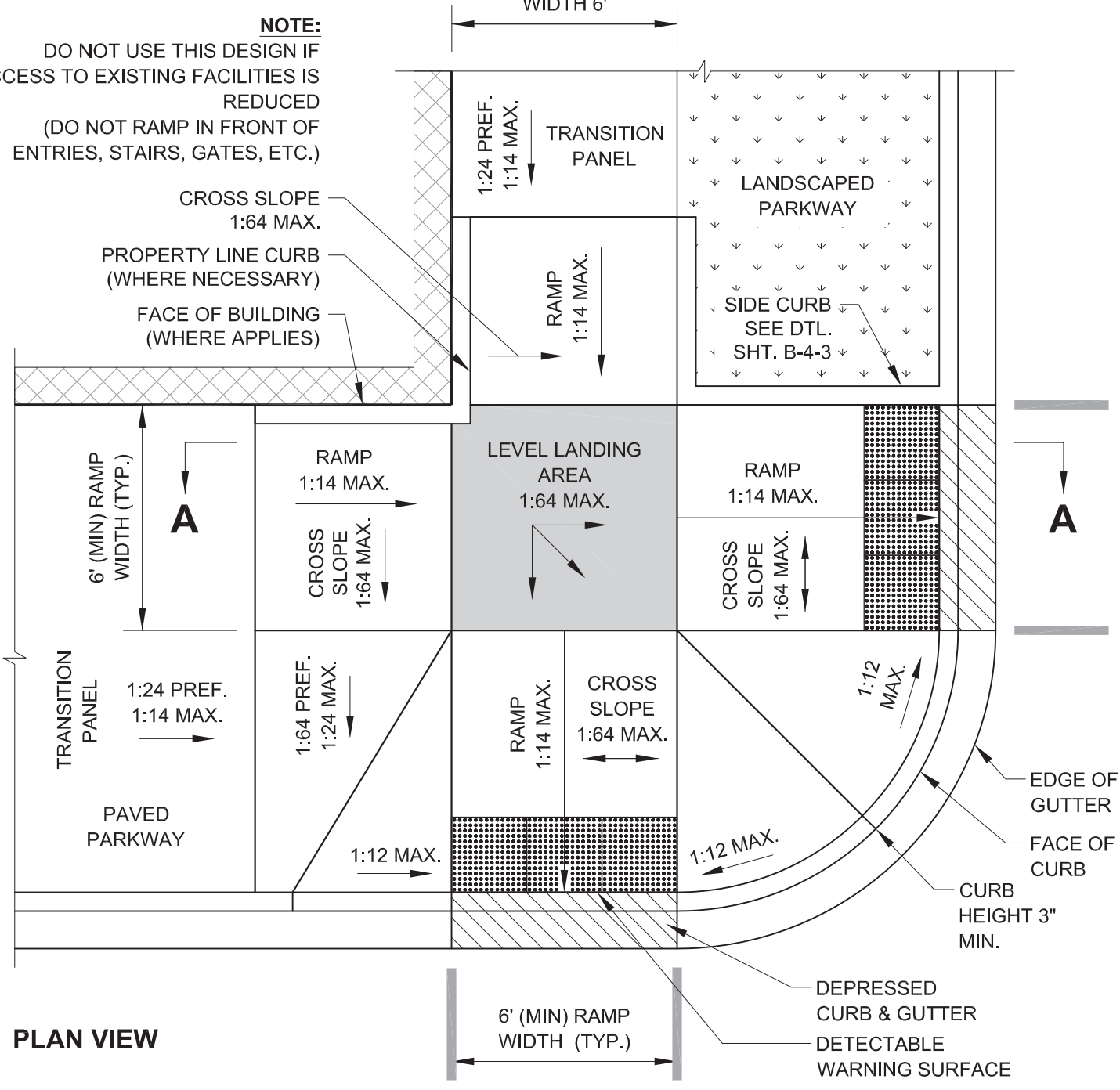
SHEET B-1-5

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CHECKED BY: LCM



SECTION A-A

NOTE:
DO NOT USE THIS DESIGN IF ACCESS TO EXISTING FACILITIES IS REDUCED
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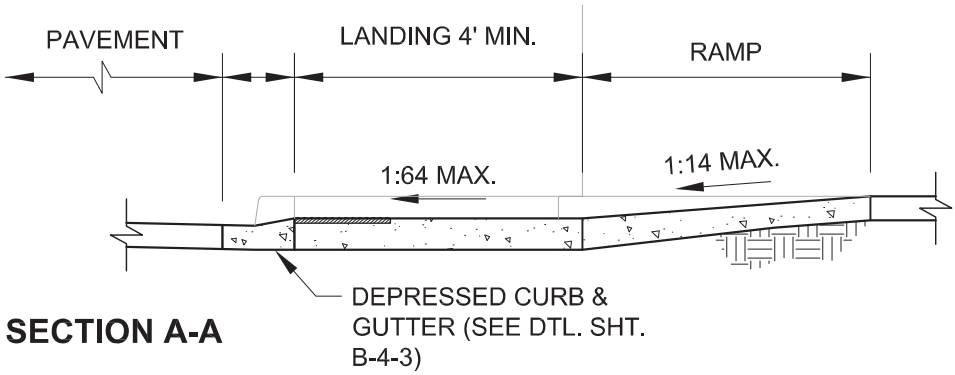
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02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

CITY OF CHICAGO
COMBINATION RAMP AT CORNER
(PARALLEL AND PERPENDICULAR RAMPS)

SCALE: NOT TO SCALE
DATE: 10/23/2006

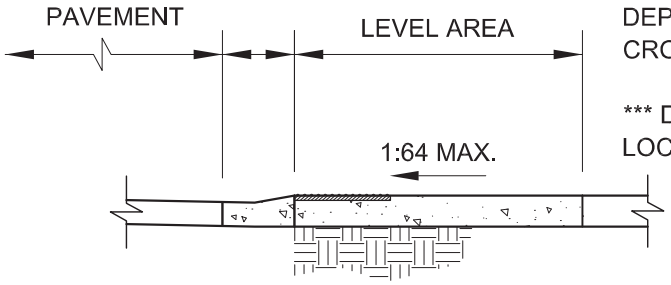
SHEET B-1-6

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SECTION A-A

* THE FLAT LANDING AREA INCLUDES THE ENTIRE SPACE BEHIND THE BACK OF THE CURB TO THE BOTTOM OF EACH RAMP; THE 4'x4' AREA DASHED IS THE MINIMUM REQUIRED MANEUVERING AREA AT A LANDING (FIT BEHIND THE BACK OF CURB) FOR A PEDESTRIAN USING A WHEELCHAIR. THE FLAT LANDING MAY INCLUDE DETECTABLE WARNING

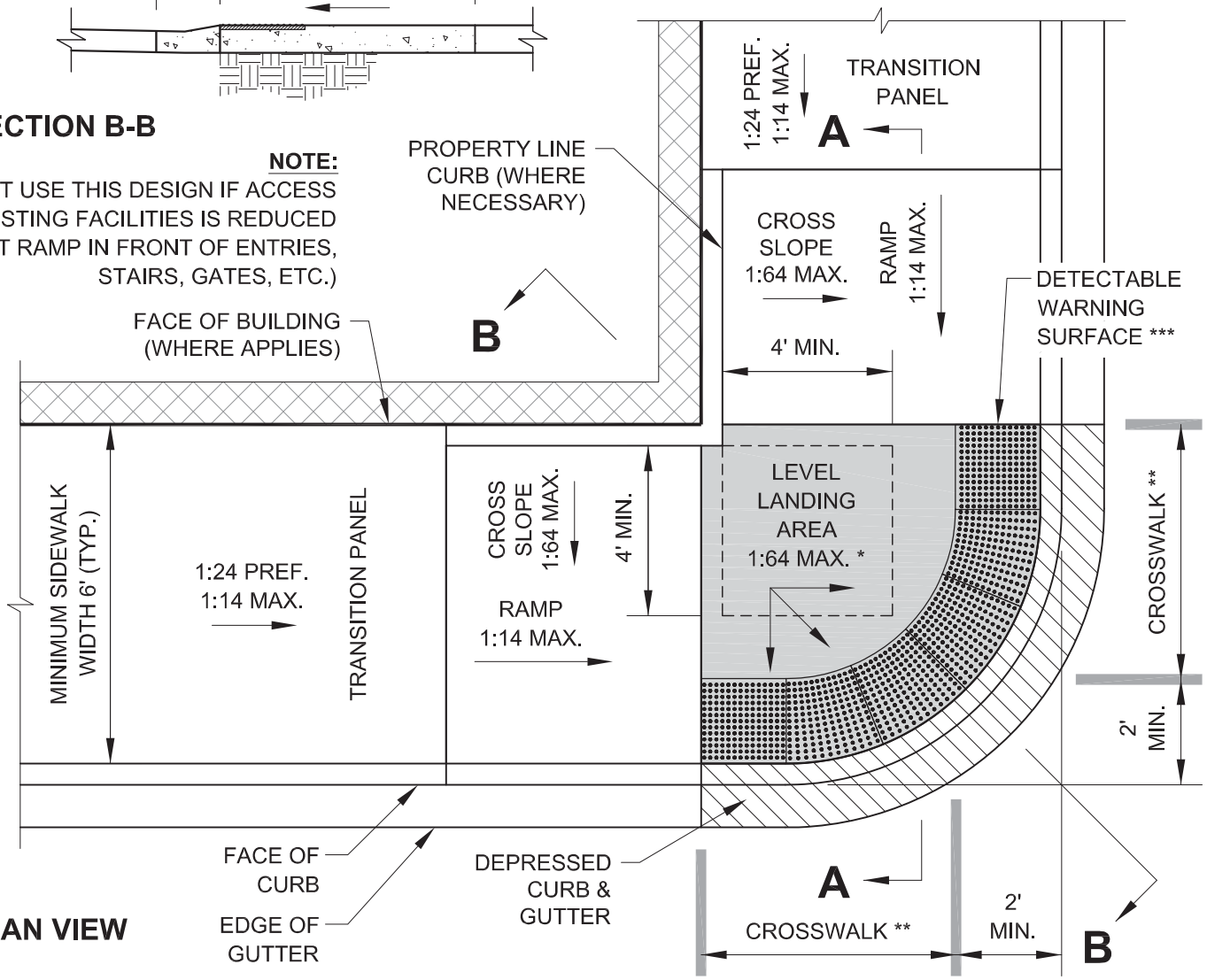


SECTION B-B

** WHERE A STREET CROSSING IS ONLY PROVIDED IN ONE DIRECTION, SITUATE THE DETECTABLE WARNING AND DEPRESSED CURB TO BEST SERVE THE ONLY AVAILABLE CROSSING (SEE DTL. SHT. B-1-8)

*** DETECTABLE WARNING SURFACE SHALL BE PLACED AT ANY LOCATION WHERE THE SIDEWALK AND STREET ARE FLUSH

NOTE:
DO NOT USE THIS DESIGN IF ACCESS TO EXISTING FACILITIES IS REDUCED (DO NOT RAMP IN FRONT OF ENTRIES, STAIRS, GATES, ETC.)



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CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION
02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

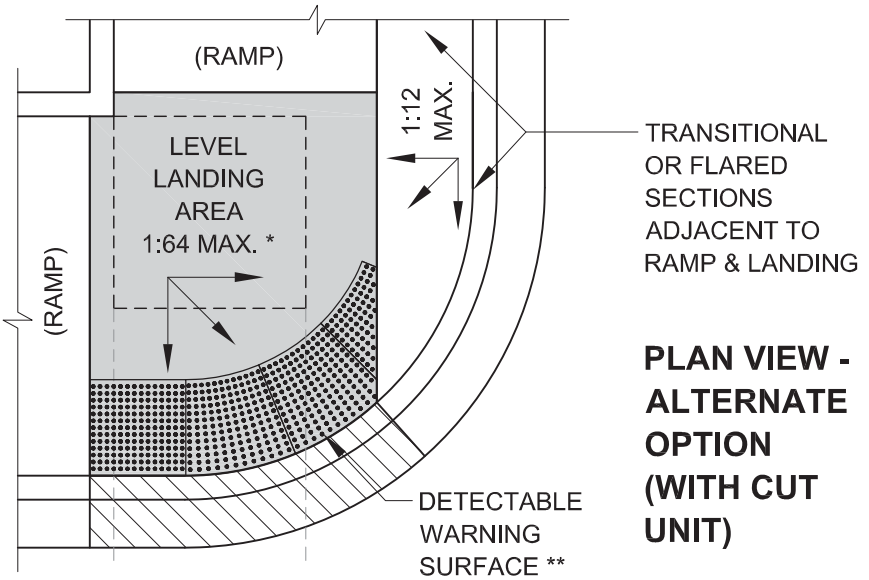
CITY OF CHICAGO
BLENDED TRANSITION AT CORNER
SHEET B-1-7

SCALE: NOT TO SCALE
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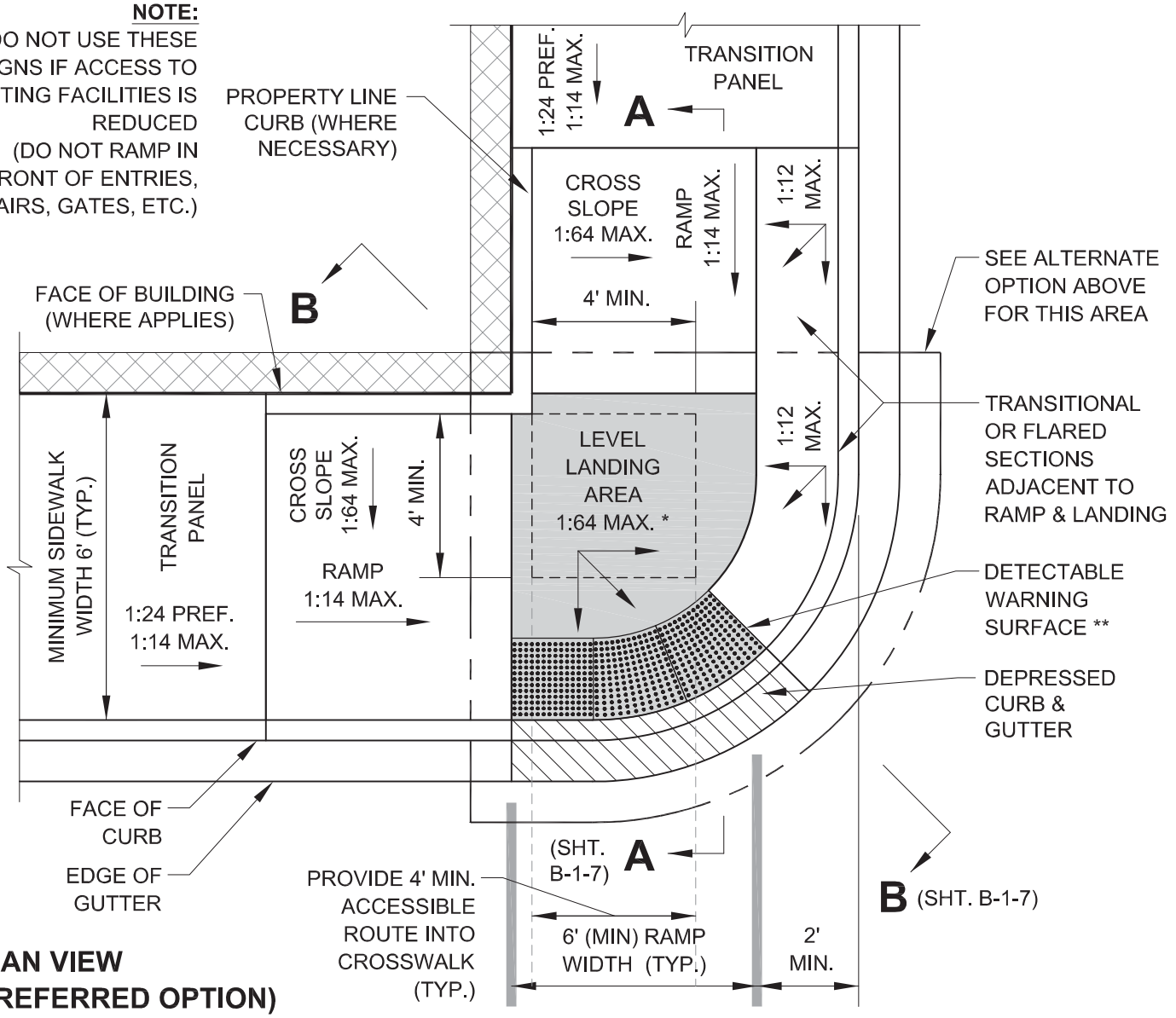
* THE FLAT LANDING AREA INCLUDES THE ENTIRE SPACE BEHIND THE BACK OF RADIAL CURB TO THE BOTTOM OF EACH RAMP; THE 4'x4' AREA DASHED IS THE MINIMUM REQUIRED MANEUVERING AREA AT A LANDING (FIT BEHIND BACK OF CURB) FOR A PEDESTRIAN USING A WHEELCHAIR. THE FLAT LANDING MAY INCLUDE DETECTABLE WARNING

** DETECTABLE WARNING SURFACE SHALL BE PLACED AT ANY LOCATION WHERE THE SIDEWALK AND STREET ARE FLUSH. REFER TO NOTE #3 ON SHEET B-3-2 FOR ADDITIONAL INFORMATION WHEN CUTTING UNITS IS NECESSARY



PLAN VIEW - ALTERNATE OPTION (WITH CUT UNIT)

NOTE:
DO NOT USE THESE DESIGNS IF ACCESS TO EXISTING FACILITIES IS REDUCED (DO NOT RAMP IN FRONT OF ENTRIES, STAIRS, GATES, ETC.)



PLAN VIEW (PREFERRED OPTION)

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DATE	REVISION
02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

CITY OF CHICAGO
BLENDED TRANSITION AT CORNER
WITH SINGLE CROSSING

SCALE: NOT TO SCALE
DATE: 10/23/2006

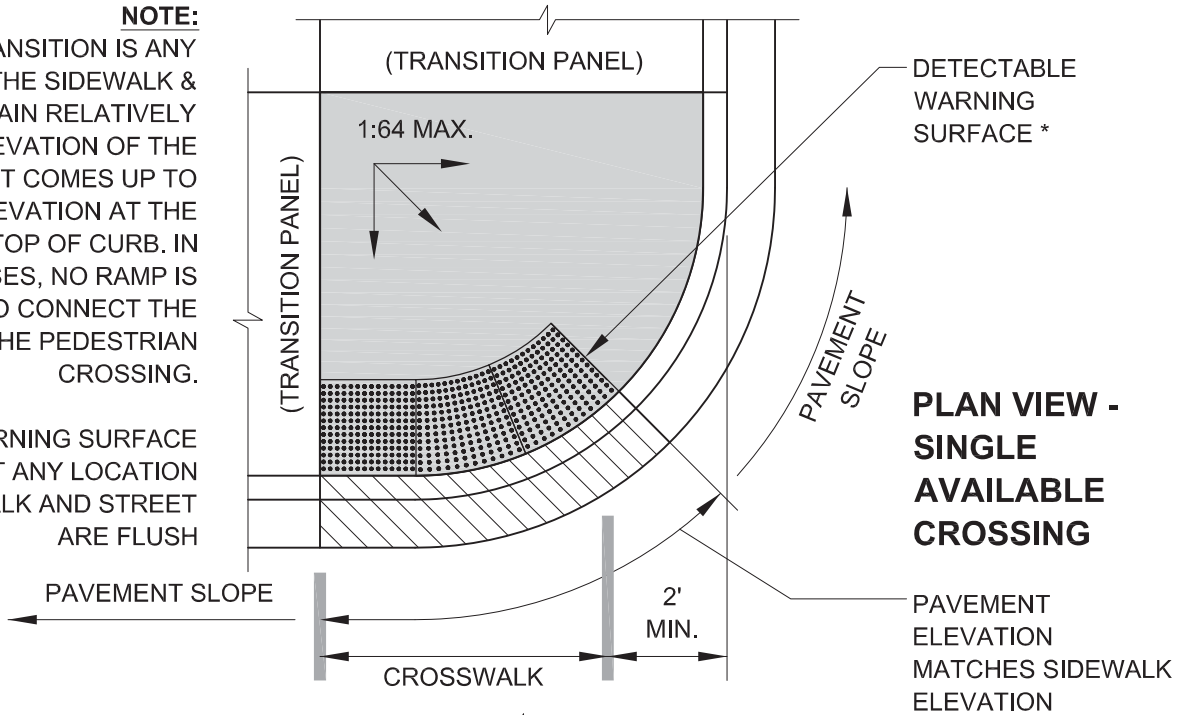
SHEET B-1-8

DRAWN BY: CDOT
CHECKED BY: LCM

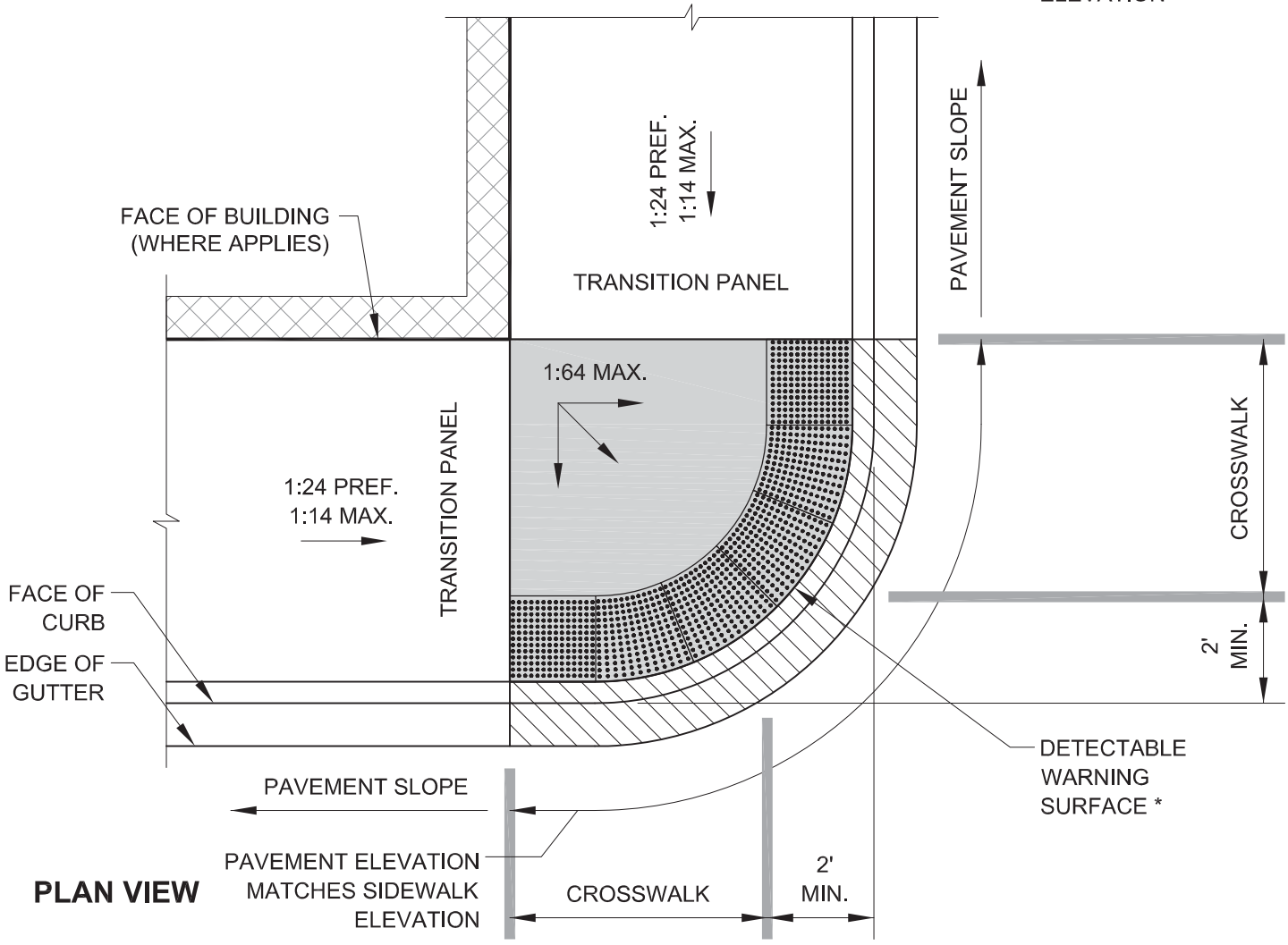
NOTE:

A FLUSH TRANSITION IS ANY LOCATION WHERE THE SIDEWALK & TOP OF CURB REMAIN RELATIVELY FLAT AND THE ELEVATION OF THE ROADWAY PAVEMENT COMES UP TO MEET THE ELEVATION AT THE SIDEWALK AND TOP OF CURB. IN THESE CASES, NO RAMP IS NECESSARY TO CONNECT THE SIDEWALK WITH THE PEDESTRIAN CROSSING.

* DETECTABLE WARNING SURFACE SHALL BE PLACED AT ANY LOCATION WHERE THE SIDEWALK AND STREET ARE FLUSH



PLAN VIEW - SINGLE AVAILABLE CROSSING



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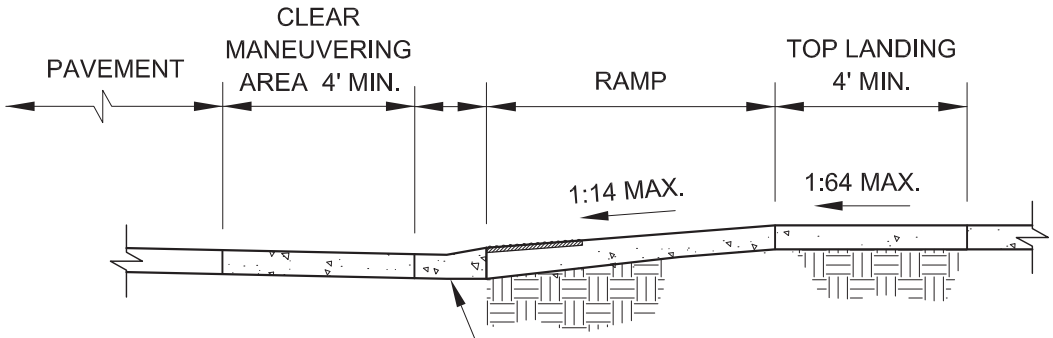
CDOT
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION
02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

CITY OF CHICAGO
FLUSH TRANSITION AT CORNER
SHEET B-1-9

SCALE: NOT TO SCALE
DATE: 10/23/2006

DRAWN BY: CDOT
CHECKED BY: LCM



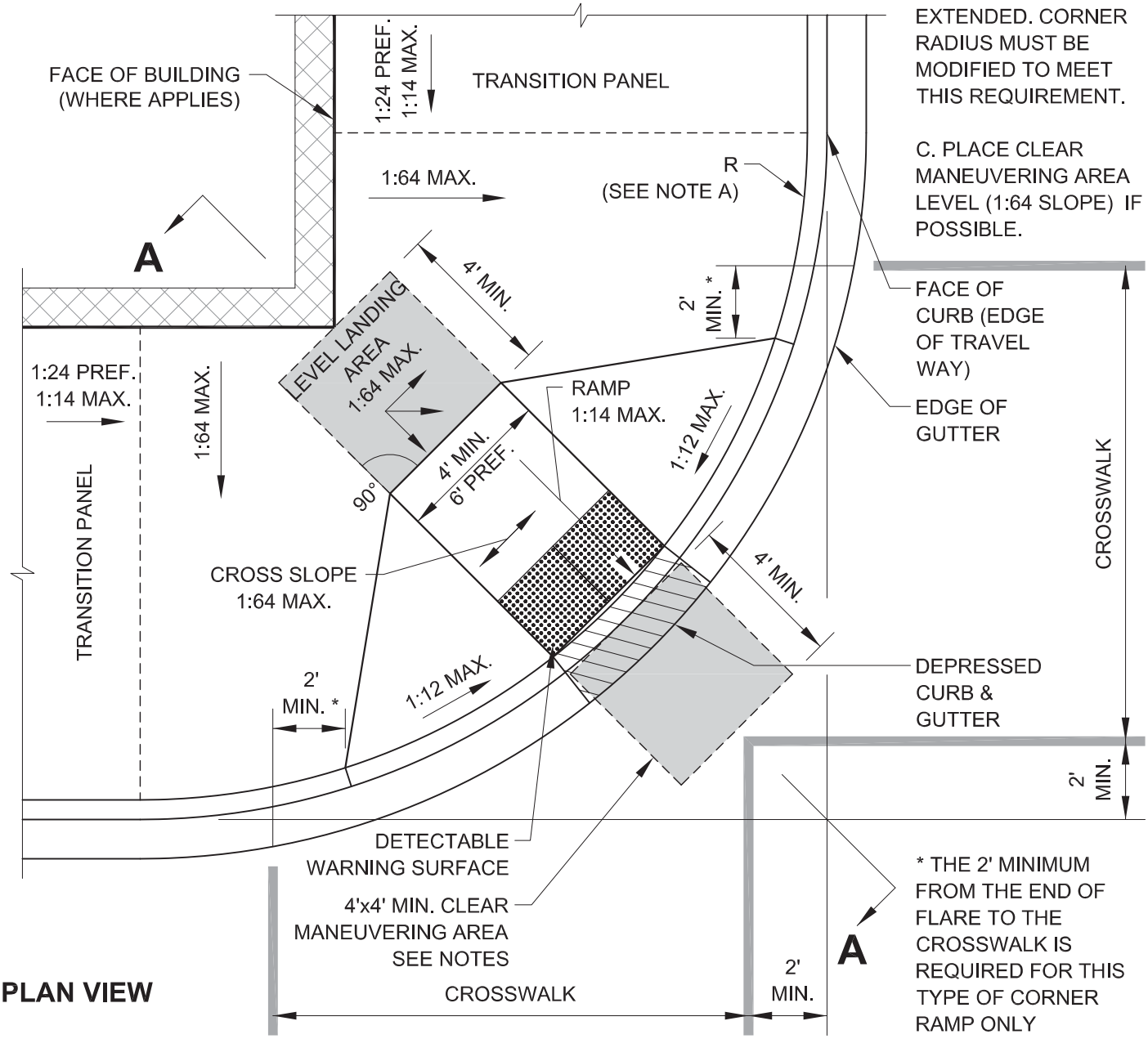
SECTION A-A

NOTES:

A. MIN. 17' RADIUS IS REQUIRED TO PROVIDE 4'x4' MIN. CLEAR MANEUVERING AREA AT BOTTOM OF RAMP AS SHOWN.

B. THE CLEAR MANEUVERING AREA MUST FALL COMPLETELY WITHIN THE AREA BEHIND THE FACE OF CURB LINES EXTENDED. CORNER RADIUS MUST BE MODIFIED TO MEET THIS REQUIREMENT.

C. PLACE CLEAR MANEUVERING AREA LEVEL (1:64 SLOPE) IF POSSIBLE.



PLAN VIEW

* THE 2' MINIMUM FROM THE END OF FLARE TO THE CROSSWALK IS REQUIRED FOR THIS TYPE OF CORNER RAMP ONLY

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DATE	REVISION
02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
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08/10/12	REVISION 5

CITY OF CHICAGO
SHARED (DIAGONAL) PERPENDICULAR RAMP AT CORNER

SCALE: NOT TO SCALE
DATE: 10/23/2006

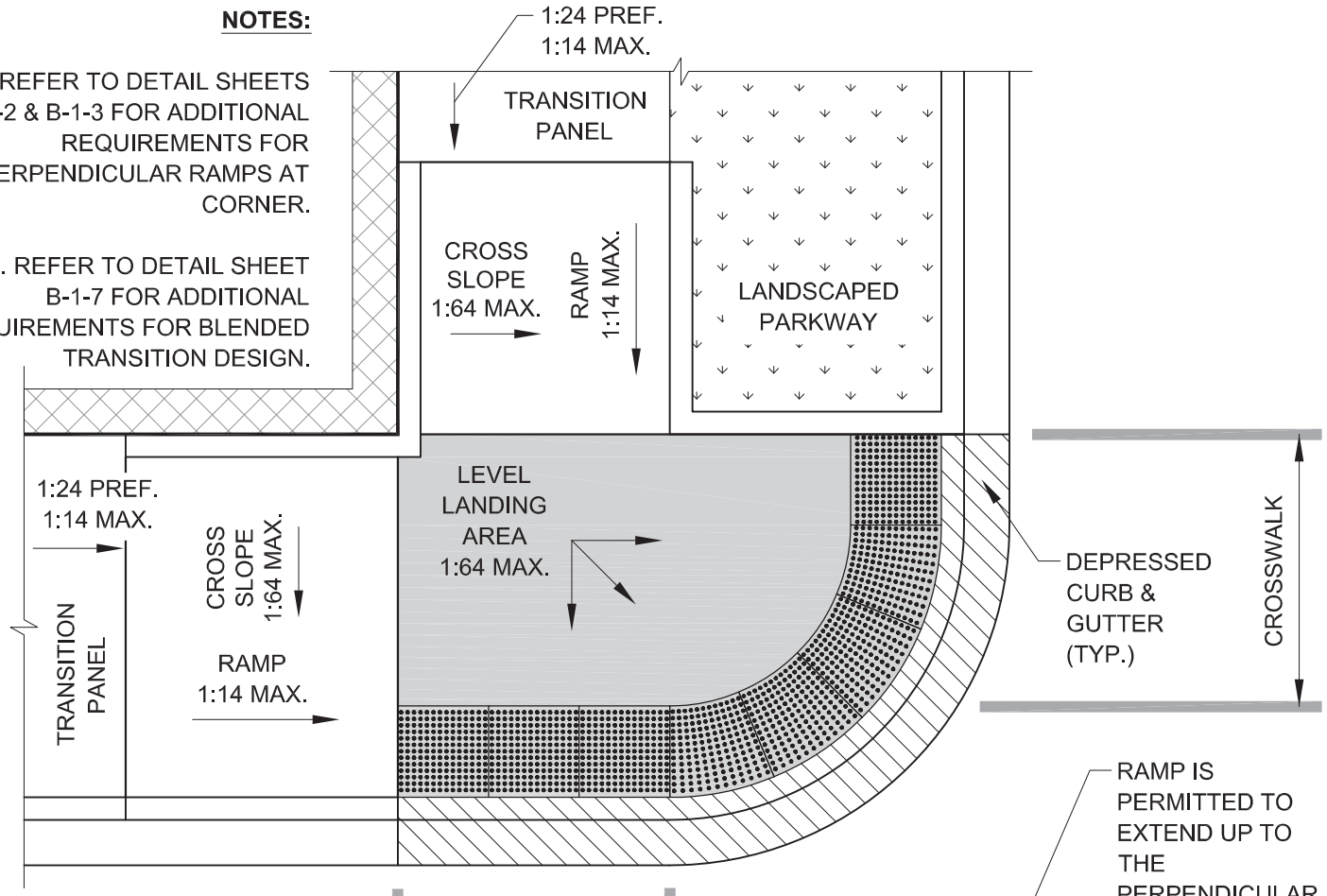
SHEET B-1-10

DRAWN BY: CDOT
CHECKED BY: LCM

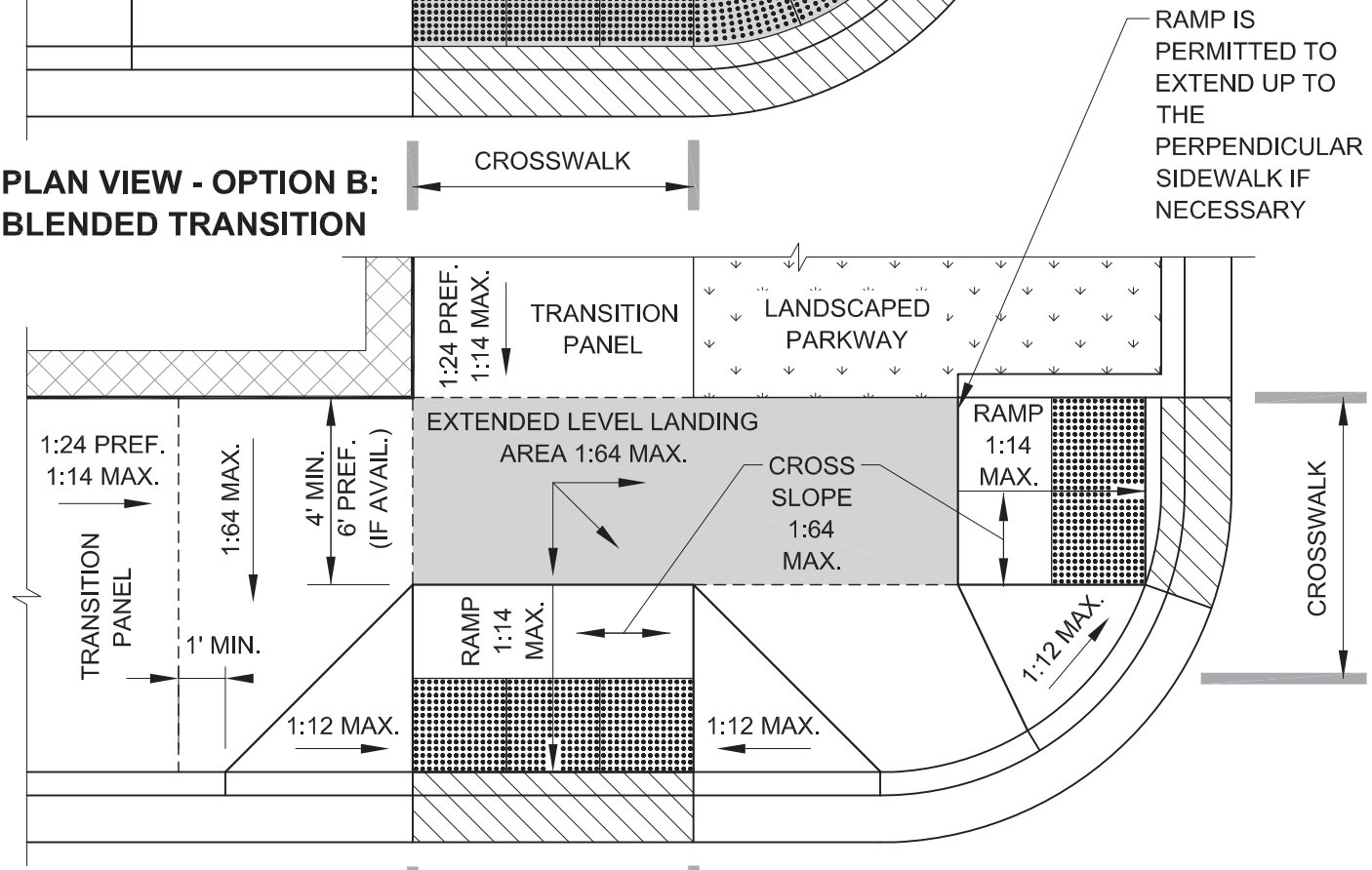
NOTES:

A. REFER TO DETAIL SHEETS B-1-2 & B-1-3 FOR ADDITIONAL REQUIREMENTS FOR PERPENDICULAR RAMPS AT CORNER.

B. REFER TO DETAIL SHEET B-1-7 FOR ADDITIONAL REQUIREMENTS FOR BLENDED TRANSITION DESIGN.



PLAN VIEW - OPTION B: BLENDED TRANSITION



PLAN VIEW - OPTION A: PERPENDICULAR RAMPS (PREFERRED OPTION)

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DATE	REVISION
02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

CITY OF CHICAGO
RAMPS AT CORNER WITH DIFFERENT SIDEWALK WIDTHS

SCALE: NOT TO SCALE
DATE: 10/23/2006

SHEET B-1-11

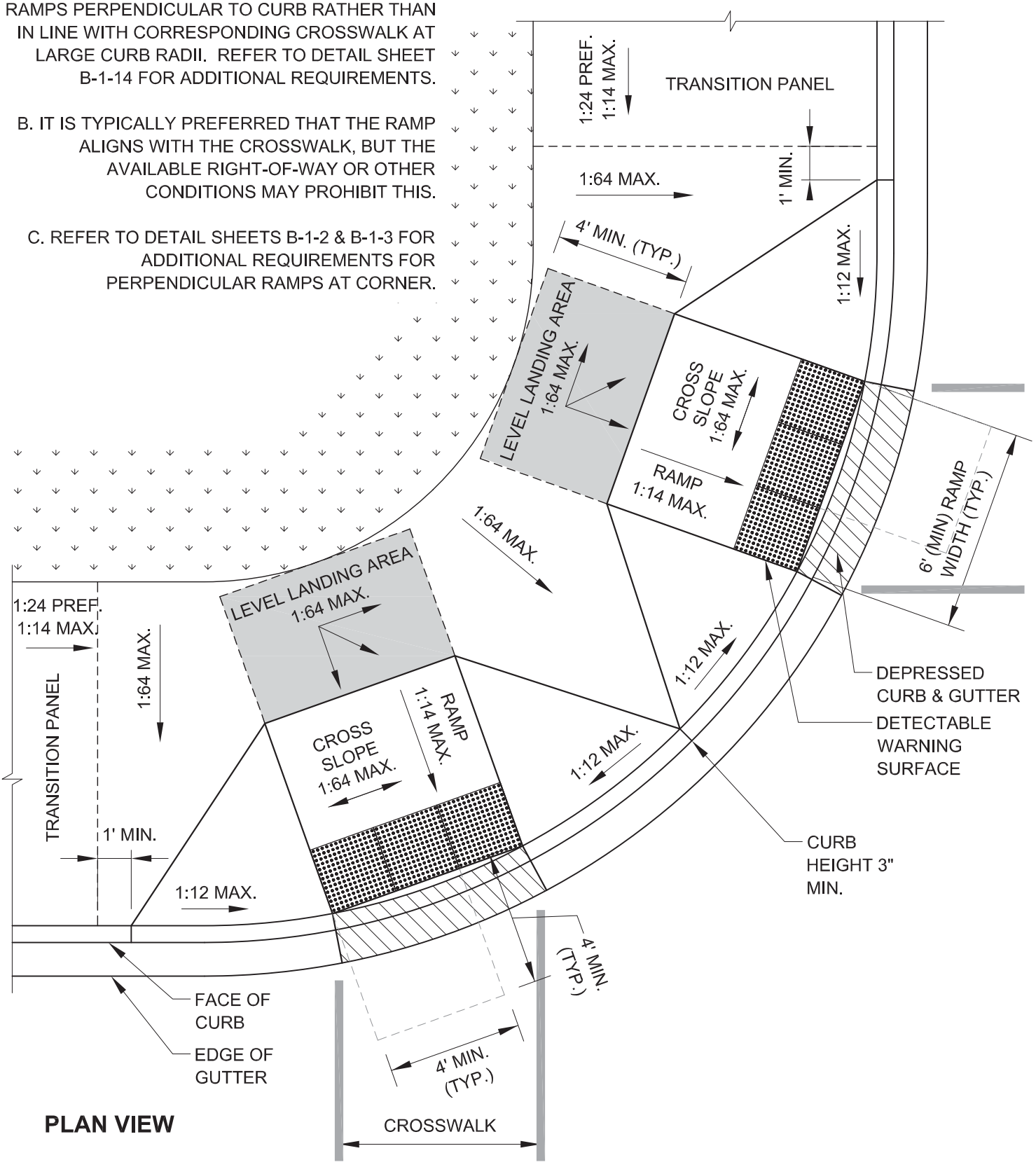
DRAWN BY: CDOT
CHECKED BY: LCM

NOTES:

A. IT MAY BE NECESSARY TO ALIGN THE CURB RAMPS PERPENDICULAR TO CURB RATHER THAN IN LINE WITH CORRESPONDING CROSSWALK AT LARGE CURB RADII. REFER TO DETAIL SHEET B-1-14 FOR ADDITIONAL REQUIREMENTS.

B. IT IS TYPICALLY PREFERRED THAT THE RAMP ALIGNS WITH THE CROSSWALK, BUT THE AVAILABLE RIGHT-OF-WAY OR OTHER CONDITIONS MAY PROHIBIT THIS.

C. REFER TO DETAIL SHEETS B-1-2 & B-1-3 FOR ADDITIONAL REQUIREMENTS FOR PERPENDICULAR RAMPS AT CORNER.



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CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION
02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

CITY OF CHICAGO
PERPENDICULAR RAMPS AT CORNER WITH LARGE CURB RADIUS

SCALE: NOT TO SCALE
DATE: 10/23/2006

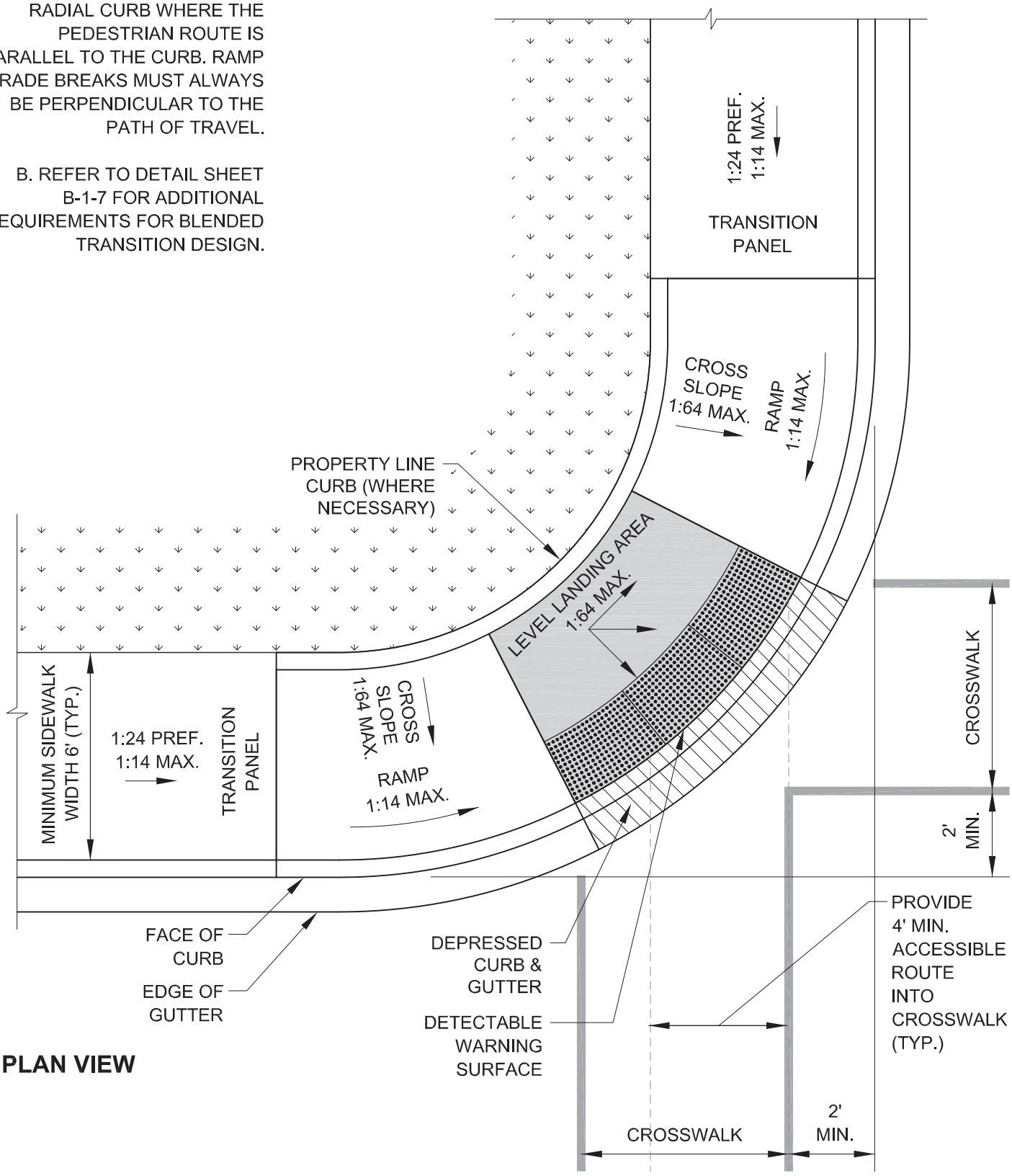
SHEET B-1-12

DRAWN BY: CDOT
CHECKED BY: LCM

NOTES:

A. IT IS ACCEPTABLE TO RAMP DOWN PARALLEL TO THE RADIAL CURB WHERE THE PEDESTRIAN ROUTE IS PARALLEL TO THE CURB. RAMP GRADE BREAKS MUST ALWAYS BE PERPENDICULAR TO THE PATH OF TRAVEL.

B. REFER TO DETAIL SHEET B-1-7 FOR ADDITIONAL REQUIREMENTS FOR BLENDED TRANSITION DESIGN.



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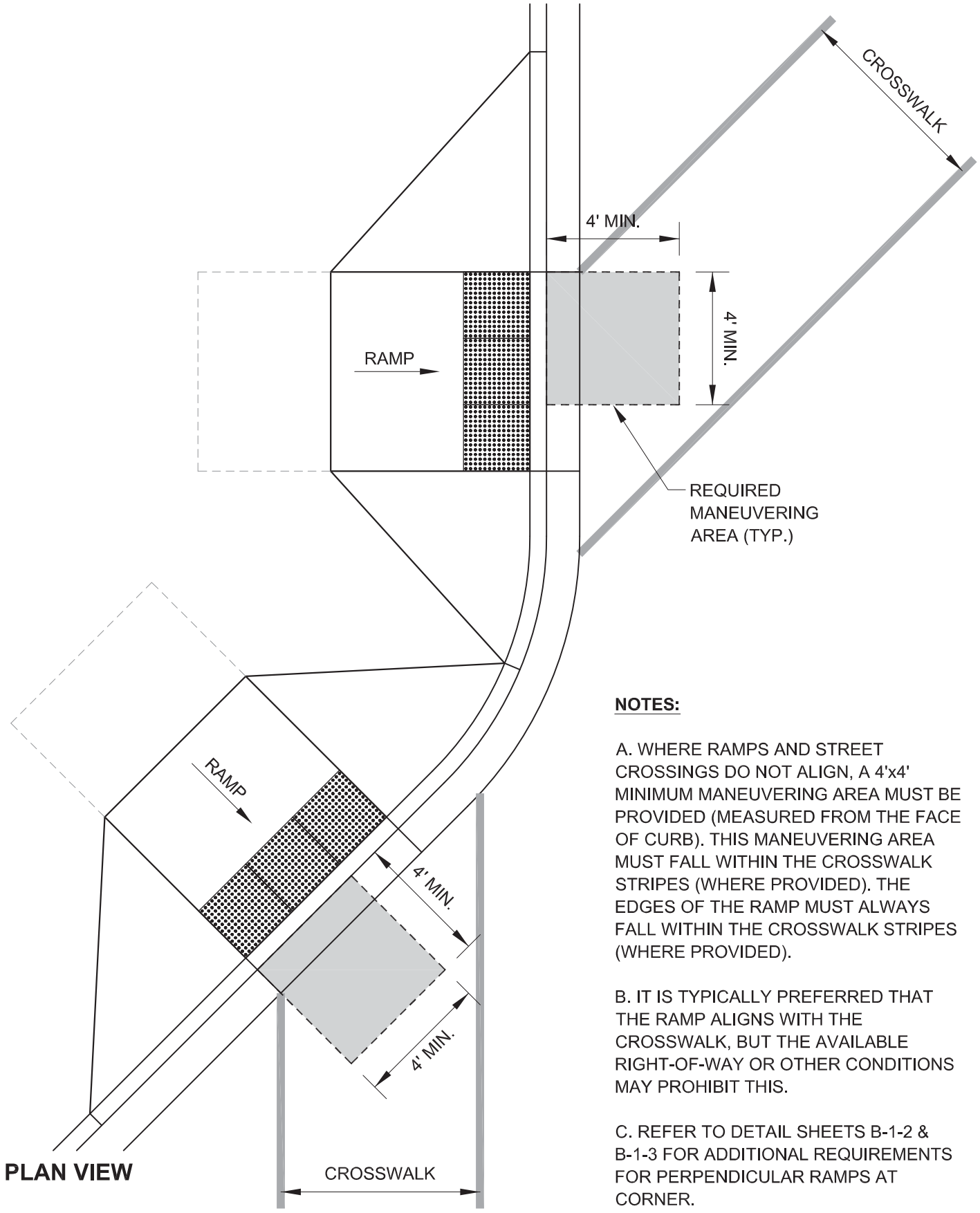
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11/14/08	REVISION 3
11/02/09	REVISION 4
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CITY OF CHICAGO
BLENDED TRANSITION AT CORNER WITH LARGE CURB RADIUS

SCALE: NOT TO SCALE
DATE: 10/23/2006

SHEET B-1-13

DRAWN BY: CDOT
CHECKED BY: LCM



PLAN VIEW

NOTES:

A. WHERE RAMPS AND STREET CROSSINGS DO NOT ALIGN, A 4'x4' MINIMUM MANEUVERING AREA MUST BE PROVIDED (MEASURED FROM THE FACE OF CURB). THIS MANEUVERING AREA MUST FALL WITHIN THE CROSSWALK STRIPES (WHERE PROVIDED). THE EDGES OF THE RAMP MUST ALWAYS FALL WITHIN THE CROSSWALK STRIPES (WHERE PROVIDED).

B. IT IS TYPICALLY PREFERRED THAT THE RAMP ALIGNS WITH THE CROSSWALK, BUT THE AVAILABLE RIGHT-OF-WAY OR OTHER CONDITIONS MAY PROHIBIT THIS.

C. REFER TO DETAIL SHEETS B-1-2 & B-1-3 FOR ADDITIONAL REQUIREMENTS FOR PERPENDICULAR RAMPS AT CORNER.

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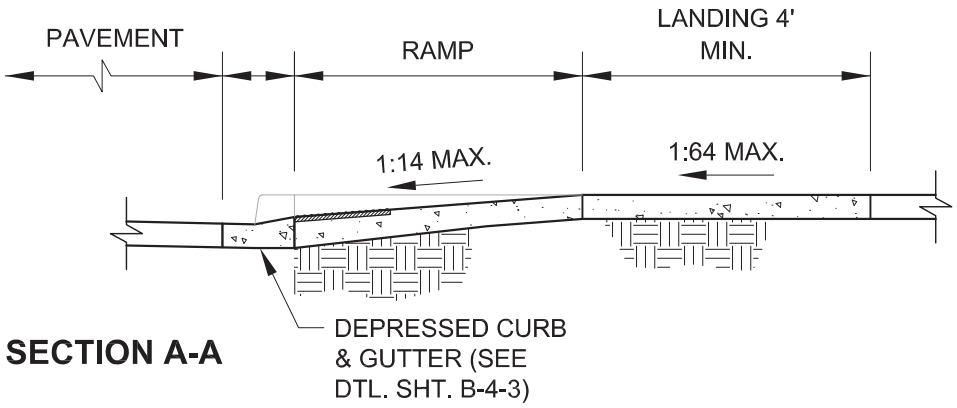
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11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

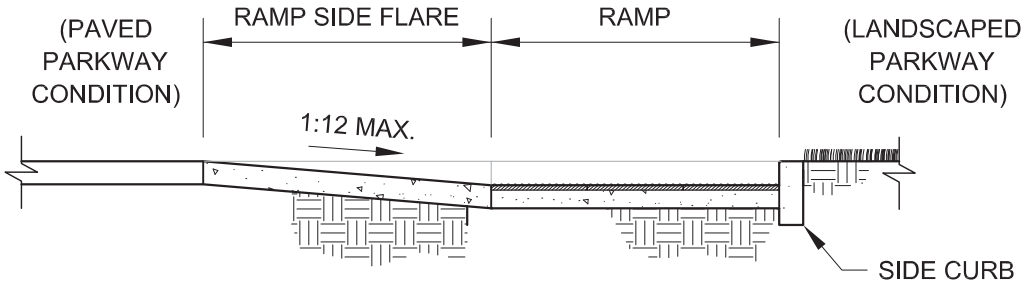
CITY OF CHICAGO
RAMPS THAT DO NOT ALIGN WITH CROSSWALK
SHEET B-1-14

SCALE: NOT TO SCALE
DATE: 10/23/2006

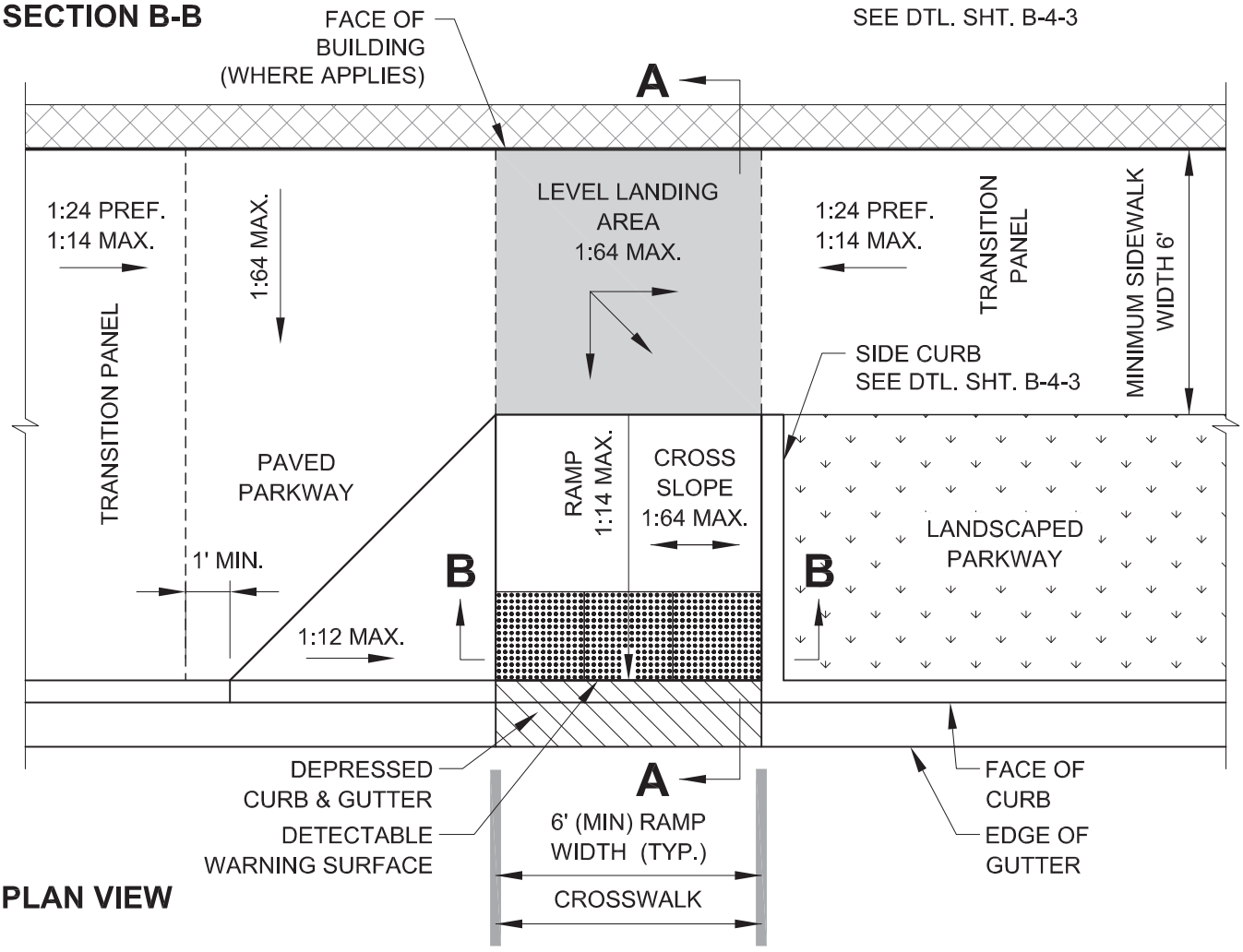
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SECTION A-A



SECTION B-B



PLAN VIEW

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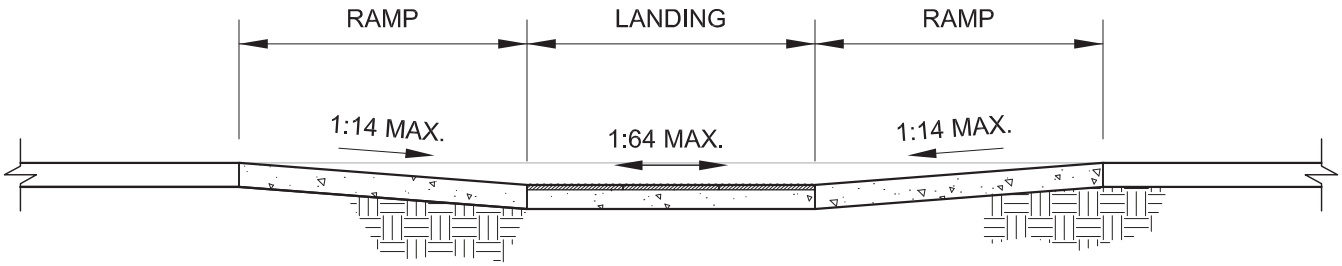
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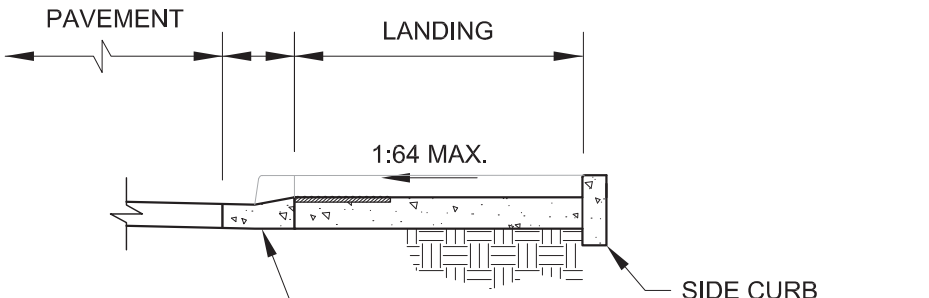
CITY OF CHICAGO
PERPENDICULAR RAMP AT MID-BLOCK LOCATION
SHEET B-1-15

SCALE: NOT TO SCALE
DATE: 10/23/2006

DRAWN BY: CDOT
CHECKED BY: LCM

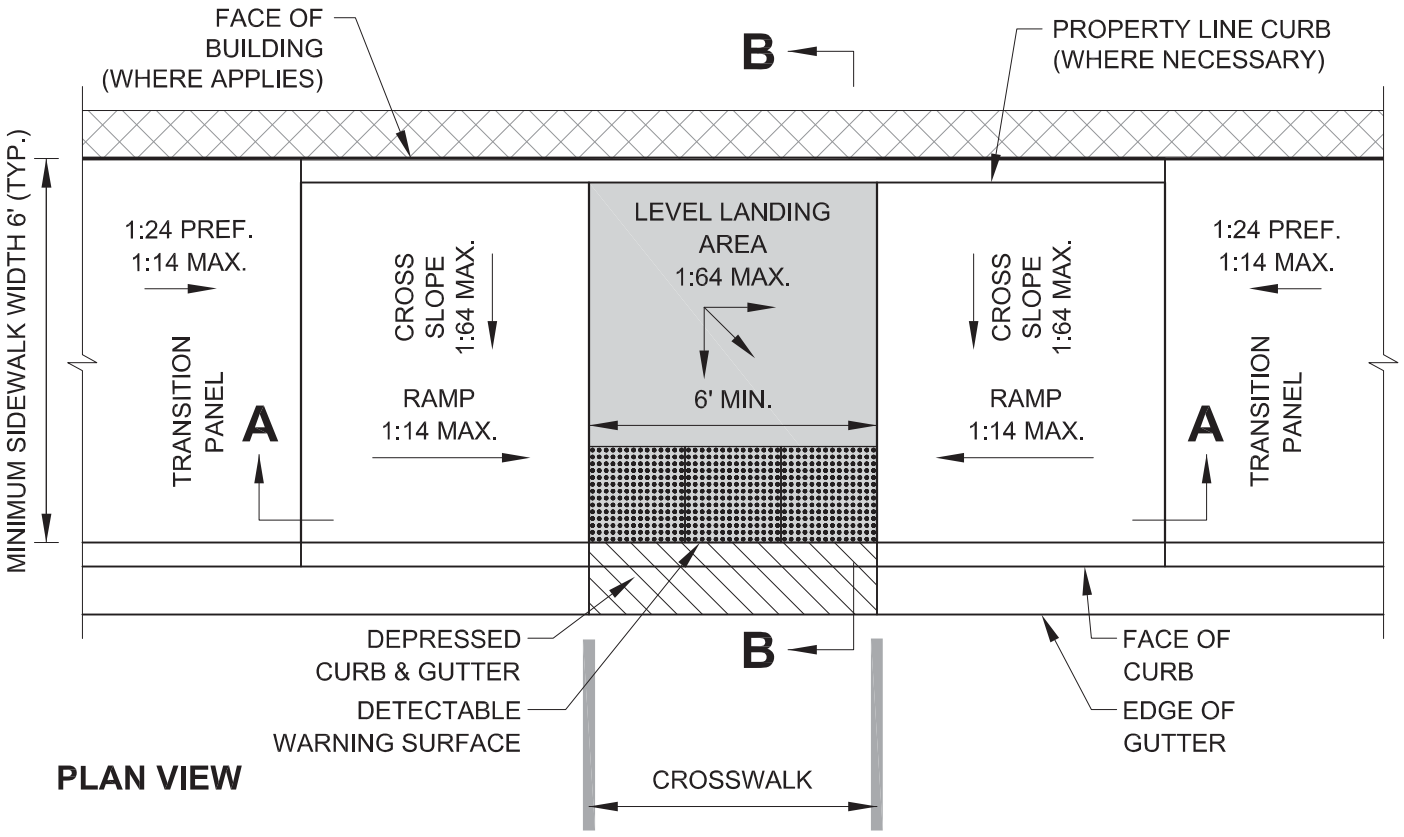


SECTION A-A



SECTION B-B

NOTE:
DO NOT USE THIS DESIGN IF ACCESS TO EXISTING FACILITIES IS REDUCED
(DO NOT RAMP IN FRONT OF ENTRIES, STAIRS, GATES, ETC.)



PLAN VIEW

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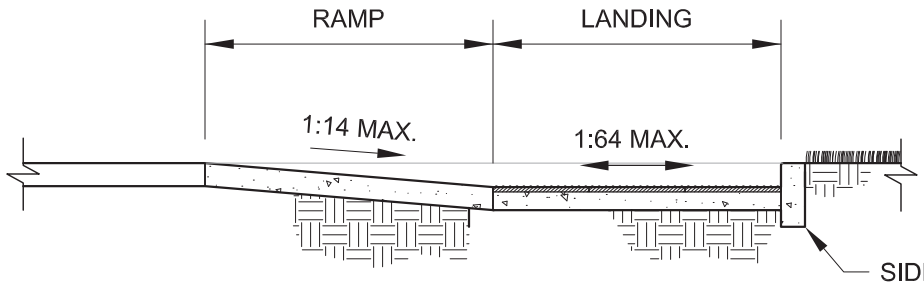
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11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

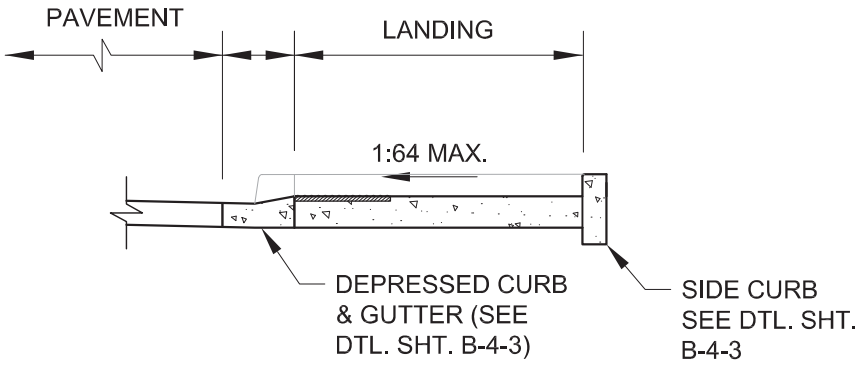
CITY OF CHICAGO
PARALLEL RAMP AT MID-BLOCK LOCATION
SHEET B-1-16

SCALE: NOT TO SCALE
DATE: 10/23/2006

DRAWN BY: CDOT
CHECKED BY: LCM

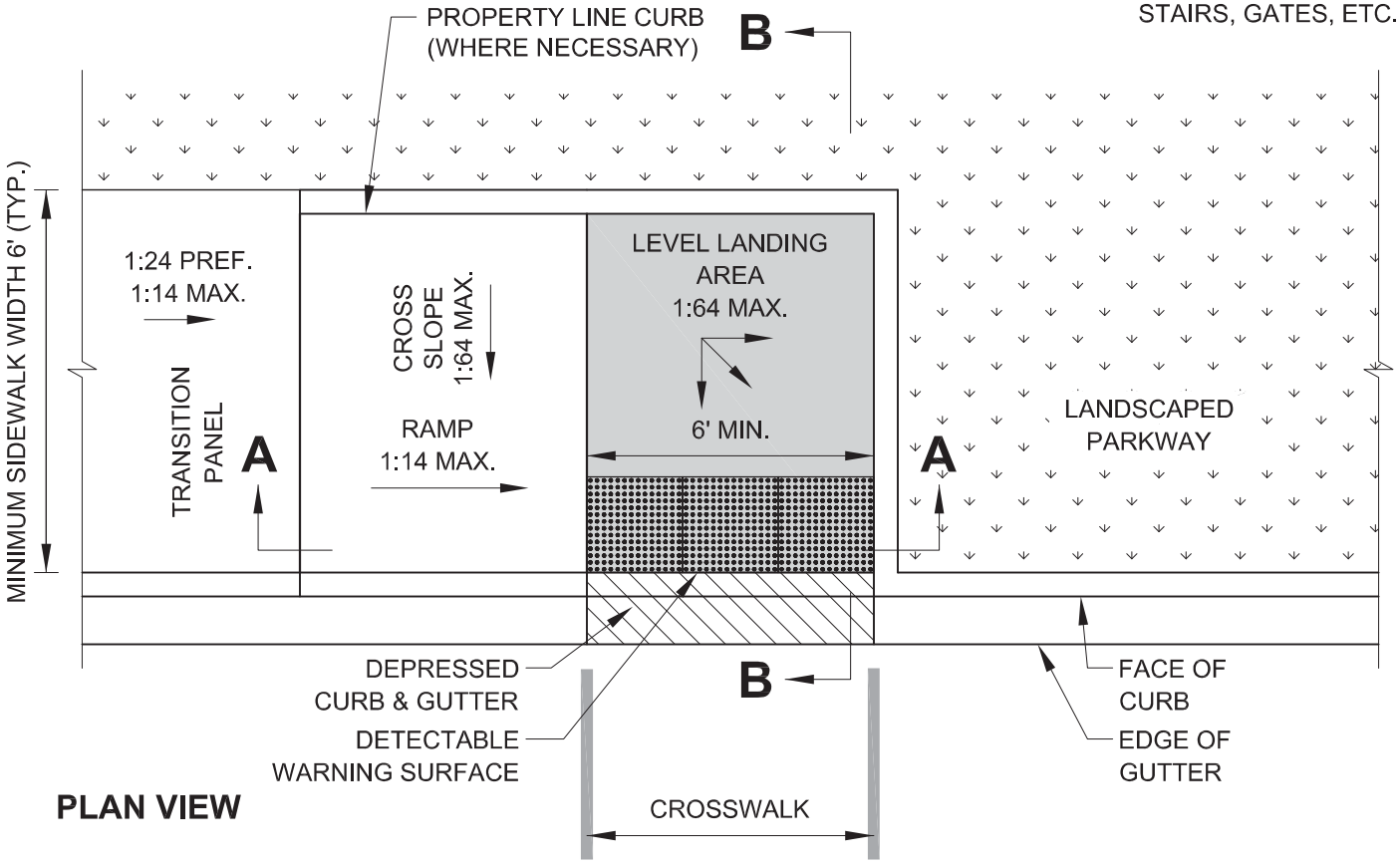


SECTION A-A



SECTION B-B

NOTE:
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(DO NOT RAMP IN FRONT OF ENTRIES, STAIRS, GATES, ETC.)



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DATE	REVISION
02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
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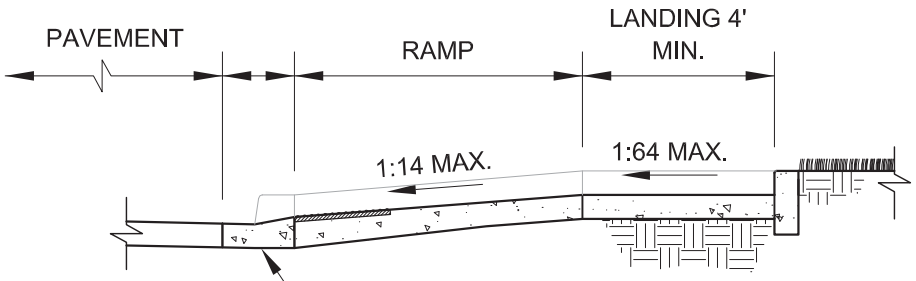
CITY OF CHICAGO
PARALLEL RAMP (ONE DIRECTION)
AT MID-BLOCK LOCATION

SCALE: NOT TO SCALE
DATE: 10/23/2006

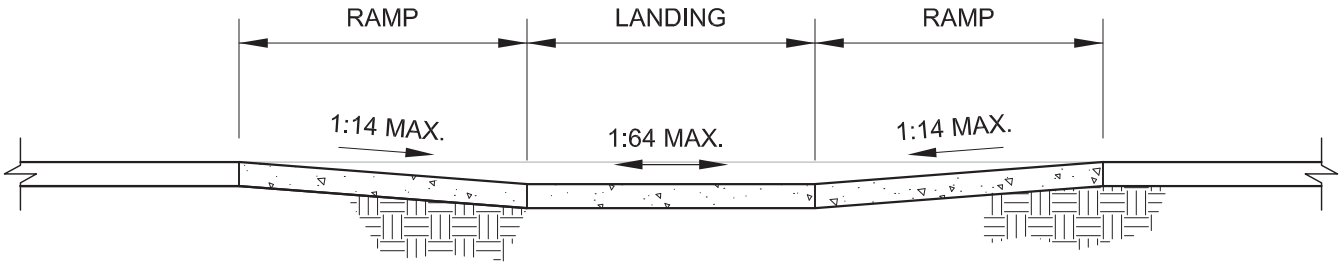
SHEET B-1-17

DRAWN BY: CDOT
CHECKED BY: LCM

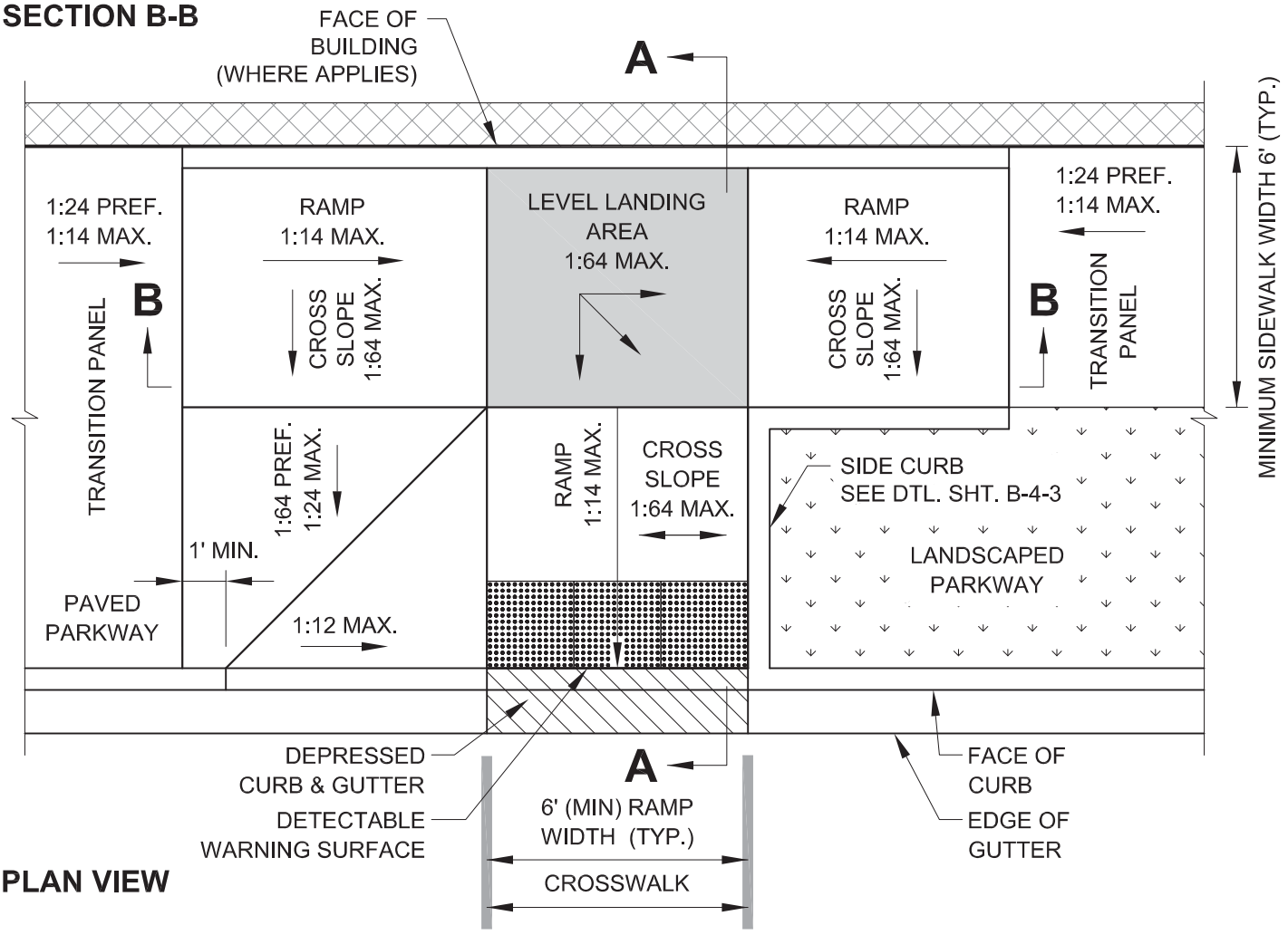
NOTE:
DO NOT USE THIS DESIGN IF ACCESS TO EXISTING FACILITIES IS REDUCED (DO NOT RAMP IN FRONT OF ENTRIES, STAIRS, GATES, ETC.)



SECTION A-A



SECTION B-B



PLAN VIEW

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DATE	REVISION
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11/15/07	REVISION 2
11/14/08	REVISION 3
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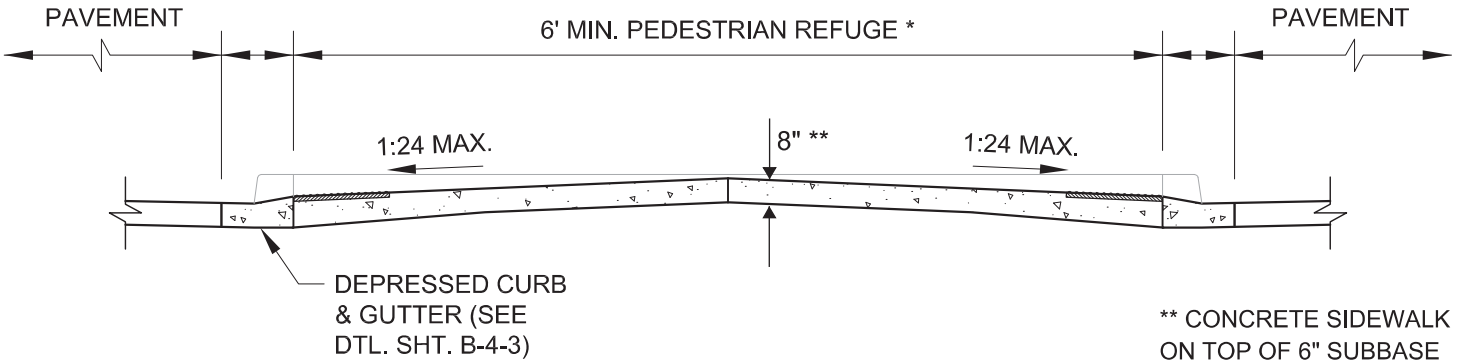
CITY OF CHICAGO
COMBINATION RAMP (PARALLEL AND PERPENDICULAR RAMPS) AT MID-BLOCK LOCATION

SCALE: NOT TO SCALE
DATE: 10/23/2006

SHEET B-1-18

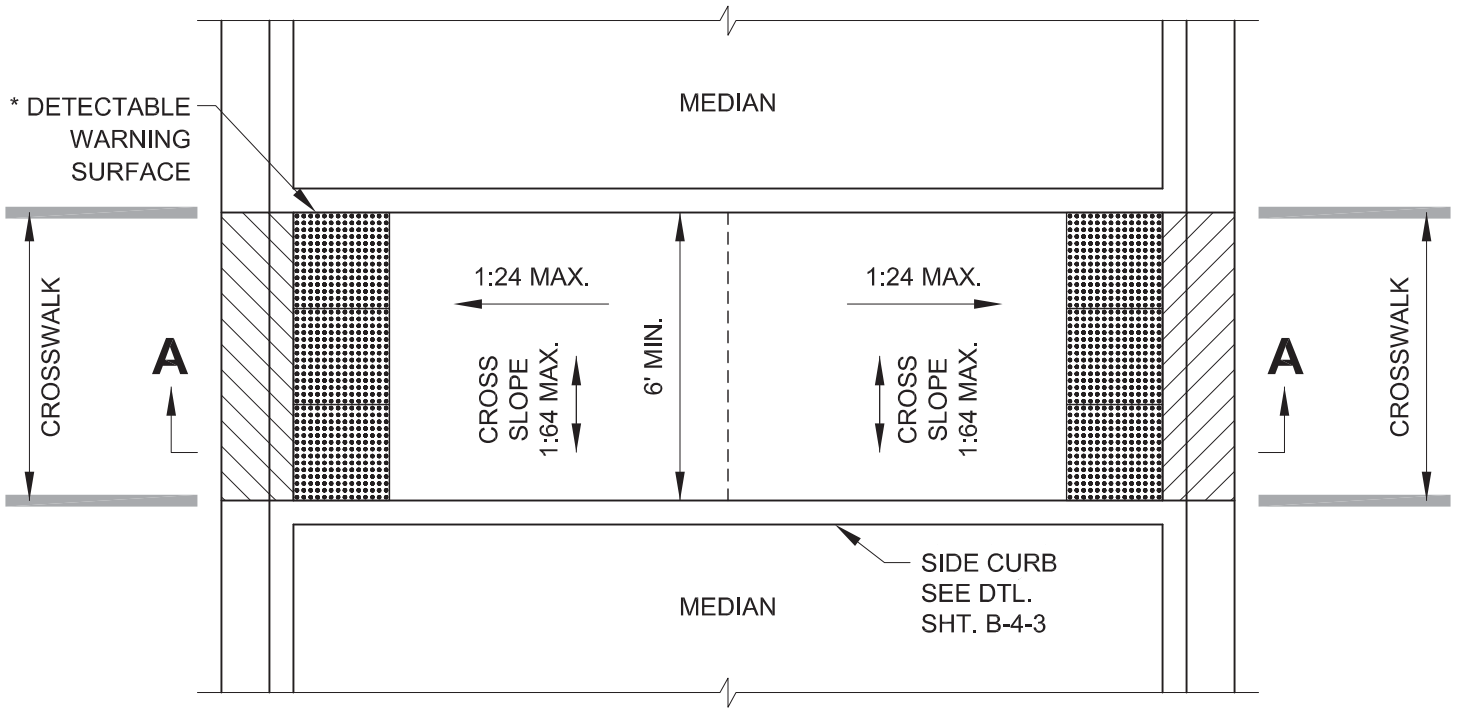
DRAWN BY: CDOT
CHECKED BY: LCM

* IF LENGTH OF 6' MIN. CANNOT BE PROVIDED FOR PEDESTRIAN REFUGE, DETECTABLE WARNING IS NOT TO BE PROVIDED



** CONCRETE SIDEWALK ON TOP OF 6" SUBBASE GRANULAR MATERIAL, TYPE B

SECTION A-A



PLAN VIEW

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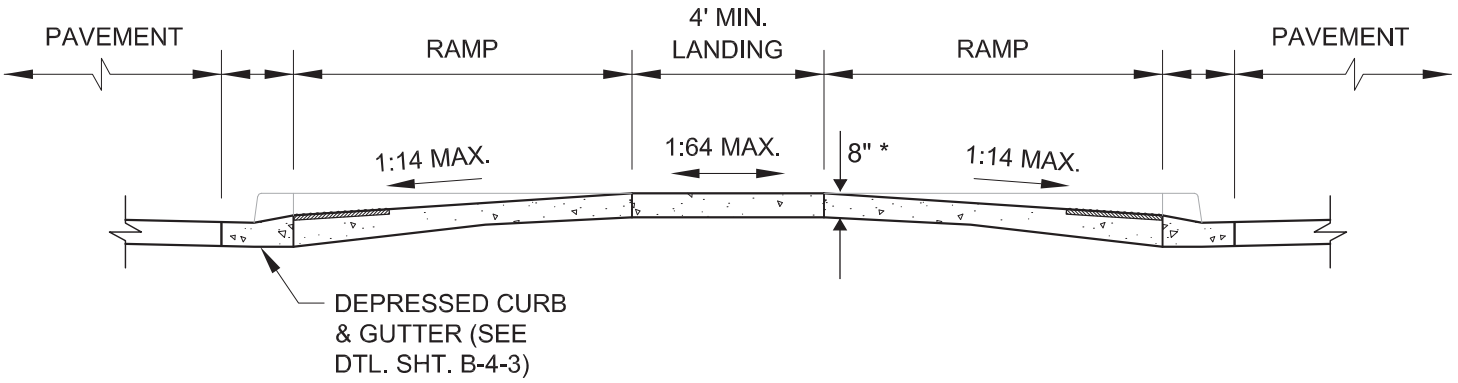
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11/14/08	REVISION 3
11/02/09	REVISION 4
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01/01/14	REVISION 6

CITY OF CHICAGO
MEDIAN PASS-THROUGH
SHEET B-1-19

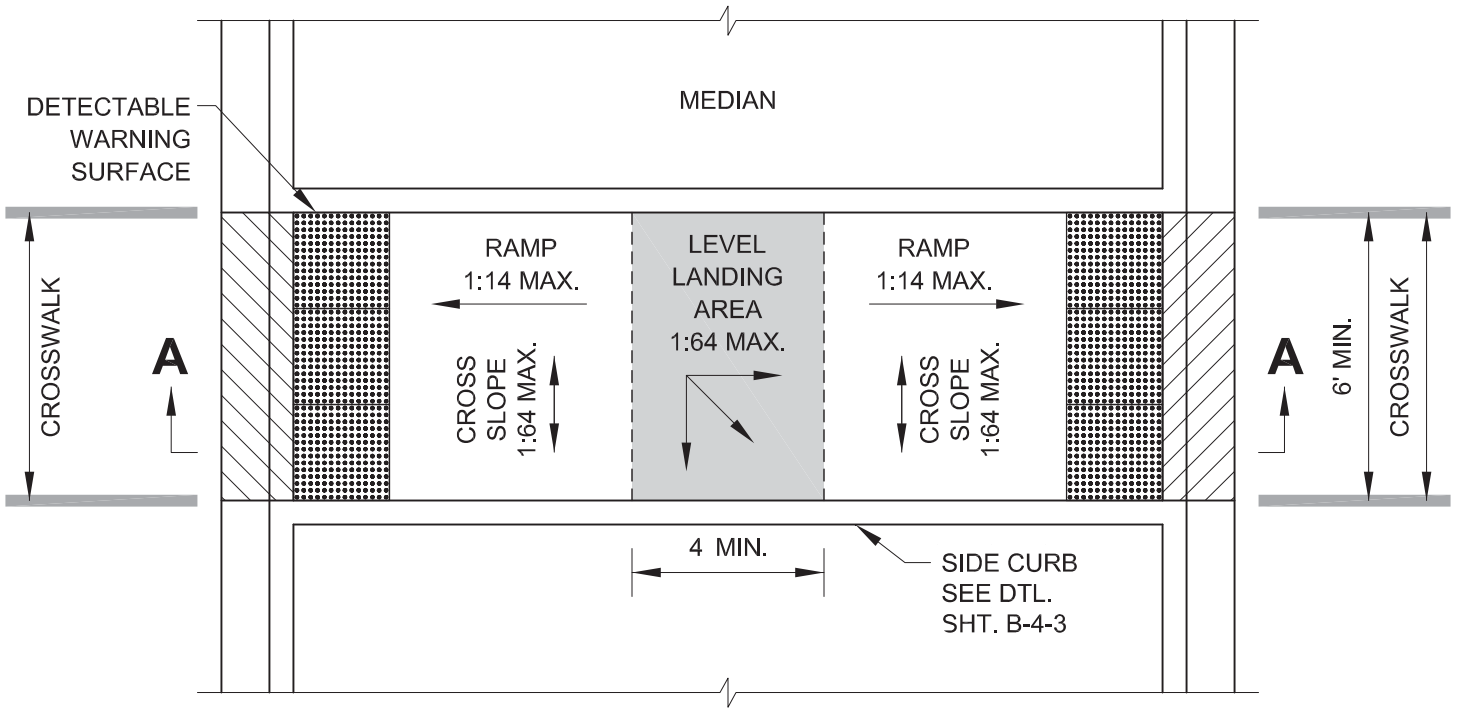
SCALE: NOT TO SCALE
DATE: 10/23/2006

DRAWN BY: CDOT
CHECKED BY: GK

* CONCRETE SIDEWALK ON TOP OF 6" SUBBASE GRANULAR MATERIAL, TYPE B



SECTION A-A



PLAN VIEW

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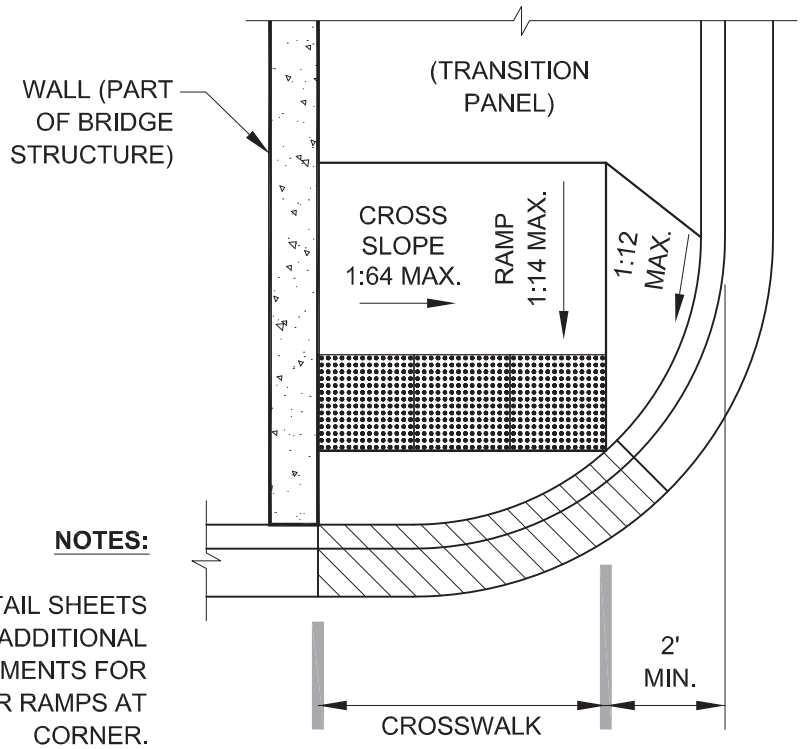
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11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5
01/01/14	REVISION 6

CITY OF CHICAGO
MEDIAN PASS-THROUGH WITH RAMPS
SHEET B-1-20

SCALE: NOT TO SCALE
DATE: 10/23/2006

DRAWN BY: CDOT
CHECKED BY: GK

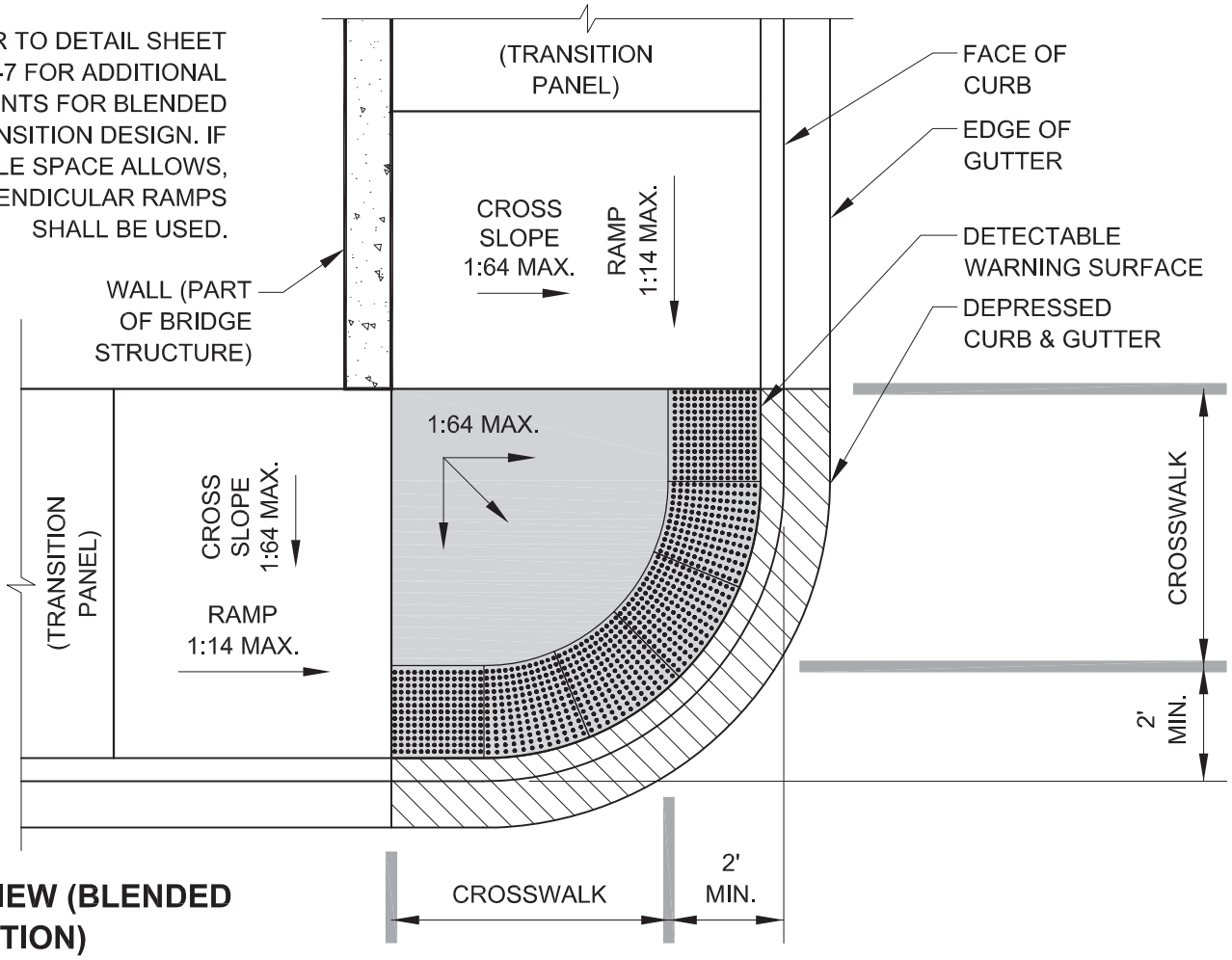


PLAN VIEW - SINGLE AVAILABLE CROSSING

NOTES:

A. REFER TO DETAIL SHEETS B-1-2 & B-1-3 FOR ADDITIONAL REQUIREMENTS FOR PERPENDICULAR RAMPS AT CORNER.

B. REFER TO DETAIL SHEET B-1-7 FOR ADDITIONAL REQUIREMENTS FOR BLENDED TRANSITION DESIGN. IF AVAILABLE SPACE ALLOWS, PERPENDICULAR RAMPS SHALL BE USED.



PLAN VIEW (BLENDED TRANSITION)

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DATE	REVISION
02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

CITY OF CHICAGO
ON-GRADE RAMP AT BRIDGE OR OVERPASS
SHEET B-1-21

SCALE: NOT TO SCALE
DATE: 10/23/2006

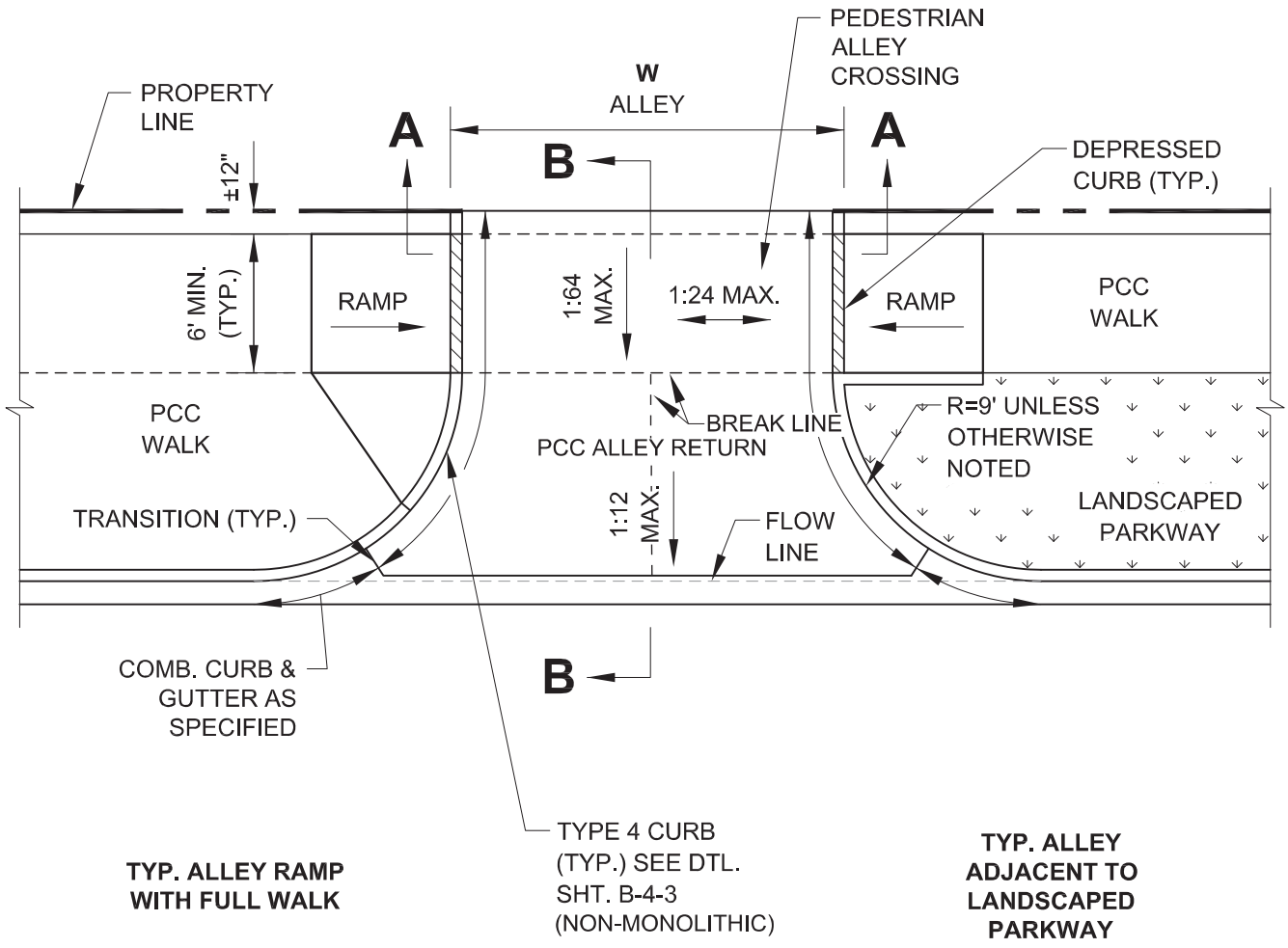
DRAWN BY: CDOT
CHECKED BY: LCM

NOTES:

A. DETECTABLE WARNING IS NOT REQUIRED AT ALLEY RETURNS.

B. RAMP DETAILS ARE DEPENDENT UPON SITE SPECIFIC CONDITIONS (WHERE RAMPS ARE NECESSARY). SEE APPROPRIATE RAMP SHEET AS REQUIRED (TYP.).

C. SEE DETAIL B-2-5 FOR REDUCED WIDTH (4' MIN.) PEDESTRIAN ACCESSIBLE ROUTE ACROSS ALLEY / DRIVEWAY (TO ALLOW FOR ADDITIONAL SLOPE AT ALLEY / DRIVEWAY).



TYP. ALLEY RAMP WITH FULL WALK

TYP. ALLEY ADJACENT TO LANDSCAPED PARKWAY

PLAN VIEW

NOTE:
WORK THIS SHEET WITH SHEET B-2-2.

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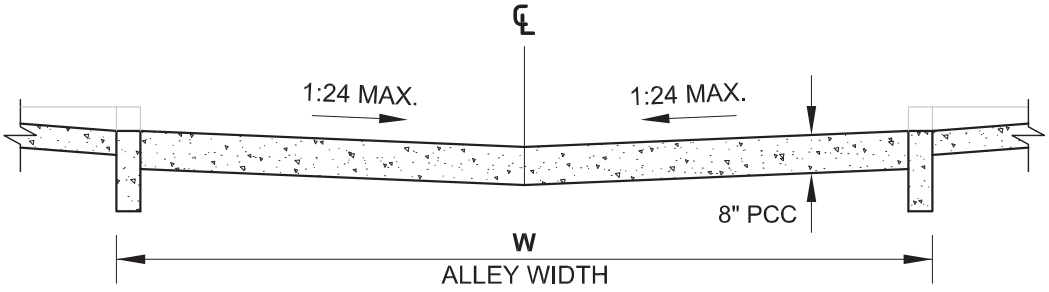
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DATE	REVISION
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08/10/12	REVISION 5
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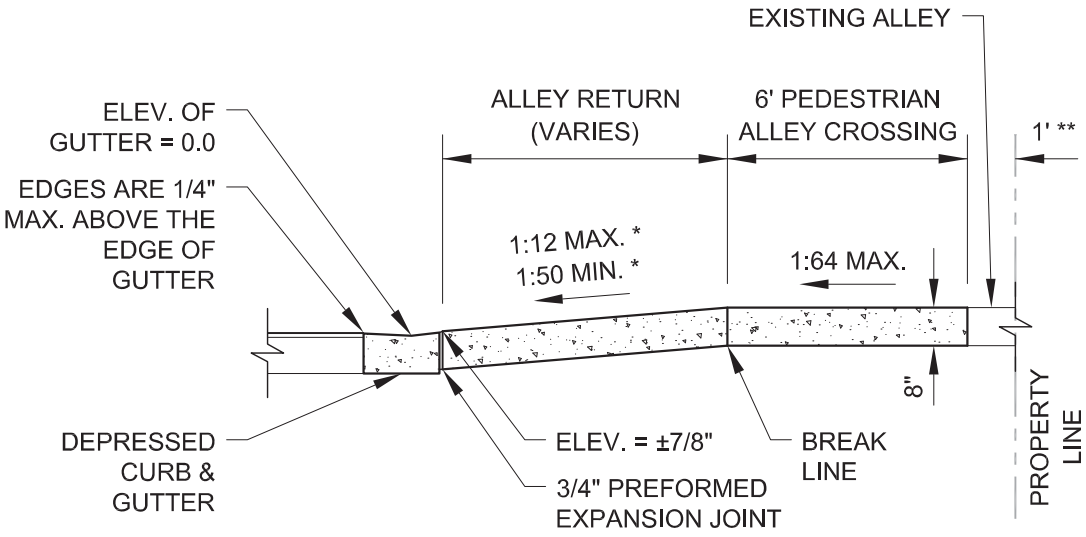
CITY OF CHICAGO
ALLEY RETURN PLAN VIEW
SHEET B-2-1

SCALE: NOT TO SCALE
DATE: 10/23/2006

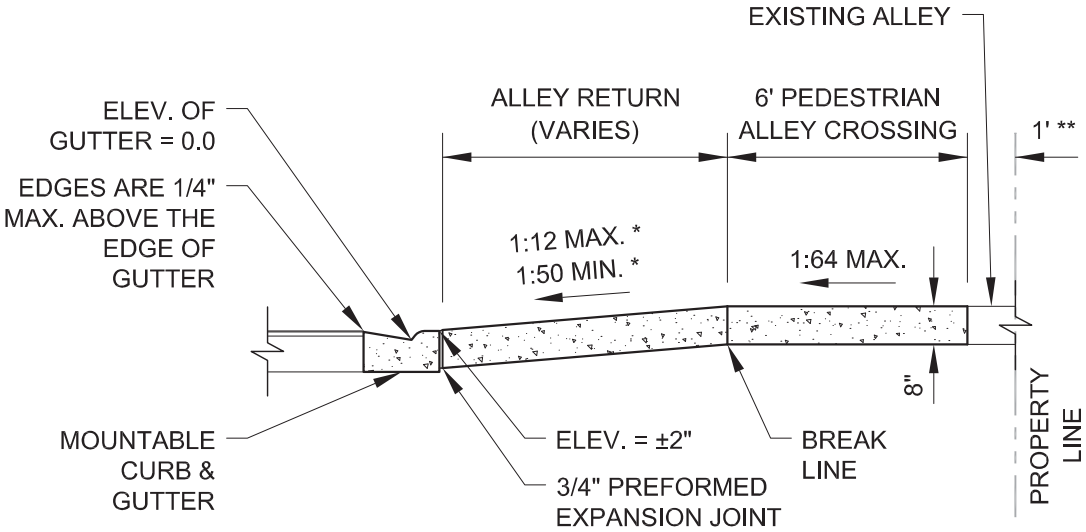
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CHECKED BY: GK



SECTION A-A: CROSS SECTION AT PROPERTY LINE



SECTION B-B: LONGITUDINAL SECTION SHOWING DEPRESSED CURB & GUTTER



SECTION B-B: LONGITUDINAL SECTION SHOWING MOUNTABLE CURB & GUTTER

ALLEY RETURN NOTES:

A. WHEN A PORTION OF AN EXISTING PAVED ALLEY IS REMOVED TO ADJUST THE ALLEY PAVEMENT TO THE NEW GRADE, 3/4" PREFORMED EXPANSION JOINT MATERIAL SHALL BE PLACED ON THE PROPERTY LINE OTHERWISE THE JOINT IS OMITTED. THE COST OF FURNISHING AND PLACING THE 3/4" PREFORMED EXPANSION JOINT MATERIAL SHALL BE INCLUDED IN THE COST OF THE PORTLAND CEMENT CONCRETE ALLEY RETURN.

B. SAWED JOINTS SHALL BE SEALED WITH A POURED MATERIAL MEETING THE REQUIREMENTS OF SECTION 1050 OF THE SSRBC.

* SLOPE VARIES AND IS NOT GOVERNED BY ADA

** THE SLOPE OF THE ALLEY IN THE 1' SPACE ADJACENT TO THE PROPERTY LINE MAY BE ALTERED UP TO 10% TO MEET EXISTING CONDITIONS

NOTE:
WORK THIS SHEET WITH SHEET B-2-1.

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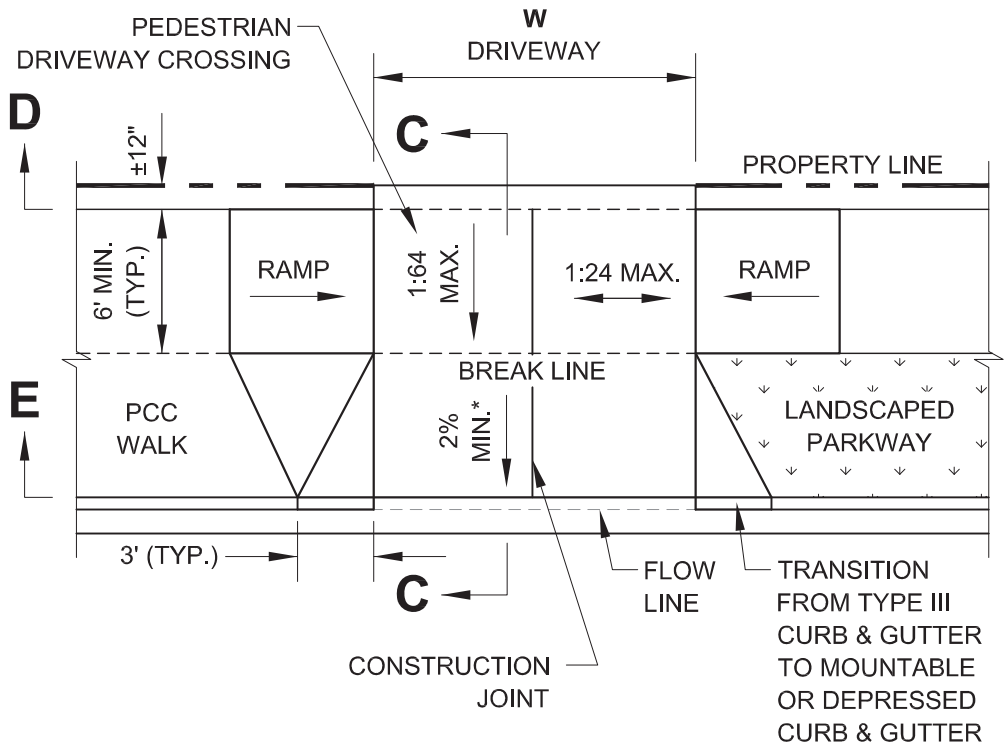
CDOT
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION
02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5
01/01/14	REVISION 6

CITY OF CHICAGO
ALLEY RETURN SECTIONS
SHEET B-2-2

SCALE: NOT TO SCALE
DATE: 10/23/2006

DRAWN BY: CDOT
CHECKED BY: GK



ALLEY NOTES:

A. DETECTABLE WARNING IS NOT REQUIRED AT NON-SIGNALIZED DRIVEWAYS.

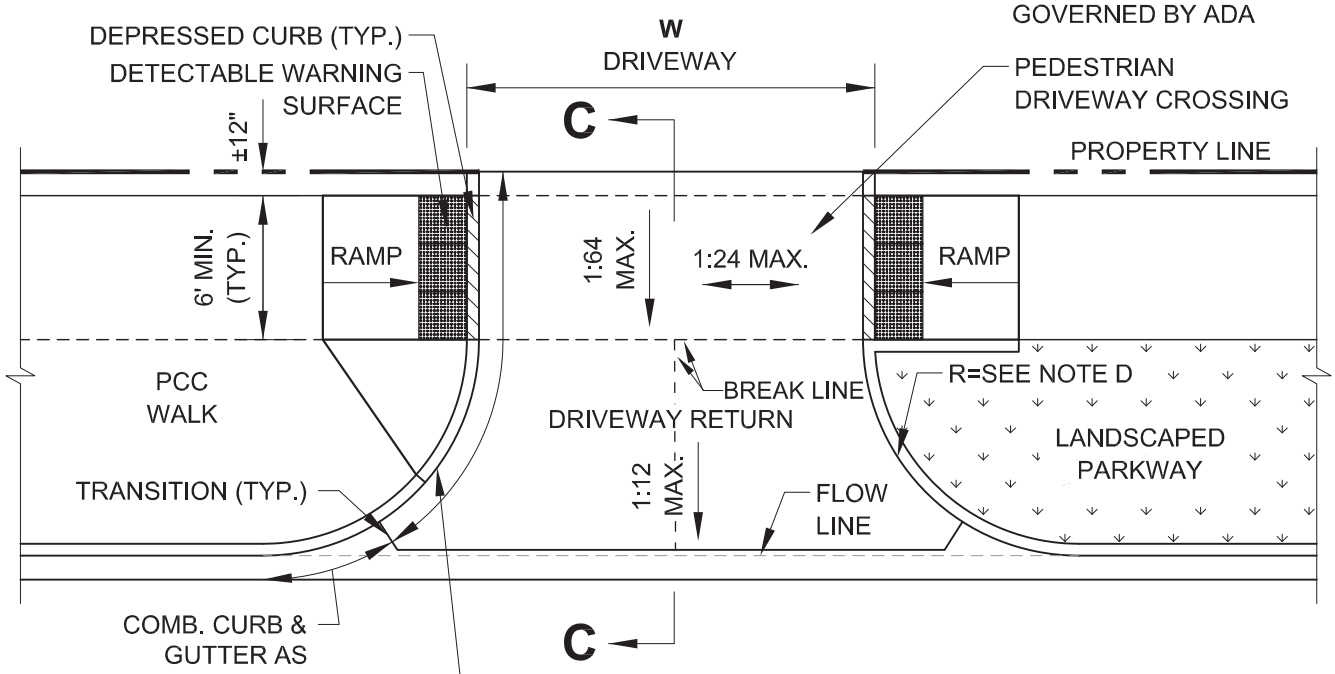
B. RAMP DETAILS ARE DEPENDENT UPON SITE SPECIFIC CONDITIONS (WHERE RAMPS ARE NECESSARY). SEE APPROPRIATE RAMP SHEET AS REQUIRED (TYP.).

C. SEE DETAIL B-2-5 FOR REDUCED WIDTH (4' MIN.) PEDESTRIAN ACCESSIBLE ROUTE ACROSS ALLEY / DRIVEWAY (TO ALLOW FOR ADDITIONAL SLOPE AT ALLEY / DRIVEWAY).

D. DEPENDENT UPON TYPE & VOLUME OF TRAFFIC.

* SLOPE VARIES AND IS NOT GOVERNED BY ADA

OPTION A - DRIVEWAY WITH FLARES



TYP. DRIVEWAY RAMP WITH FULL WALK

TYP. RAMP ADJACENT TO LANDSCAPED PARKWAY

OPTION B - COMMERCIAL AND RESIDENTIAL DRIVEWAY WITH CURB

FOR USE WITH TRAFFIC SIGNALIZATION APPROVED BY CITY ORDINANCE

NOTE: WORK THIS SHEET WITH SHEET B-2-4.

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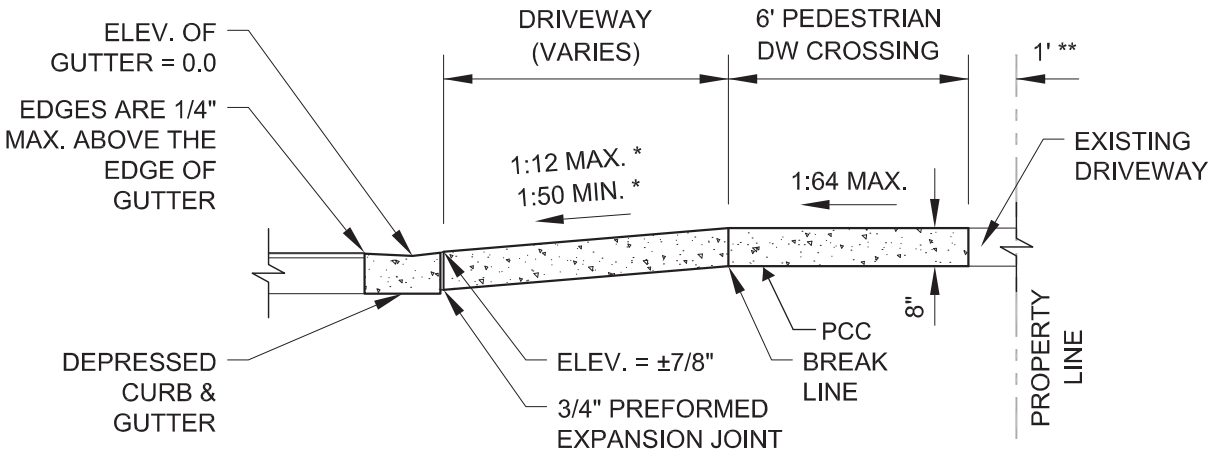
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11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5
01/01/16	REVISION 6

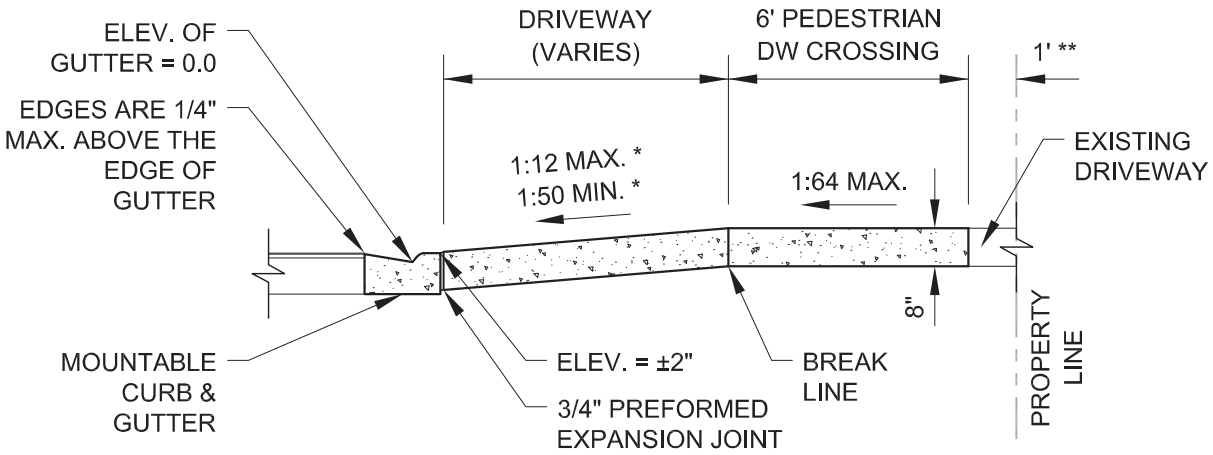
CITY OF CHICAGO
DRIVEWAY CONSTRUCTION PLAN VIEWS
SHEET B-2-3

SCALE: NOT TO SCALE
DATE: 10/23/2006

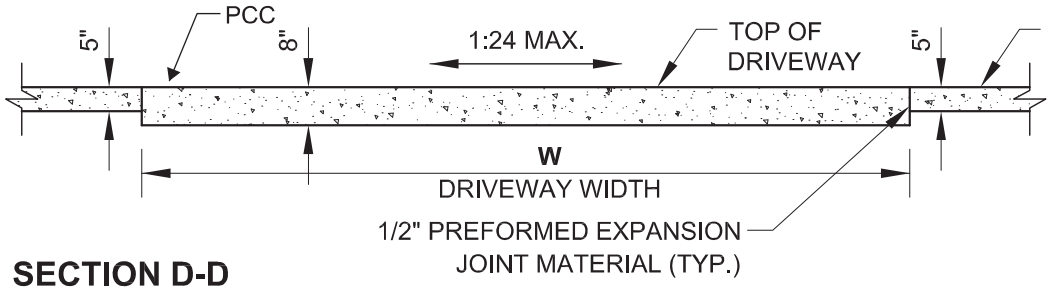
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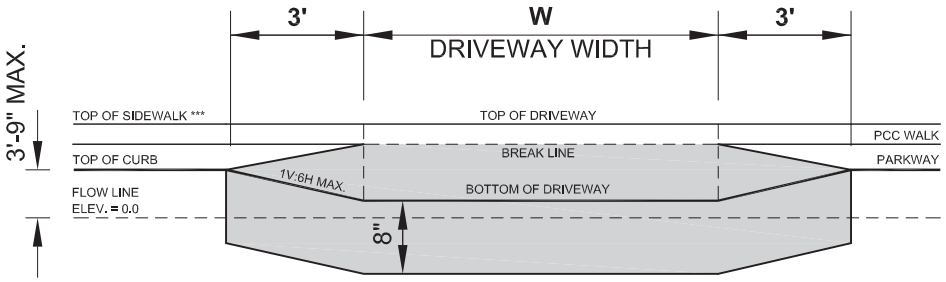
SECTION C-C: SECTION SHOWING DEPRESSED CURB & GUTTER



SECTION C-C: SECTION SHOWING MOUNTABLE CURB & GUTTER



SECTION D-D



SECTION E-E

* SLOPE VARIES AND IS NOT GOVERNED BY ADA

** THE SLOPE OF THE ALLEY IN THE 1' SPACE ADJACENT TO THE PROPERTY LINE MAY BE ALTERED UP TO 10% TO MEET EXISTING CONDITIONS

*** HEIGHT OF FLARE + WIDTH OF SIDEWALK x 1.56% + WIDTH OF PARKWAY x 1.56% TO 4%

NOTE:
WORK THIS SHEET WITH SHEET B-2-3.

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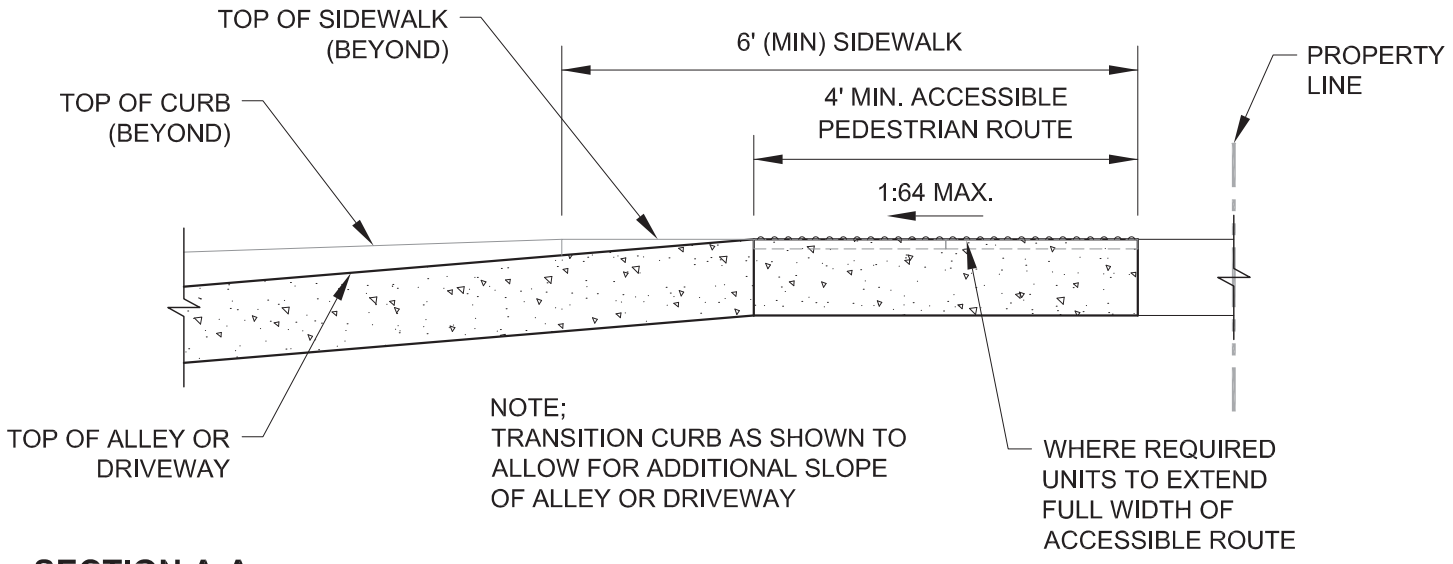
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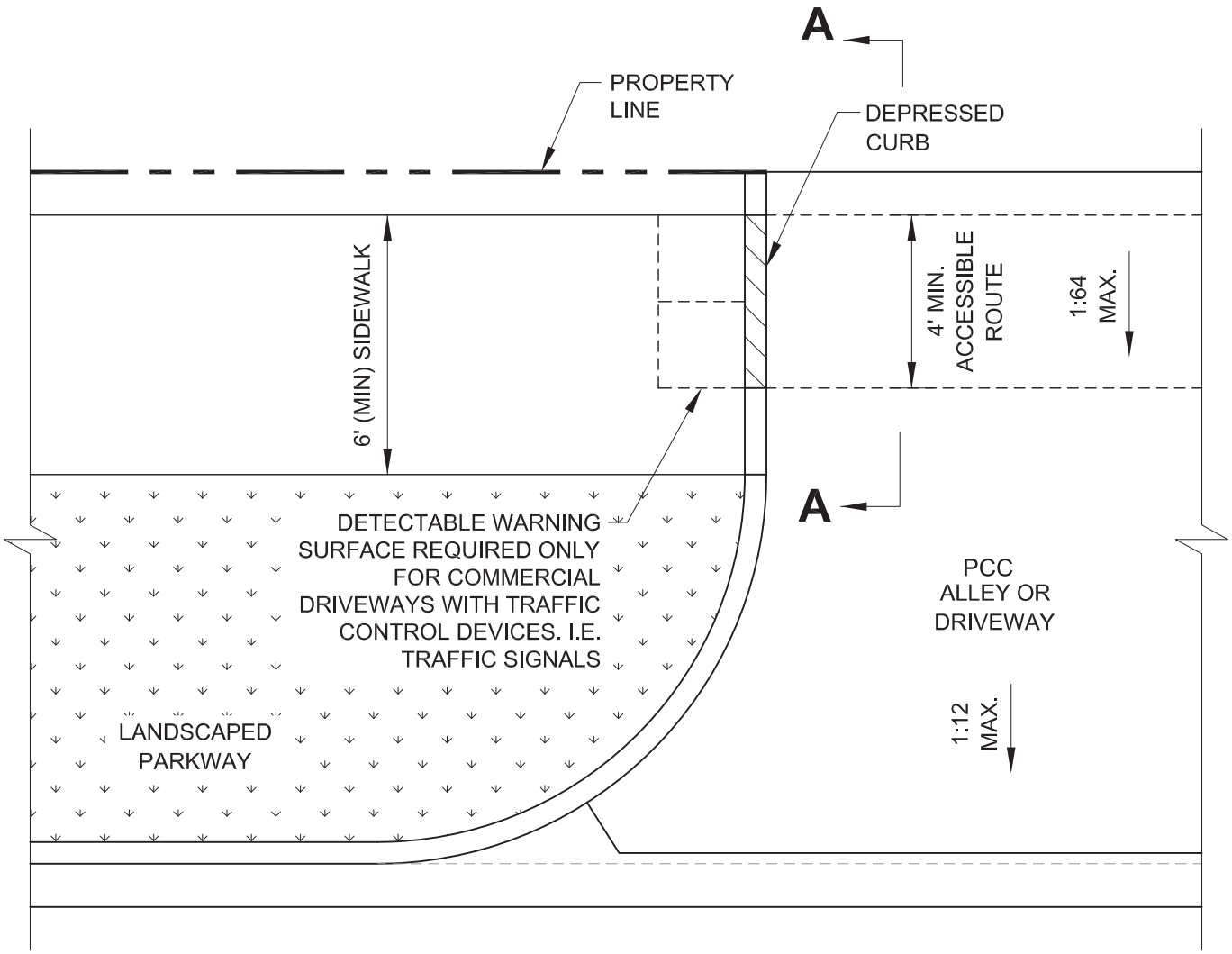
CITY OF CHICAGO
DRIVEWAY CONSTRUCTION SECTIONS
SHEET B-2-4

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DATE: 10/23/2006

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SECTION A-A



PLAN VIEW

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CITY OF CHICAGO
ALLEY & DRIVEWAY DETAIL FOR REDUCED
WIDTH PEDESTRIAN ACCESS ROUTE

SCALE: NOT TO SCALE
DATE: 10/23/2006

SHEET B-2-5

DRAWN BY: CDOT
CHECKED BY: GK

SLOPE CONVERSION CHART			
% SLOPE	SLOPE RATIO	INCHES PER FOOT	DECIMAL FEET PER FOOT
16.67%	1:6	2"	0.167'
10%	1:10	1 1/4"	0.104'
8.33%	1:12	1"	0.083'
7.14%	1:14	7/8"	0.073'
5%	1:20	5/8"	0.052'
4.17%	1:24	1/2"	0.042'
2%	1:50	1/4"	0.021'
1.56%	1:64	3/16"	0.016'

GENERAL NOTES:

1. THE DETECTABLE WARNING USED SHALL BE CHOSEN FROM THE CHICAGO DEPARTMENT OF TRANSPORTATION LIST OF APPROVED DETECTABLE WARNING PRODUCTS (AVAILABLE ON THE CITY OF CHICAGO WEBSITE). IT IS NOT ACCEPTABLE TO INSTALL TWO DIFFERENT DETECTABLE WARNING PRODUCTS ADJACENT TO ONE ANOTHER AT ANY LOCATION. IN THE CENTRAL BUSINESS DISTRICT, GRANITE OR OTHER SPECIALTY PAVING MATERIALS MAY BE SUBMITTED TO THE COMMISSIONER FOR APPROVAL.

2. THE DETECTABLE WARNING MUST BE INSTALLED A MAXIMUM OF 8" OR LESS FROM FACE OF CURB (SEE DETAIL SHEET B-4-2).

3. THE DETECTABLE WARNING MUST COVER FULL WIDTH OF RAMP EXCLUDING SIDE FLARES FOR A MINIMUM UNOBSTRUCTED DEPTH OF 24". THE DETECTABLE WARNING LOCATED ON THE SURFACES OF RAMPS IS TYPICALLY ORIENTED PERPENDICULAR TO THE RUN OF THE RAMP UNLESS SPECIAL CIRCUMSTANCES OCCUR (SEE DETAIL SHEET B-1-5). THE DETECTABLE WARNING MUST BE PROVIDED FOR A MINIMUM DEPTH OF 24" FOR THE ENTIRE LENGTH OF THE SIDEWALK WHERE THE SIDEWALK IS FLUSH WITH THE STREET (DEPRESSED CURB OR FLUSH TRANSITION). IF IT IS NECESSARY TO CUT A UNIT(S) IN THE PROVISION OF A COMPLIANT RAMP OR SIDEWALK WITH 24" MINIMUM DEPTH OF DETECTABLE WARNING, THE UNITS SHALL BE CUT IN A NEAT AND WORKMAN LIKE MANNER PER MANUFACTURER'S REQUIREMENTS WITH A MINIMUM OF THREE PINS OR ANCHOR POINTS (WHERE APPLICABLE). THE UNITS SHALL BE ARRANGED SO THAT THE CUT UNITS ARE LARGE ENOUGH TO BE PROPERLY AND ADEQUATELY SECURED. CUT UNITS SHALL NOT BE USED UNLESS ALL OTHER DESIGN OPTIONS HAVE BEEN EXHAUSTED. THE USE OF SALVAGE PIECES FROM UNITS THAT ARE CUT WILL NOT BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE COMMISSIONER. CUT UNIT SALVAGE PIECES NOT APPROVED FOR USE MUST BE REMOVED FROM THE SITE AND DISPOSED OF PROPERLY.

4. WHERE APPLICABLE, A COMBINATION OF STRAIGHT AND RADIAL DETECTABLE WARNING UNITS MAY BE USED ON COMPOUND AND LARGE RADII. CONTRACTOR MUST MAKE THIS DETERMINATION AND VERIFY IN FIELD.

5. THE DETECTABLE WARNING MUST CONTRAST WITH ADJACENT PAVEMENT. IF LIGHT COLORED PAVEMENT IS USED THE DETECTABLE WARNING COLOR SHALL BE RED. IF A DARK COLORED PAVEMENT IS USED THE DETECTABLE WARNING COLOR SHALL BE YELLOW. CONTRACTOR TO VERIFY THAT PROPER CONTRAST IS OBTAINED.

6. PRIOR TO PLACING CONCRETE FOR DEPRESSED CURBS, RAMPS, OR SIDEWALKS THE CONTRACTOR SHALL VERIFY THAT LAYOUT OR DESIGN COMPLIES WITH THE REQUIREMENTS OF THE CDOT ADA STANDARDS.

7. RAMP WIDTH MUST BE A MINIMUM OF 6'-0" AND IN INCREMENTS OF 1'-0", EXCEPT WHEN USING THE PERPENDICULAR RAMP AT CORNER (OR OTHER SPECIAL CDOT APPROVED CONDITIONS), WHICH HAS A MINIMUM WIDTH OF 4'-0".

8. THE MAXIMUM ALLOWABLE RAMP RUNNING SLOPE IS 1:14, MEASURED AT ANY PORTION OF THE RAMP. IF POSSIBLE, A MORE GRADUAL SLOPE SHALL BE USED. GRADE BREAKS AT THE TOP AND BOTTOM OF RAMPS SHALL BE PERPENDICULAR TO THE DIRECTION OF RAMP RUN.

9. THE MAXIMUM ALLOWABLE RAMP CROSS SLOPE IS 1:64, MEASURED AT ANY PORTION OF THE RAMP. IF POSSIBLE, A MORE GRADUAL SLOPE SHALL BE USED.

10. THE MAXIMUM ALLOWABLE RAMP LANDING SLOPE IS 1:64, MEASURED AT ANY LOCATION AND IN ANY DIRECTION ON THE LANDING. THE RAMP LANDING WIDTH SHALL MATCH THE FULL WIDTH OF THE RAMP FOR A MINIMUM UNOBSTRUCTED DEPTH OF 4'-0". RAMP LANDINGS SHALL BE PROVIDED AT THE TOP AND/OR BOTTOM OF RAMPS WHERE TURNING IS REQUIRED.

11. RAMP SIDE FLARES SHALL BE INSTALLED AT ANY LOCATION WHERE THE SURFACE ADJACENT TO THE RAMP SURFACE IS INTENDED FOR PEDESTRIAN USE. TRIPPING HAZARDS, INCLUDING STEPS, DROP-OFFS, OR CURBS SHALL NOT BE LOCATED WITHIN THE LIMITS OF THE SIDEWALK. RAMP SIDE FLARES ARE NOT REQUIRED WHERE THE SURFACE ADJACENT TO THE RAMP SURFACE IS LANDSCAPED OR IS OCCUPIED BY A BARRIER THAT BLOCKS PEDESTRIAN ACCESS. EXCEPTIONS TO THIS RULE MAY BE SUBMITTED TO THE COMMISSIONER FOR APPROVAL.

GENERAL NOTES (CONTINUED):

12. UTILITIES, SUCH AS LIGHT POLES, TRAFFIC POLES AND HYDRANTS, MAY BE LOCATED IN THE FLARE OF THE RAMP BUT ARE NOT ALLOWED ON THE RAMP SURFACE OR LANDING AREAS. EXISTING UTILITY STRUCTURE LIDS MAY REMAIN WITHIN THE FLARE OR ON THE SURFACE OF THE RAMP IF THE REQUIREMENTS OF GENERAL NOTE #19 ARE MET.

13. ALL LOCATIONS WITH TYPE 4 OR TYPE B CURB (EXCEPT ALLEY APRONS) SHALL BE CONSTRUCTED AS CURB AND GUTTER TYPE BV.12 THROUGH THE LIMITS OF THE CORNER AND THE CURB RAMPS.

14. ALTERATIONS SHALL NOT DECREASE THE ACCESSIBILITY TO EXISTING FACILITIES, SIDEWALKS LEADING TO EXISTING FACILITIES, OR DOOR OR GATE ACCESS POINTS TO FACILITIES. THE ELEVATION AT THE EXISTING PROPERTY LINE OR FACILITY ACCESS POINT SHALL BE MAINTAINED AT A MINIMUM. ANY ALTERATIONS ADJACENT TO OR AFFECTING A FACILITY ACCESS POINT SHALL RESULT IN IMPROVED ACCESS OR AT A MINIMUM A REPLICATION OF EXISTING CONDITIONS, INCLUDING SIDEWALK SLOPES AND SURFACE CONDITIONS. FACILITIES INCLUDE, BUT ARE NOT LIMITED TO PRIVATE BUSINESSES, PUBLIC BUILDINGS, RESIDENCES, BUS STOPS, PUBLIC BENCHES, PAY PHONES, AND PARKING METERS.

15. THE MINIMUM CROSSWALK WIDTH IS 6'-0". CROSSWALKS SHALL BE LOCATED AS SHOWN IN THE PLAN SHEETS DEPENDING ON THE TYPE OF CURB RAMP USED. BEYOND THE CURB FACE AT THE BASE OF CURB RAMPS, A CLEAR SPACE OF 4'-0" BY 4'-0" MINIMUM SHALL BE PROVIDED WITHIN THE STRIPES OF THE CROSSWALK (WHERE PROVIDED).

16. IF SIDEWALK AND ALLEY ARE AT THE SAME GRADE, A RAMP IS NOT REQUIRED. IF SIDEWALK AND DRIVEWAY ARE AT THE SAME GRADE, A RAMP IS NOT REQUIRED BUT DETECTABLE WARNING UNITS ARE STILL REQUIRED IF THE DRIVEWAY HAS TRAFFIC CONTROL DEVICES (I.E. TRAFFIC SIGNALS).

17. MAIN LINE SIDEWALK SHALL HAVE A MAXIMUM CROSS SLOPE NOT TO EXCEED 1:64 FOR THE FULL WIDTH OF WALK UNLESS OTHERWISE APPROVED BY THE COMMISSIONER. WHERE TURNING IS REQUIRED AND WHERE SIDEWALKS INTERSECT, THE SLOPE OF THE SIDEWALK SHALL NOT EXCEED 1:64 IN ANY DIRECTION.

18. MAIN LINE SIDEWALK RUNNING SLOPES SHALL NOT EXCEED 1:24 OR THE GENERAL GRADE ESTABLISHED FOR THE ADJACENT STREET, WHICH EVER IS HIGHER.

19. THERE SHALL BE NO VERTICAL LEVEL DIFFERENCES BETWEEN SURFACES GREATER THAN 1/4" ON THE MAIN LINE SIDEWALK. THERE SHALL BE NO HORIZONTAL GAPS OR OPENINGS GREATER THAN 1/2" ON THE MAIN LINE SIDEWALK.

20. WHERE OBSTRUCTIONS EXIST ON THE MAINLINE SIDEWALK, THE CLEAR WIDTH OF USEABLE SIDEWALK SHALL NOT BE LESS THAN 4'-0". OBSTRUCTIONS INCLUDE, BUT ARE NOT LIMITED TO SIDEWALK BENCHES, FIRE HYDRANTS, SIGNAL OR LIGHT POLES, NEWSPAPER DISPENSERS, TRASH RECEPTACLES, AND UTILITY PEDESTALS.

21. CURB RAMPS AND LANDING (KEYSTONE) TO BE CONSTRUCTED WITH 8" THICK CONCRETE AT ALL TRAFFIC SIGNALIZED INTERSECTIONS AND INDUSTRIAL STREET INTERSECTIONS. AT ALL OTHER LOCATIONS, 5" THICK CONCRETE TO BE USED.

22. DEPRESSED CURB, RAMP, OR SIDEWALK DESIGNS OR LAYOUTS SHALL MAINTAIN OR IMPROVE EXISTING DRAINAGE AND THE EXISTING INTERSECTION GEOMETRY SHALL NOT BE MODIFIED WITHOUT CDOT APPROVAL.

23. ALL CONSTRUCTION DOCUMENTS MUST BE STAMPED BY A LICENSED ARCHITECT/LANDSCAPE ARCHITECT/ ENGINEER TO CERTIFY THAT THEY ARE IN ACCORDANCE WITH THE AMERICANS WITH DISABILITIES ACT (ADA) AND ALL CODES AND BUILDING ORDINANCES OF THE CITY OF CHICAGO AND THE STATE OF ILLINOIS.

24. NO DEVIATIONS FROM THESE STANDARDS ARE ALLOWED WITHOUT WRITTEN APPROVAL FROM THE COMMISSIONER.

ADA COMPLIANCE AND TRANSITION GUIDELINES

POLICY STATEMENT: ANY ALTERATION OF THE PUBLIC WAY MUST BE RESTORED IN AN ADA COMPLIANT MANNER

I. STREET/ALLEY RESTORATION

FOR ANY PROJECT WHERE, WITHIN THE PROJECT LIMITS, A CROSSWALK IS ENCOUNTERED OR WHERE THE PROJECT LIMITS TERMINATE WITHIN 4' OR LESS OF A CROSSWALK, THOSE CROSSWALKS AND THE ASSOCIATED CURB RAMPS MUST BE IMPROVED TO CURRENT ADA STANDARDS IF THEY ARE NOT COMPLIANT (SEE APPENDIX A.)

WHEN A PROJECT CALLS FOR ONLY AN INTERSECTION TO BE REPAVED, THE INTERSECTION LIMITS AS DEFINED BY THE AREA OUTLINED BY OUTERMOST CROSSWALK LINES AND ADJACENT CURB FACES AND ALL ADJOINING CROSSWALKS AND CURB RAMPS MUST BE IMPROVED TO CURRENT ADA STANDARDS IF THEY ARE NOT COMPLIANT (SEE APPENDIX A).

WHEN WORK IS LIMITED TO A SINGLE CORNER OF AN INTERSECTION, THE CURB RAMP MUST BE IMPROVED TO CURRENT ADA STANDARDS AND THE ADJACENT PAVEMENT MUST BE RESURFACED, AS NECESSARY TO PROVIDE FOR A FLUSH TRANSITION (SEE APPENDIX A).

WHEN ADA WORK IS LIMITED TO A SINGLE CORNER OF AN INTERSECTION, THE ADJACENT PAVEMENT MUST BE RESTORED (SEE APPENDIX A).

FOR ANY CONSTRUCTION WHERE, WITHIN THE PROJECT LIMITS, AN ALLEY APRON IS ENCOUNTERED, THE ASSOCIATED CURB RAMPS, ALLEY APRON, AND SIDEWALKS MUST BE IMPROVED TO CURRENT ADA STANDARDS IF THEY ARE NOT COMPLIANT (SEE APPENDIX A).

II. SIDEWALK INSTALLATION / REPAIRS / RECONSTRUCTION

THE LIMITS OF ANY MAINLINE SIDEWALK REPLACEMENT, GREATER THAN TEN FEET (10') IN LENGTH, THAT ABUT AN EXISTING RAMP, KEYSTONE, TRANSITION PANEL, AND/OR LANDING AREA (THIS TOTAL LENGTH INCLUDES THE PRIOR ELEMENTS), SHALL BE EXTENDED TO INCLUDE THE AFFECTED RAMPS AND THESE RAMPS SHALL BE RECONSTRUCTED TO CURRENT ADA STANDARDS. IN ADDITION, ALL NEWLY PLACED SIDEWALK TEN FEET (10') OR MORE IN LENGTH SHALL BE CONSTRUCTED IN ACCORDANCE WITH ALL CURRENT APPLICABLE STANDARDS WHICH INCLUDE PROVIDING A MINIMUM FOUR FEET (4') WIDTH ACCESSIBLE PATHWAY WITH A CROSS SLOPE NOT TO EXCEED 1:64 (SEE APPENDIX A).

III. GUIDELINES FOR TRANSITIONING TO EXISTING NON-COMPLIANT CONDITION

NEW SIDEWALK PLACEMENTS GREATER THAN TEN FEET IN CONTIGUOUS LENGTH:

THE LIMITS OF ANY MAINLINE SIDEWALK REPLACEMENT, GREATER THAN TEN FEET (10') IN LENGTH, MUST BE EXTENDED FOR A MINIMUM FIVE ADDITIONAL FEET (5') EITHER SIDE IN ORDER TO PROVIDE A TRANSITION TO MATCH THE EXISTING SIDEWALK. THE LENGTH OF TRANSITION SHALL BE LENGTHENED AS NECESSARY TO ENSURE THAT THE RUNNING SLOPE OF THE TRANSITION DOES NOT EXCEED A SLOPE OF 1:24 (PREFERRED) OR 1:14 (MAXIMUM) AT ANY POINT.

NEW SIDEWALK REPLACEMENTS TEN FEET OR LESS IN CONTIGUOUS LENGTH (REPAIRS):

IT IS ACCEPTABLE PRACTICE TO MATCH ADJACENT SIDEWALKS AT THE EXISTING SLOPE.

CURB RAMP REPLACEMENTS

WHEN REPLACING AN ADA RAMP, THE SIDEWALK REPLACEMENT MUST EXTEND BEYOND THE LIMITS OF THE LANDING AREA AND/OR THE "KEYSTONE" A MINIMUM OF AN ADDITIONAL FIVE FEET (5') ON EITHER SIDE IN ORDER TO PROVIDE A TRANSITION TO MATCH THE EXISTING SIDEWALK. THE TRANSITION PANEL SHALL BE LENGTHENED AS NECESSARY TO ENSURE THAT THE RUNNING SLOPE OF THE TRANSITION PANEL DOES NOT EXCEED A SLOPE OF 1:24 (PREFERRED) OR 1:14 (MAXIMUM) AT ANY POINT.

NO EXCEPTIONS TO THE ABOVE WILL BE ALLOWED WITHOUT WRITTEN APPROVAL FROM THE COMMISSIONER.

ALL DRAWINGS FOR WORK IN THE PUBLIC WAY MUST BE STAMPED AND SIGNED BY A LICENSED ARCHITECT, LANDSCAPE ARCHITECT OR LICENSED ENGINEER FOR CERTIFICATION

CERTIFICATION:

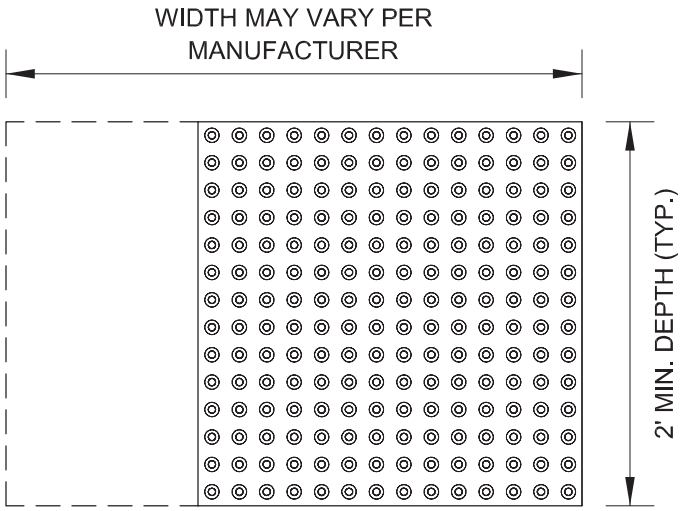


THIS CERTIFIED THAT THESE DRAWINGS HAVE BEEN REVIEWED TO THE BEST OF MY KNOWLEDGE AND THAT I BELIEVE THEY ARE IN ACCORDANCE WITH THE AMERICANS WITH DISABILITIES ACT (ADA), AND ALL CODES AND BUILDING ORDINANCES OF THE CITY OF CHICAGO, STATE OF ILLINOIS.

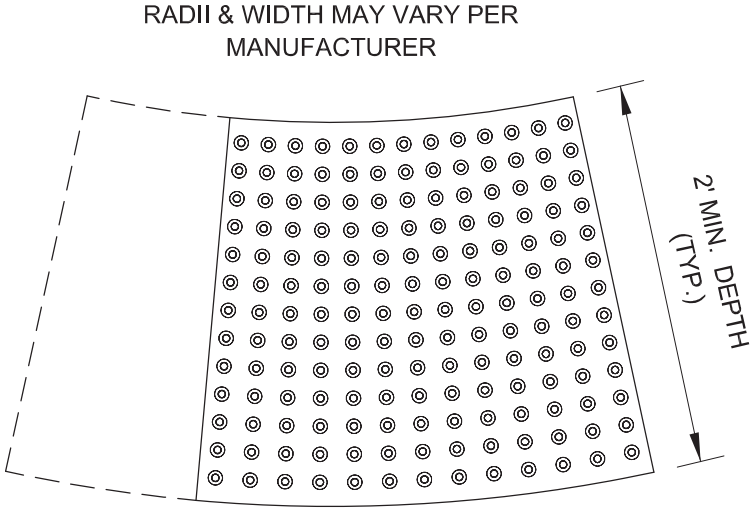
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LICENSED ARCHITECT / LANDSCAPE ARCHITECT / LICENSED ENGINEER

STRAIGHT DETECTABLE WARNING UNITS



RADIAL DETECTABLE WARNING UNITS



DETECTABLE WARNING UNIT SIZES

- VERIFY ALL DIMENSIONS WITH THE PRODUCT MANUFACTURER.
- IF USING RADIAL UNITS, VERIFY THAT THE CURB RADIUS MATCHES AVAILABLE UNIT RADII WITH THE PRODUCT MANUFACTURER.
- APPROVED LIST OF DETECTABLE WARNING PRODUCTS CAN BE FOUND ON CDOT'S WEBSITE (www.cityofchicago.org).

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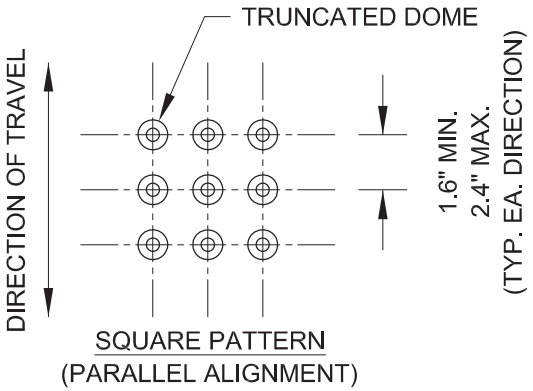
CITY OF CHICAGO
DETECTABLE WARNING UNIT SIZES
SHEET B-4-1

SCALE: NOT TO SCALE
DATE: 10/23/2006

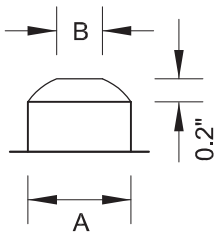
DRAWN BY: CDOT
CHECKED BY: LCM

GENERAL NOTE:

THE ROWS OF DOMES IN THE DETECTABLE WARNING MATERIAL MUST BE ALIGNED WITH THE PATH OF WHEELCHAIR TRAVEL WHICH IS REQUIRED TO BE PERPENDICULAR TO THE GRADE BREAK AT THE BOTTOM OF THE RAMP TO PERMIT TRACKING BETWEEN DOME ROWS. ON BLENDED TRANSITIONS OR FLUSH TRANSITIONS, WHERE RADIAL UNITS ARE SITUATED ABOUT THE CURB RADIUS, DOME ORIENTATION IS NOT SIGNIFICANT.

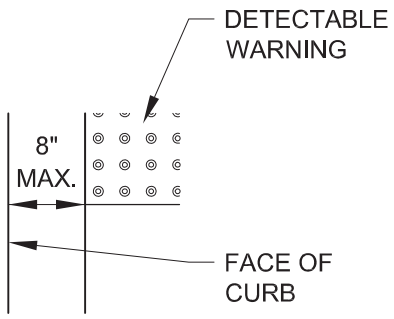


SQUARE PATTERN
(PARALLEL ALIGNMENT)



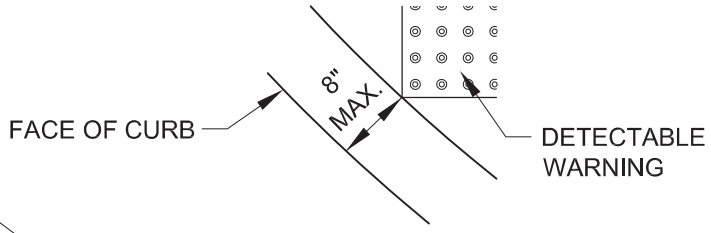
A = 0.9" MIN.
1.4 MAX.
B = 50% OF
(A) MIN. 65%
OF (A) MAX.

TRUNCATED DOME DETAIL



UNIT PATTERN & DOME DETAIL

TYPICAL DETECTABLE WARNING PLACEMENT



DETECTABLE WARNING PLACEMENT ON A RADIUS

DETECTABLE WARNING UNIT SECTION

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Division of Engineering
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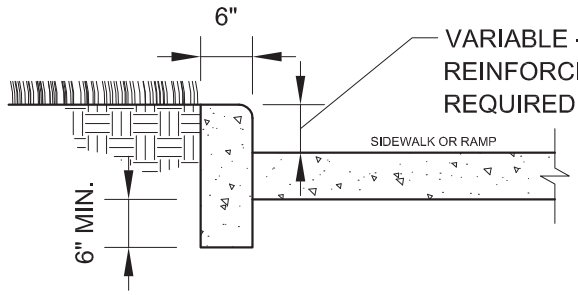
CDOT
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION
02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

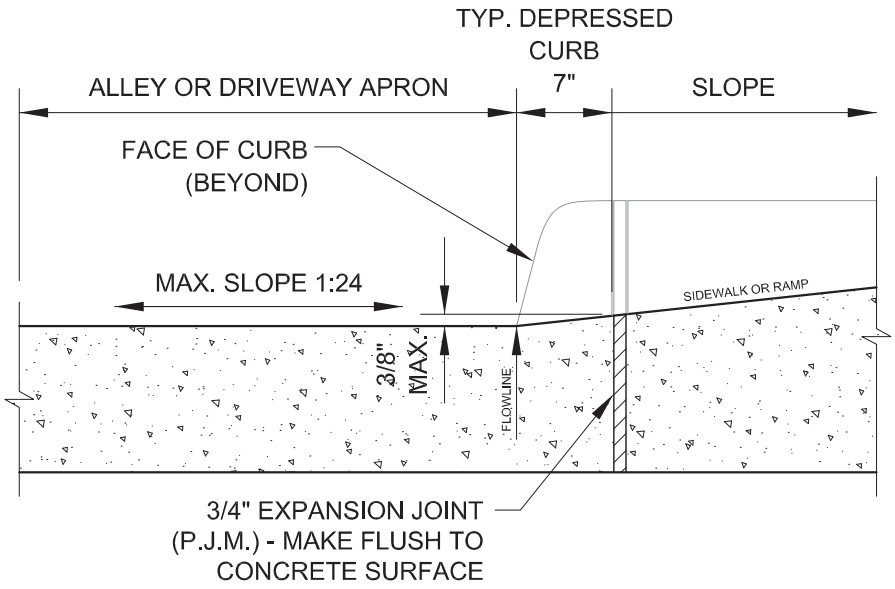
CITY OF CHICAGO
DETECTABLE WARNING UNIT DETAILS
SHEET B-4-2

SCALE: NOT TO SCALE
DATE: 10/23/2006

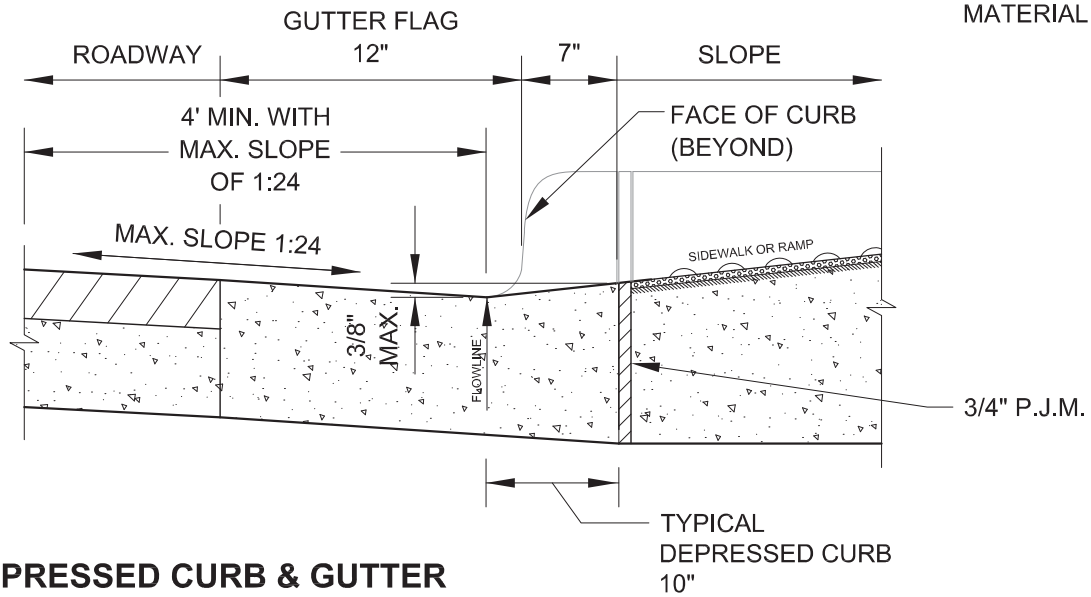
DRAWN BY: CDOT
CHECKED BY: LCM



SIDE CURB - SECTION



DEPRESSED CURB & GUTTER
AT ALLEY/DRIVEWAY APRON (TYPE 4 OR B CURB)



DEPRESSED CURB & GUTTER
AT BOTTOM OF TYPICAL CURB RAMP

NOTES FOR CURB & GUTTER DETAILS THIS SHEET:

A. CROSS SLOPE AT DEPRESSED CURB & GUTTER NOT TO EXCEED 1:64.

B. DETECTABLE WARNING SURFACE AT DRIVEWAYS REQUIRED ONLY FOR COMMERCIAL DRIVEWAYS WITH TRAFFIC CONTROL DEVICES, I.E. SIGNALS.

C. REFER TO *REGULATIONS FOR OPENINGS, CONSTRUCTION AND REPAIR IN THE PUBLIC WAY (CDOT)* FOR ADDITIONAL REQUIREMENTS FOR CURB AND GUTTER INSTALLATION.

D. RAMP SIDE FLARES SHALL BE INSTALLED AT ANY LOCATION WHERE THE SURFACE ADJACENT TO THE RAMP SURFACE IS INTENDED FOR PEDESTRIAN USE. TRIPPING HAZARDS, INCLUDING STEPS, DROP-OFFS, OR SIDE CURBS SHALL NOT BE LOCATED WITHIN THE LIMITS OF THE SIDEWALK.

E. 'P.J.M.' THIS SHEET REFERS TO PREFORMED JOINT MATERIAL.

City of Chicago
Rahm Emanuel, Mayor
Department of Transportation
Division of Engineering
www.cityofchicago.org
CDOT
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION
02/20/07	REVISION 1
11/15/07	REVISION 2
11/14/08	REVISION 3
11/02/09	REVISION 4
08/10/12	REVISION 5

CITY OF CHICAGO
CURB & GUTTER DETAILS
SHEET B-4-3

SCALE: NOT TO SCALE
DATE: 10/23/2006

DRAWN BY: CDOT
CHECKED BY: LCM

APPROVED DETECTABLE WARNING PRODUCTS

EAST JORDAN IRON WORKS
301 SPRING STREET
EAST JORDAN, MI 49727
(800) 847-4100

NEENAH FOUNDRY
2121 BROOKS AVENUE
NEENAH, WI 54956
(800) 558-5075

PIONEER DETECTABLE, LLC
N8060 MAPLE STREET
IXONIA, WI 53036
(262) 370-5355

ADVANTAGE CAST IRON
241 MAIN STREET, SUITE 100
BUFFALO, NY 14203
(800) 679-4022

DETECTILE CAST IRON ADA PLATES
DETECTILE CORPORATION
603 MALLARD LANE
OAK BROOK, IL 60523
(630) 734-0277

TUFTILE
1200 FLEX COURT
LAKE ZURICH, IL 60047
(888) 960-8897

NOTES:

1. ALL DETECTABLE WARNING UNITS MUST BE CAST IRON WITH A NATURAL FINISH.
2. IT IS NOT ACCEPTABLE TO INSTALL TWO DIFFERENT DETECTABLE WARNING PRODUCTS ADJACENT TO ONE ANOTHER AT ANY LOCATION.

City of Chicago
Department of Transportation
Division of Engineering
www.cityofchicago.org

CDOT
CHICAGO DEPARTMENT OF TRANSPORTATION

DATE	REVISION	DATE	REVISION
05/15/07	REVISION 1	10/11/11	REVISION 7
10/15/07	REVISION 2	05/13/12	REVISION 8
11/15/07	REVISION 3	08/23/12	REVISION 9
04/13/09	REVISION 4	09/21/12	REVISION 10
05/05/09	REVISION 5	04/29/14	REVISION 11
11/02/09	REVISION 6		

CITY OF CHICAGO
APPROVED DETECTABLE WARNING PRODUCT LIST

DATE: 10/23/2006

SECTION 01 30 00

HEALTH AND SAFETY PLAN

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes the requirements for providing a Health and Safety Plan.

B. Prevention of accidents on or near the Work is the Contractor's responsibility. The Contractor shall take all necessary precautions to assure the safety of all persons and property during performance of the Work and will protect the Work and adjacent property from damage. The Contractor will conform to all laws and regulations relating to health and safety. The Contractor shall designate a qualified representative responsible for safety.

C. The Contractor shall at all times be solely responsible for all aspects of safety in connection with the Work, including initiating, maintaining and supervising all safety precautions and plans. The Contractor shall perform the Work or ensure that it is performed, in a manner to avoid risk of injury to persons or damage to property and shall continuously inspect the Work, which includes all of the Contractor's materials, equipment and lower tier subcontractors, to discover the existence of any conditions which impose a risk of bodily injury or damage to property.

1.2 SUBMITTALS

A. Prior to beginning the Work, The Contractor shall submit for the Commissioner's review, a written Safety Plan, with detail commensurate with the Work. Such Plan shall be prepared by an appropriate health or safety professional and shall describe anticipated hazards and control methods. The Contractor will employ to administer a Safety Plan which provides adequate safeguards for all construction employees, the Commissioner's employees, site visitors, and the public. The Plan's safety measures, policies and standards shall conform to those required or recommended by governmental and quasi-governmental authorities having jurisdiction and by the Commissioner, including, but not limited to, requirements imposed by the Contract Documents.

PART 2 – PRODUCTS - (Not Applicable)

PART 3 - EXECUTION

3.1 The Safety Plan must include, at a minimum, the following components:

A. **Training.** The Contractor is responsible for the safety education of their employees. The training must comply with all laws and standards and include additional training for site supervision. Training must continue through the term of the Contract. The Contractor shall provide copies of training certificates to the Commissioner for all operations, which require such training. These documents must be submitted prior to performing the Work. As a minimum, the following training is required:

1. Supervisor Safety Training – must cover record keeping, incident investigation, OSHA inspections, H&S documentation requirements, and the OSHA 10 hour course for construction.
2. Competent Person Training – each person designated as a competent person shall attend training on that particular operation. Operations requiring a competent person per OSHA requirements include, but are not limited to, trenching and excavation, fall protection, scaffolds, confined space entry, and rigging.
3. Employee Orientation Training – must cover the various safety policies, safety manuals, first aid availability, accident reporting procedures, safety meeting participation, personal protective equipment, and enforcement procedures.
4. Emergency Procedures – must cover notification procedures, evacuation routes, mustering points, and accountability.
5. Safety Meetings – must be conducted weekly with all Subcontractor's onsite personnel. Documentation detailing the subject discussed and signatures of all participants must be kept for each meeting.
6. Hazard Communication Standard – must cover all aspects of the standard including MSDSs, chemicals onsite, labeling and the written program. Annual re-training is required.
7. Lockout / Tagout – must cover each individual piece of machinery or equipment that is to be serviced or altered during this Project.

B. **Incident Investigation**. The Contractor must report all OSHA recordable injuries and any property damage to the Commissioner immediately (within 1 hour of incident). An incident investigation must be conducted and a complete report issued to the Commissioner within twenty-four (24) hours of incident.

C. **Emergency Procedures and First Aid/Medical Services**. The Contractor must meet OSHA's first aid requirements and provide at least one (1) onsite employee possessing a current training certification in CPR and First Aid.

D. **Record Keeping**. Project-specific OSHA 300 and first aid logs must be maintained onsite at all times.

E. **Personal Protective Equipment**. The Contractor shall provide and inspect all personal protective equipment (PPE). In addition, the Contractor shall enforce the use of PPE by its employees, as specified in the project health and safety plan. Minimum PPE for the Commissioner projects includes: hard hats, safety glasses, hard soled work boots and high visibility warning vests (meeting ANSI/ISEA 107-2004 standards) when personnel are in proximity to moving equipment. The minimum dress code for the Commissioner projects includes appropriate clothing (long pants and sleeved shirts that must cover torso).

F. **Competent Person**. The Contractor agrees to provide a competent person onsite at all times during operations which require such according to the OSHA regulations. This person must be experienced in the operation and have received detailed training on the regulations pertaining to the operation. The competent person shall perform a daily inspection of the operation.

G. **Housekeeping and Site Services**. The Contractor is solely responsible for housekeeping in their work areas. Good housekeeping is essential for all work performed at any of the Commissioner's sites. The Contractor is responsible to supply drinking water, adequate toilets, washing facilities, fire extinguishers, first aid kits and jobsite posters per OSHA requirements.

3.2 The Contractor shall designate a qualified safety representative with responsibility for preventing accidents and implementing and supervising the Safety Plan and other safety programs. The safety representative shall attend all project safety meetings, participate fully in all activities outlined in the Safety Plan and shall devote whatever time is necessary to perform such duties properly.

END OF SECTION 01 30 00

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SECTION 01 32 23

CONSTRUCTION STAKING

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes the establishing and maintaining lines and grades for construction.

1.2 QUALITY ASSURANCE

A. Work is to be performed by a professional having appropriate equipment and experience in construction staking.

PART 2 – PRODUCTS - (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL

A. All work under this Contract must be constructed in accordance with the lines and grades shown on the Plans, specified, or as directed by the Commissioner. The Contractor has full responsibility for keeping alignment and grade.

3.2 REFERENCE MARKS FOR CONSTRUCTION

A. Reference marks for line and grade will be set by the Commissioner as the Work progresses and will be located to cause as little inconvenience to the prosecution on the Work as possible. The Contractor must so place excavation and other materials as to cause no inconvenience in the use of the reference marks provided. The Contractor must remove any obstructions placed that are contrary to this provision.

B. The Contractor must furnish stakes and other such materials and give such assistance, including the supervision of a Registered Professional Engineer or a Professional Land Surveyor in the State of Illinois, and qualified helpers, as may be required by the Commissioner for setting line and grade reference marks. This process is considered incidental to the establishing and maintaining of lines and grades and no additional payment will be allowed. The Commissioner will establish controlling points for benchmarks and base lines. The Contractor must check such lines and grades by such means as are deemed necessary and, before using them, must call the Commissioner's attention to any inaccuracies. The establishment of all working or construction lines and grades as required from the reference marks set by the Commissioner is considered incidental to the construction and no additional payment will be allowed. Also, the Contractor has sole responsibility for the accuracy of the working or construction lines and grades. The Contractor, however, is subject to the check and review of the Commissioner.

C. The Contractor must keep the Commissioner informed in a reasonable time in advance as to the Contractor’s need for line and grade reference marks in order that they may be furnished, and all necessary measurements made for record and payment with minimum inconvenience to the Commissioner and minimum delay to the Contractor.

D. The Contractor must verify all distances and elevations prior to removing any material or ordering any material. The distances and angles shown on the drawings are for information only. The City makes no guarantees as to the accuracy of the measurements shown.

E. It is the intention not to delay the Work for the establishment of reference lines and grades, but when necessary, working operations may be suspended for such reasonable time as the Commissioner may require for this purpose.

3.3 PRESERVATION OF REFERENCE MARKS

A. The Contractor must safeguard all points, stakes, grade marks, monuments,

and bench marks made or established on the Work, reestablish them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining, protecting, or removing without authorization such established points, stakes, and marks.

END OF SECTION 01 32 23

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SECTION 01 32 38

TELEVISED INSPECTION OF WATER MAINS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes requirements for televising the interior of existing water mains for the purpose of evaluating their physical condition.

1.2 SUBMITTALS

A. Videotaped inspections must be recorded on a DVD read only format. Recordings are to be in high quality color. Printed labels on DVD containers must include the contract name and number, date of inspection, and the location of the inspection.

B. Provide written report of the water main video results. Identify all defects in the pipeline as follows: Location of item in feet from entry point and location on pipe interior surface of pipe (degree from horizontal). Number each defect and provide a diagram of the total pipe length inspected indicating the location of each defect by number. Include a table on the diagram with the additional information about each defect.

1. Provide three (3) draft copies of the report.

2. After review by DWM, incorporate comments, and provide three (3) copies of final report.

1.3 QUALITY ASSURANCE

A. Work is to be performed by a professional video operator having appropriate equipment and significant documentable experience in televising similar types of work.

B. The entire televised inspection process must be done in the presence of the Commissioner or his representative.

PART 2 – PRODUCTS – (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor will not be entitled to any additional days due to delays in securing the videotaping services of a private vendor.

3.2 PROTECTION OF PIPELINE

A. Remove all dirt, debris and other foreign material from any equipment, cables and accessories to be placed within the pipeline. Clean all televising equipment, cables and accessories with a disinfectant solution of 100 ppm chlorine solution prior to placing equipment within the pipeline.

3.3 TELEVISING PROCEDURES

A. Televising must be done one (1) section at a time, each section isolated from the remainder of the line as required or directed by the Commissioner.

B. The camera must be moved through the line in either direction at a uniform rate, stopping when necessary to ensure proper documentation of the condition of the line, but in no case may the television camera be pulled at speed greater than 30-feet per minute. Panning and zoom rates must be controlled to maintain clarity of the documented items during playback. Manual winches, power winches, TV cable and powered rewinds, or other devices that do not obstruct the camera view or interfere with proper documentation of the line conditions may be used to move the camera through the line.

C. Whenever non-remote powered and controlled winches are used to pull the television camera through the pipe line, a suitable means of communication must be set up between the access pits of the section being inspected to ensure adequate communication exist between members of the televising crew. Measurement for the location of defects must be above ground by means of a metering device. Marking the cable or similar methods to determine measurement or location which requires interpolation is not acceptable.

D. The accuracy of the measurement meters must be checked daily by use of a walking meter, roll-a-tape, or other suitable device. Footage measurements must begin at the entrance of the pipe, unless permission is given by the Commissioner to do otherwise. Footage must be shown on the video data view at all times.

E. Camera, cables, supports and all appurtenant equipment placed in the water main must be thoroughly cleaned of dirt and debris, and disinfected with chlorine solution with a chlorine concentration of at least 50 parts per million.

3.4 DOCUMENTATION OF TELEVISING

A. Audio and written documentation must accompany all videotapes submitted to the Commissioner.

B. The voice recording on the videotapes must make brief but informative comments on data of significance, including, but not limited to, the locations of unusual conditions, side connections, the presence of scale and corrosion, and other discernible features.

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

1. Data View:
   a. Report Number.
   b. Date of TV inspection.
   c. Upstream and downstream access pit or station numbers.
   d. Current distance along reach (tape counter footage).

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

D. The following items are to be documented as per 1.2.B:

1. Cracks

2. Pitting

3. Corrosion

4. Tuberculation

5. Mineral Deposits

6. Failure of Cement Lining

7. Internal Joint Seals

8. Connections: Water Main, Services, Hydrant Leads including sizes.

3.5 REMOVAL OF DEBRIS

A. If debris is found to exist in the water main, the Contractor must remove the debris.

3.6 FOLLOW UP TELEVISING

A. Upon removal of debris, the Contractor must again televise the water main to assure all debris has been removed to the satisfaction of the Commissioner. This televising is considered incidental to the water main inspection and no additional payment will be allowed.

END OF SECTION 01 32 38

SECTION 01 40 00

QUALITY CONTROL

PART 1 - GENERAL

1.1 SCOPE

A. This section includes requirements for the implementation of the Contractor's quality control program.

1.2 SITE INVESTIGATION AND CONTROL

A. The Contractor shall check and verify all dimensions and conditions in the field continuously during construction. The Contractor shall be solely responsible for any inaccuracies built into the Work due to the Contractor's failure to comply with this requirement.

B. The Contractor shall inspect related and appurtenant Work and report in writing to the Commissioner any conditions that will prevent proper completion of the Work. Failure to report such conditions shall constitute acceptance of all site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the Contractor solely and entirely at the Contractor's expense.

1.3 INSPECTION OF THE WORK

A. All Work performed by the Contractor shall be inspected by the Contractor and non-conforming Work and any safety hazards in the site of the Work shall be noted and promptly corrected. The Contractor shall be responsible for the Work to be performed safely and in conformance to the Contract Documents.

B. The Work shall be conducted under the general observation of the Commissioner and is subject to inspection by representatives of the City acting on behalf of the City to ensure strict compliance with the requirements of the Contract Documents. Such inspection may include mill, plant, shop, or field inspection, as required. The Commissioner or any inspector(s) shall be permitted access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.

C. The presence of the Commissioner, or any inspector(s), however, shall not relieve the Contractor of the responsibility for the proper execution of the Work in accordance with all the requirements of the Contract Documents. Compliance is the responsibility of the Contractor. No act or omission on the part of the Commissioner, or any inspector(s) shall be construed as relieving the Contractor of this responsibility. Inspection of Work later determined to be non-conforming shall not be

cause or excuse for acceptance of the non-conforming Work. The City may accept non-conforming Work when adequate compensation is offered and it is in the City's best interest as determined by the City.

D. All materials and articles furnished by the Contractor shall be subject to rigid documented inspection, by qualified personnel, and no materials or articles shall be used in the Work until they have been inspected and accepted by the Commissioner or other designated representative.

1.4 SAMPLING AND TESTING

A. The Contractor shall retain and pay for an independent materials testing laboratory approved by the Commissioner and the City. This independent testing agency will develop and submit a testing plan for quality assurance on each type of work activity. The testing laboratory shall document the processes and procedures utilized to verify and maintain quality work. When not otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the most current standards, as applicable to the class and nature of the article or materials considered. However, the Commissioner reserves the right to use any generally accepted system of inspection which, in the opinion of the Commissioner, will assure the Commissioner that the quality of the workmanship is in full accord with the Contract Documents.

1. The Contractor may retain and pay for a qualified testing materials laboratory (approved by CDOT and IDOT); subject to the review and approval of the Commissioner, in lieu of using an independent testing agency. The qualified testing materials laboratory shall meet all CDOT and IDOT standards as a testing materials laboratory, and all applicable criteria within this specification section.

B. The City reserves the right to abbreviate, modify the frequency of, or waive tests or quality assurance measures, but waiver of any specific testing or other quality assurance measure, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial work, shall not be construed as a waiver of any technical or qualitative requirements of the Contract Documents.

C. Notwithstanding the existence of such waiver, the City shall reserve the right to make independent investigations and tests as specified in the following paragraph and failure of any portion of the Work to meet any of the qualitative requirements of the Contract Documents, shall be reasonable cause for the City to require the removal or correction and reconstruction of any such Work.

D. In addition to any other inspection or quality assurance provisions that may be specified, the City shall have the right to independently select, test, and analyze, at the expense of the City, additional test specimens of any or all of the materials to be

used. Results of such tests and analyses shall be considered along with the tests or analyses made by the Contractor to determine compliance with the applicable specifications for the materials so tested or analyzed, provided that wherever any portion of the Work is discovered, as a result of such independent testing or investigation by the Commissioner, which fails to meet the requirements of the Contract Documents, all costs of such independent inspection and investigation and all costs of removal, correction, reconstruction, or repair of any such Work shall be borne by the Contractor.

1.5 CONTRACTOR'S QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

A. Inspection and Tests:

1. The Contractor shall maintain and provide to the Commissioner, within two (2) working days of completion of each inspection and test, adequate records of all such inspections and tests. Inspection and test results shall be documented and evaluated to ensure that requirements have been satisfied.

2. The Contractor shall provide verification and control of all testing provided including, but not limited to:

c. Individual test records will contain the following information:

(1). Item tested: item number and description.

(2). Test results.

(3). Test designation.

(4). Test work sheet including location sample was obtained.

(5). Acceptance or rejection.

(6). Date sample was obtained.

(7). Retest information, if applicable.

(8). Control requirements.

(9). Tester signature.

d. Maintaining copies of all test results.

e. Ensuring that the Commissioner receives independent copies of all tests.

f. Ensuring that testing laboratories are functioning independently and in accordance with the requirements of these Specifications.

g. Ensuring re-tests are properly taken and documented.

H. Control of Measuring and Test Equipment: Measuring and/or testing instruments shall be adequately maintained, calibrated, certified and adjusted to maintain accuracy within prescribed limits. Calibration shall be performed at specified periods against valid standards traceable to nationally recognized standards and documented.

I. Supplier Quality Assurance: The Contractor shall insure that procured products and services conform to the requirements of these Specifications. Requirements of these procedures shall be applied, as appropriate, to lower-tier suppliers and/or subcontractors. QC inspections and certifications may not be deferred to the Contractor's subcontractors or suppliers.

J. Deficient, Defective, and Non-conforming Work Corrective Action:

1. The contractor shall investigate the cause of conditions that adversely effect the quality be determine and documented and measures implemented to prevent recurrence. In addition, at a minimum, this procedure shall address:

a. Personnel responsible for identifying deficient and non-complying items within the Work.

b. Tracking processes and tracking documentation for deficient and non-compliant items.

c. Personnel responsible for achieving resolution of outstanding deficiencies.

d. Once resolved, how the resolutions documented and by whom.

1.6 TESTING SERVICES

A. All tests which require the services of a laboratory to determine compliance with the Contract Documents shall be performed by an independent commercial testing firm acceptable to Commissioner. The testing firm's laboratory shall be staffed with experienced technicians, properly equipped and fully qualified to perform the tests in accordance with the specified standards. All standard quality assurance testing and installation verification testing will be at the expense of the Contractor.

B. The Contractor's independent testing laboratory shall be accredited by the American Association of State Highway and Transportation Officials (AASHTO) for the tests they will perform and as appropriate to the construction work being performed. The Contractor's laboratory shall also be AASHTO accredited in accordance with the requirements of ASTM C1077-92, "Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation"; ASTM D3740, "Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design/Construction"; and ASTM D3666, "Specifications for Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials"; ACI, American Concrete Institute standards, and specified industry standards, for sewers, waterlines, sidewalks, curbs, and other applicable work. The independent testing laboratory shall be submitted to CDOT for approval.

C. Testing, when required, will be in accordance with all pertinent codes and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM).

D. The Commissioner shall have the right to inspect work performed by the independent testing laboratory both at the project and at the laboratory.

E. The Contractor shall obtain the Commissioner's acceptance of the testing firm before having services performed, and shall pay all costs for these testing services.

F. Testing services provided by City, if any, are for the sole benefit of City, however, test results shall be available to the Contractor. Testing necessary to satisfy the Contractor's internal quality control procedures shall be the sole responsibility of the Contractor.

G. Laboratory Duties:

1. Cooperate with the Commissioner and the Contractor.

2. Provide qualified personnel promptly on notice.

3. Perform specified inspections, sampling and testing of materials and methods of construction.

4. Comply with specified standards and other recognized authorities and as specified.

5. Ascertain compliance with requirements of the Contract Documents.

6. Promptly notify the Commissioner and the Contractor of irregularity or deficiency of Work, which are observed during performance of services.

7. Perform additional services as required.

8. Promptly submit two (2) written copies and one (1) electronic copy of the report for each test to the Commissioner. Transmit to the Commissioner within three (3) workdays after each test is completed. Each report for each type of test shall be consecutively numbered. Each report shall include:

    a. Date issued.

    b. Project title and number.

    c. Testing laboratory name and address.

    d. Name and signature of inspector.

    e. Date of inspection or sampling.

    f. Record of temperature and weather.

    g. Date of test.

    h. Identification of product and Specification section.

    i. Location of Project.

    j. Type of inspection or test.

    k. Results of test.

    l. Observations regarding compliance with the Contract Documents.

9. Laboratory is not authorized to:

    a. Release, revoke, alter or enlarge on requirements of the Contract Documents.

    b. Approve or accept any portion of the Work.

H. Testing Services Furnished by the Contractor

I. Unless otherwise specified, and in addition to all other specified testing requirements, the Contractor shall provide all testing services as required for the Commissioner's review:

1. Concrete strength tests.

2. Moisture-density and relative density tests on embankment, fill, and backfill materials.

3. In-place field density test on embankments, fills, and backfill.

4. Other materials and equipment as specified in this section.

5. Concrete materials and mix designs.

6. Embankment, fill, and backfill materials, density, optimum moistures, and compaction.

7. All other tests and Engineering data required for the Commissioner's review of materials and equipment proposed to be used in the Work

8. Testing, including sampling, shall be performed by the Contractor's testing firm's laboratory personnel, in general manner and frequency indicated in these Specifications. The Commissioner and/or the City shall have the right to stipulate the location of the confirmation tests. The Contractor shall provide preliminary representative samples of materials to be tested to the laboratory, in required quantities.

9. The testing firm's laboratory shall perform all laboratory tests within a reasonable time consistent with the specified standards and will furnish a written report of each test.

10. The Contractor shall furnish all sample materials and cooperate in the testing activities, including sampling. The Contractor shall interrupt the Work when necessary to allow testing, including sampling to be performed. The Contractor shall have no claim for an increase in Contract Price or Contract Times due to such interruption. The Contractor shall be responsible for transporting all samples, except those taken by testing laboratory personnel, to the testing laboratory.

11. When testing activities, including sampling are performed in the field by the test firm's laboratory personnel, the Contractor shall furnish required labor and facilities:

    a. To provide access to Work to be tested.

    b. To obtain and handle samples at the site of the Work.

    c. To facilitate inspections and tests.

    d. Build or furnish a holding box for concrete cylinders or other samples

as required by the laboratory.

12. Where such inspection and testing are to be conducted by an independent laboratory agency, the sample or samples shall be selected by such laboratory or agency or the Commissioner and shipped to the laboratory by the Contractor at the Contractor's expense.

13. Notify laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.

14. The Contractor shall be responsible for furnishing all materials necessary for testing.

J. Transmittal of Test Reports: Written reports of tests and Engineering data furnished by the Contractor for the Commissioner's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings. Final transmittal of all Project testing records will be required as a final close-out submittal for the release of retainage.

1. The Contractor shall promptly process and distribute all required copies of test reports and related instructions to insure all necessary retesting or replacement of materials with the least possible delay in the progress of the Work.

K. The Contractor shall provide copies of all correspondence between the Contractor and testing agencies to the Commissioner.

L. Inspections and tests required by codes or ordinances or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

M. Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

N. Schedules For Testing:

1. Establishing Schedule:

a. The Contractor shall, by advance discussion with the testing laboratory determine the time required for the laboratory to perform its tests and to issue each of its findings, and make all arrangements for the testing laboratory to be on site of the Work to provide the required testing.

b. The Contractor shall provide all required time within the construction schedule.

c. When changes of construction schedule are necessary during construction, the Contractor shall coordinate all such changes of schedule with the testing laboratory as required.

END OF SECTION 01 40 00

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SECTION 01 42 00

REFERENCES, DEFINITIONS AND ABBREVIATIONS

PART 1 – GENERAL

1.1 FORM OF SPECIFICATIONS

A. Wherever used in the Specifications, the following terms have the meanings indicated which are applicable to both the singular and plural form of the word.

B. Where "as shown," "as indicated," and "as detailed," or words of similar import are used, it is understood that reference to the Drawings is made unless stated otherwise. Where "as directed," "as permitted," "approved," or words of similar import are used, it is understood that the direction, requirements, permission, approval, or acceptance of the City is intended unless stated otherwise.

1.2 DEFINITIONS

A. Addenda: Written or graphic instruments issued prior to the opening of bids, which clarify, modify, or interpret the Contract Documents.

B. Agreement: The written Contract, which is evidence of the agreement between the City and the Contractor covering the Work.

C. Arterial Streets: Major streets where special construction techniques may be required by CDOT.

D. Chief Procurement Officer: The Chief Procurement Officer of the City of Chicago.

E. City: The City of Chicago.

F. Commissioner: The Commissioner of the City of Chicago Department of Water Management or the Commissioner's duly authorized representative.

G. Completion: All tests performed and accepted, water services transferred, connections made, and abandonment's completed.

H. Comptroller: The City Comptroller of the City of Chicago or the Comptroller's successor or successors upon whom the Comptroller's duties are transferred.

I. Contract: The entire and integrated written agreement between the City and the Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

J. Contract Documents: The Agreement, Addenda, Contractor's bid, and related documentation when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, the General Conditions, the Special Conditions, the Specifications and the Drawings, together with all Written Orders which completely describe the technical requirements of the Project including bid, Contract, and construction procedures.

K. Contract Notice: A written notice from the Chief Procurement Officer mailed to the Contractor at the address designated in the Contractor's proposal or to such other address as the Contractor may designate in writing as Contractor's official place of business, transmitting to the Contractor an executed copy of the Contract.

L. Contractor: The person, firm, or corporation with whom the City has executed the Contract, and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his authorized representative.

M. Defective: An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty, or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the

Contract Documents, or has been damaged prior to final acceptance.

N. Department: The City of Chicago Department of Water Management.

O. Drawings or Plans: The part of the Contract Documents, which shows the characteristics, and scope of the work to be performed and which have been prepared and approved by the Engineer.

P. Engineer: The Deputy Commissioner of the Bureau of Water Engineering Services or the Deputy Commissioner's duly authorized representative.

Q. Force Account: The method of payment for extra work performed.

R. Furnish: Furnish means supply and deliver to the Work area, ready for unloading, unpacking, assembly, installation, and similar operations.

S. Install: Install means the actual unloading, packing, assembly, erection, constructing, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

T. Municipal Code: The Municipal Code of the City of Chicago.

U. Neat Lines: The required clear width of a trench or excavation. In sheeted trenches, the required width is measured to the outside of the sheeting. Unless noted elsewhere on the Plans, neat line clear width is equal to:

1. the sum of the outside diameter of the pipe plus 2-feet for water main construction.
2. the sum of the outside diameter of the pipe plus 8-feet for sewer construction.
3. the sum of the outside diameter or edge plus 4-feet for structure construction

V. Notice to Bidders: The advertisement for bids, the official notice inviting bids for the work to be done.

W. Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work.

X. Project: The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents. Refer to the definition, terms and conditions for "Project" in Book 1 of the Contract Documents.

Y. Provide: Furnish and Install as required.

Z. Samples: Physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.

AA. Shop Drawings: All drawings, diagrams, illustrations, brochures, schedules, and other data, which are prepared by the Contractor, Subcontractor, manufacturer, supplier, or distributor, which illustrates how specific portions of the Work are proposed to be fabricated or installed.

BB. Site and/or Work Area: The lands and other places on, under, in, or through which the Work is to be executed or carried out and any other lands or places provided by the City for the purposes of the Contract, together with such other places as may be specifically designated in the Contract Documents as forming part of the Site and/or Work Area.

CC. Specifications: A part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards, and workmanship.

DD. State: The State of Illinois.

EE. Subcontractor: An individual, firm, or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the Site. The term Subcontractor is referred to

throughout the Contract Documents as if singular in number and masculine in gender and means a Subcontractor or his authorized representative.

FF. Sub-Order: A project (within this Term Agreement) for total construction of the Work to be performed in whole, or part as indicated elsewhere in the Contract Documents. "Sub-Order" shall be synonymous and interchangeable with the term "Project", including all "Project" terms and conditions as defined in Book 1 of these Contract Documents.

FF. Supplier: Any person, supplier, or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the Site. A supplier is not a Subcontractor who purchases an item or equipment from a manufacturer or supplier.

GG. Unit Price: A cost per unit of work or measurement of material, for a bid item.

HH. Work: All labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in such construction. Work is also used to mean the same as Project.

II. Written Order: A directive, written and signed by the Commissioner, delivered to the Contractor at the address designated in the Contractor's bid or to such other address as the Contractor may designate in writing as Contractor's official place of business.

1.3 CITATION OF OTHER SPECIFICATIONS

A. Commonly used abbreviations have the meanings as specified in this Section. The plans may contain a list of additional abbreviations applicable thereto. Whenever the Contract Documents refer to the specifications of any society, institute, association, or governing organization, the specifications cited will become a part of this Contract as if written herein in full.

1.4 ABBREVIATIONS

A.	AASHTO:	American Association of State Highway & Transportation Officials.
B.	ACI:	American Concrete Institute.
C.	AISC:	American Institute of Steel Construction.
D.	ANSI:	American National Standards Institute.
E.	APWA:	American Public Works Association.
F.	ASCE:	American Society of Civil Engineers.
G.	ASME:	American Society of Mechanical Engineers.
H.	ASTM:	American Society for Testing and Materials.
I.	AWS:	American Welding Society.
J.	AWWA:	American Water Works Association.
K.	CCD:	Chicago City Datum.
L.	CDOT:	City of Chicago Department of Transportation.
M.	CRSI:	Concrete Reinforcing Steel Institute.
N.	FS:	Federal Specification Board.
O.	IDOT:	Illinois Department of Transportation.
P.	IEPA:	Illinois Environmental Protection Agency.
Q	ISO:	Insurance Services Office of Illinois.

R. MWRD: Metropolitan Water Reclamation District of Greater Chicago.

S. NBFU: National Board of Fire Underwriters.

T. NBS: National Board of Standards.

U. NCMA: National Concrete Masonry Association.

V. NCPWB: National Certified Pipe Welding Bureau.

W. NEMA: National Electric Manufacturers Association.

X. NPT: National Pipe Thread.

Y. OSHA: Occupational Safety and Health Act.

Z. PCA: Portland Cement Association.

AA. SSRBC: Illinois Department of Transportation, Standard Specifications for Road and Bridge Construction.

BB. UL: Underwriters' Laboratory.

PART – 2 – PRODUCTS – (NOT APPLICABLE)

PART - 3 – EXECUTION – (NOT APPLICABLE)

END OF SECTION 01 42 00

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SECTION 02 60 00

SPECIAL SOILS EXCAVATION AND DISPOSAL

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes the requirements for the excavation and disposal of soil classified as Special Soils Waste within the limits shown on the drawings.

1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 31 23 19 – Dewatering Excavations.

1.3 DEFINITIONS

A. Special Soils Waste - excavated soil containing contaminants that exceed the most stringent Tier 1 Soil Remediation Objectives for Residential Properties in Illinois Administrative Code (IAC), Title 35, Section 742, Appendix B, Table A. Such soils may contain gasoline, petroleum products, polynuclear aromatic substances (PNAs), and heavy metals such as mercury, chromium and similar metals.

1.4 SUBMITTALS

A. Work Plan

1. Submit a Work Plan for the removal of Special Soils Waste from designated areas as shown on the Drawings. Work Plan must be submitted to the Commissioner within thirty (30) days of start of excavation operations.

2. The Work Plan must provide a list of all proposed subcontractors, indicating the service each is to provide. The Contractor and subcontractors must provide a Statement of Qualifications demonstrating their capabilities to provide services as indicated in the Work Plan.

3. The Work Plan must describe the intended dust control measures for the removal of Special Soils Waste.

B. Documentation

1. Provide the Commissioner with copies of all environmental permits, records and reports as specified. The Contractor must provide the Commissioner with the results of any laboratory analyses necessary for permit acquisition.

C. Health and Safety Plan

1. The Contractor must develop a location specific Health and Safety Plan and submit the plan to the Commissioner a minimum of two weeks before beginning construction activities. The Contractor has full responsibility for health and safety on the Site.

D. Report

1. At the end of the Work, prepare a technical report on the activities conducted during the duration of the Work and submit three copies to the Commissioner. The technical report must include all pertinent information regarding the Work including, but not limited to:

a. Measures taken to monitor, handle, and dispose of Special Soils Waste, prevent further migration of contaminates and to protect workers**.**

b. Cost for monitoring, handling, and disposing of Special Soils Waste.

c. Reduced scale drawing(s) showing area(s) of Special Soils Waste removed.

d. Contractors and subcontractors hourly records broken down by project.

e. Waste manifests and/or landfill tickets (identified by project) for Special Soils Waste disposal.

1.5 PERMITS AND FEES

A. The Contractor must include in his unit price bid the cost associated with obtaining all permits and landfill disposal fees required for disposal of Special Soils Waste.

PART 2 - PRODUCTS - (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 DUST CONTROL.

A. Contractor must control and minimize the release of dust during Special Soils Waste removal activities, by use of water or an acceptable chemical application.

3.2 EXCAVATION AND DISPOSAL.

A. Restrictions

1. Soil and other material removed from an excavation determined to have Special Soils Waste must not be reused and placed as trench backfill material, unless directed otherwise by the Commissioner.

B. Dewatering

1. Dewater excavations in accordance with Section 31 23 19 – Dewatering Excavations.

C. Backfill Plugs

1. When excavation occurs in areas with a high groundwater table and excavated material has been classified as Special Soils Waste, the Contractor must install backfill plugs to isolate the area from the remainder of the excavation. Backfill plugs must be installed at intervals not to exceed 50 feet, and must be a minimum of 4 feet in length (measured parallel to the trench), and of full width and depth of the trench. Plugs must be constructed only from non-porous materials such as clay soils, concrete, or equivalent material approved by the Commissioner.

D. Transporting and Disposal of Special Soils Waste.

1. Due care must be used by the Contractor in transporting Special Soils Waste material from the area of origin to the disposal area. The Contractor is responsible for the clean up of any release of soil containing contaminants into the environment, at no additional cost to the City. Clean up includes, but is not be limited to, sampling beneath the material staging area to determine complete removal of the spilled material.

2. Transport and dispose of all material classified as a Special Soils Waste from the job site to an appropriately permitted landfill facility. Prepare all manifests required for the transport of Special Soils Waste.

3. Line the equipment used to haul Special Soils Waste material to the permitted landfill facility with a six (6) mil polyethylene liner and provide secure cover during transportation. The Contractor must obtain all documentation including any permits and/or licenses required to transport the Special Soils Waste material to the permitted landfill facility.

4. Make all arrangements for testing and waste disposal approval with the permitted landfill facility. Subsequent to the Contractor completing these activities and upon receipt of authorization from the Commissioner, the Contractor must initiate the disposal process.

5. Schedule and arrange the transport and disposal of each load of Special Soils Waste material produced. Make all transport and disposal arrangements to ensure no Special Soils Waste material remains within the Work area at the close of business each day. The Contractor is responsible for all other pre-disposal/transport preparations necessary on a daily basis to accomplish management activities.

3.3 TEMPORARY STAGING

A. Excavate and dispose of all waste material without temporary staging. If circumstances require the use of temporary staging, the Contractor must request approval from the Commissioner.

END OF SECTION 02 60 00

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes requirements for material and installation of reinforcing steel for cast-in-place concrete structures, pavement reinforcing, and steel dowel bars.

1.2 REFERENCES

A. American Concrete Institute (ACI), latest edition:

1. ACI 315 - Details and Detailing of Concrete Reinforcement.
2. ACI 318 - Building Code Requirements for Structural Concrete.

B. American Society for Testing and Materials (ASTM), latest edition:

1. ASTM A370 - Test Methods and Definitions for Mechanical Testing of Steel Products.
2. ASTM A615 - Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
3. ASTM A706 - Specification for Low Alloy Steel Deformed Bars for Concrete Reinforcement.
4. ASTM A775 - Specification for Epoxy-Coated Reinforcing Steel Bars.
5. ASTM A884 - Specification for Epoxy Coated Steel Wire and Welded Wire Fabric for Reinforcement.
6. ASTM D3963 - Specification for Epoxy Coated Reinforcing Steel.

C. Illinois Department of Transportation – Standard Specifications for Road and Bridge Construction (SSRBC), latest edition.

D. IDOT Supplemental Specifications and Recurring Special Provisions (SSRSP), latest edition.

E. Concrete Reinforcing Steel Institute – CRSI Manual, latest edition.

1.3 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 03 30 00 – Cast-In-Place Concrete.
B. Section 32 13 13 – Concrete Pavement.
C. Section 32 16 21 – Concrete Curbs, Gutters, & Walks.

1.4 SUBMITTALS

A. Refer to Book I – Terms and Conditions for Construction for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.

B. Reinforcing Steel.

Submit shop drawings detailing reinforcing steel in accordance with the requirements of ACI 315 and indicating and including the following details and requirements:

1. Bar lists including weights.

2. Bending diagrams and schedules.

3. Placement plans and details.

C. Certificates: Provide mill affidavits or test reports indicating certification or compliance certifying the grades and physical and chemical properties of the reinforcing steel. Certify compliance with applicable ASTM Specifications including ASTM A370, ASTM A775 and ASTM D3963.

1.5 QUALITY ASSURANCE

A. Tolerances:

1. Reinforcing Steel Tolerances: Comply with the requirements of ACI 301, ACI 318 and the CRSI Manual of Standard Practice for fabrication and placement tolerance for reinforcing steel.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Steel:

1. Epoxy coated reinforcing steel bars and steel dowel bars must conform to ASTM A706 or ASTM A615, as applicable; and epoxy-coated steel bars in accordance with ASTM A775 and ASTM D3963. Coating material color must be green.

2. Welded Wire Steel Fabric must be epoxy coated conforming to the requirements of ASTM A884.

3. Accessories: Provide steel bar supports, spacers, hangers, chairs, ties, and similar items as required for spacing, assembling and supporting reinforcement in place. All steel accessories must be nylon-, epoxy- or plastic-coated.

4. Tie Wire: Provide No. 16 gage or heavier steel wire, nylon-, epoxy- or plastic coated.

2.2 Sizes and Weights

A. The minimum cross-sectional areas and the weights per lineal foot of the steel reinforcing bars used in the work will be as shown in Table A based on nominal sizes and shapes:

TABLE A

CROSS-SECTIONAL AREA & WEIGHT/FOOT OF REBARS

BAR DESIGNATION NUMBER	UNIT WEIGHT IN POUNDS PER FOOT	NOMINAL DIAMETER IN INCHES	CROSS SECTIONAL AREA IN SQUARE INCHES
2	0.167	0.250	0.05
3	0.376	0.375	0.11
4	0.668	0.500	0.20
5	1.043	0.625	0.31
6	1.502	0.750	0.44
7	2.044	0.875	0.60
8	2.670	1.000	0.79
9	3.400	1.128	1.00
10	4.303	1.270	1.27
11	5.313	1.410	1.56

2.3 STEEL DOWEL BARS AND PAVEMENT REINFORCING

A. Steel pavement fabric, steel reinforcing bars, epoxy coated steel tie bars, and epoxy coated steel dowel bars for pavement construction, must conform to the requirements of Section 1006.10 of the SSRBC specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Contractor shall notify the Commissioner giving sufficient time in advance of excavating, erecting formwork and placing reinforcement and concrete to permit a thorough inspection.

3.2 PLACEMENT OF REINFORCING STEEL

A. Place reinforcement as shown on the Contract Drawings, or on approved Shop Drawings, and in accordance with the applicable requirements of ACI 301, ACI 318 and the CRSI Manual. Install reinforcement accurately and secure against movement.

B. All reinforcement must be supported on metal chairs, spacers and hangers, accurately placed and securely fastened to steel reinforcement in place. Hoops and stirrups must be accurately spaced and wired to the reinforcement.

C. Reinforcing steel must be installed in place, spaced and securely tied with steel tie wires at all splices and at all intersections, except where the center to center dimension is less than one foot (1 ft) in each direction, in which case alternate intersections must be tied. The placement must comply with the requirements of CRSI Manual 'Placing Reinforcing Bars'. Bending of bars on the jobsite to fit differing conditions is not permitted. Point end of wire ties away from adjacent form surfaces.

D. Center-to-center distance between parallel bars must be in accordance with ACI 318 unless indicated otherwise on the Contract Drawings.

E. Splices: Laps of splices must be securely tied together to maintain the alignment of the bars, to provide the required minimum clearances and to transfer stress by bond. Lapped splices and development lengths not shown must be detailed to develop Class B lapping length and develop lengths in tension, respectively, in accordance with ACI 318.

F. Prior to the placement of concrete, all mortar and any foreign material must be removed from the reinforcement. Placement of concrete must not commence until the Commissioner has verified that all reinforcement has been placed in the areas designated on the plans, but does not relieve the Contractor of his responsibility for properly placing, supporting and securing the reinforcement.

END OF SECTION 03 20 00

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes requirements for the construction of cast-in-place concrete for utility structures, pavements, curb and gutter, and sidewalks, where shown on the Drawings or specified here.

1.2 REFERENCES

A. American Concrete Institute (ACI), latest edition:

1. ACI 117 - Standard Specification for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Standard Specifications for Structural Concrete.
3. ACI 302.1R - Guide for Concrete Floor and Slab Construction.
4. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
5. ACI 305R - Hot Weather Concreting.
6. ACI 306.1 - Standard Specification for Cold Weather Concreting.
7. ACI 308 - Standard Practice for Curing Concrete.
8. ACI 309R - Guide for Consolidation of Concrete.
9. ACI 315 - Details and Detailing of Concrete Reinforcement.
10. ACI 318 - Building Code Requirements for Structural Concrete.
11. ACI 503.2 - Standard Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive.

B. American Society for Testing and Materials (ASTM), latest edition:

1. ASTM C31 - Standard Practice of Making and Curing Concrete Test Specimens in the Field.
2. ASTM C94 - Specification for Ready-Mixed Concrete.

C. Illinois Department of Transportation – Standard Specifications for Road and Bridge Construction (SSRBC), latest edition.

D. Illinois Department of Transportation – Supplemental Specifications and Recurring Special Provisions (SSRSP), latest edition.

1.3 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 31 23 10 - Excavation, Trenching and Backfilling.
B. Section 03 20 00 - Concrete Reinforcing.

1.4 SUBMITTALS

A. Refer to Book I for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.

B. Structural Concrete Shop Drawings:

1. Submit drawings that indicate the locations of all joints in concrete, including construction joints, expansion joints, isolation joints, and contraction joints.

2. Submit drawings that indicate concrete placement schedule, method, sequence, location, and boundaries. Include each type and class of concrete, and quantity in cubic yards.

C. Concrete Forming:

Submit shop drawings for concrete forming indicating and including the following details and requirements:

1. Forming system and method of erection with associated details.

2. Shoring accompanied by design calculations.
3. Locations of construction joints.

4. Location and sizes of conduits, openings, recesses, pipes, ducts and other attached or embedded products.

5. Chamfer strips for corner treatment.

6. Method and schedule for removing forms and shoring.

7. Method for detecting formwork movement during concrete placement.

D. Product Data: Submit manufacturer's product data for epoxy adhesive.

E. Records and Reports: Report the location in the finished work of each mix design, and the start and completion times of placement of each batch of concrete placed for each date concrete is placed.

1.5 QUALITY CONTROL

A. Concrete Tolerances must comply with the requirements of ACI 117 as applicable.

B. Cold Joints: Cold joints in concrete will not be permitted unless planned and treated properly as construction joints.

C. Monitoring of Formwork: Provide monitoring of forms and embedded items to detect movement, or forms and embedded items out-of-alignment, from pressure of concrete placement.

D. Provide 100% quality control (QC) independent of said Contractor for all field testing in accordance with CDOT and IDOT Standards. The Contractor is responsible for notifying CDOT and the DWM Commissioner no later than 2pm on the day prior to the concrete

placement. All provisions required for tests, samples and inspections are considered incidental to the Work and no additional payment is allowed.

1.6 ENVIRONMENTAL REQUIREMENTS

A. It is the contractor's responsibility (at no additional cost to the City) to deliver and place concrete in hot weather. This work must conform to the applicable requirements of ACI 305R and ACI 306.1.

B. Delivering and placing of concrete in cold weather must conform to the applicable requirements of ACI 305R and ACI 306.1 On-site additional winter protection will be paid under a separate bid item (WINTER PROTECTION).

C. Do not place concrete when the rate of evaporation of surface moisture from concrete exceeds 0.2 pounds per square foot per hour as indicated in Figure 2.1.5 of ACI 305R.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Formwork

1. Wood forms must be built of clean, sound lumber, reasonably free from knots and dressed on all sides.

2. The forms, either of steel or wood, must be watertight, with smooth surfaces, and of ample strength and rigidity. Bracing for forms must be adequate to prevent deviation from the correct lines. The forms must be coated with oil or other suitable substance that is satisfactory to obtain a smooth concrete surface. The coating must be carefully applied so none is deposited on the reinforcement steel.

3. Forms must be neatly and accurately made with all similar parts in each longitudinal section interchangeable. Bent plates required to fit must be rolled and fabricated to correct curves before being assembled.

4. All forms must be thoroughly cleaned after each use with any broken, warped or defective parts removed. Minor repairs of forms will be permitted, but any form that requires more than minor repairs in order to obtain first-class work must not be re used. The Commissioner, at his sole discretion, reserves the right to condemn any form that may compromise the structural integrity or appearance of the work, and the Contractor must at once correct the defective form or remove it from the site of the work, whichever the Commissioner may order.

B. Portland Cement Concrete for Cast-In-Place Utility Structures and Pipe Class SI Concrete conforming to Section 1020 of the SSRBC except for sewer structures and pipe, or as otherwise specified here.

1. Compressive Strength: The concrete for utility structures must have a compressive strength of not less than 3,500 pounds per square inch at the age of fourteen (14) days and not less than 4,000 pounds per square inch at the age of 28 days when tested by standard methods.

2. Admixture: The use of admixtures in the concrete for any purpose other than for air entrainment will not be permitted.

3. Air Entrainment: The amount of entrained air must not be less than 5% nor more than 8% of the volume of the concrete. The air entrainment must be produced by the use of “Darex” or other approved air-entraining agent.

4. All cement used in concrete for sewers and sewer structures must be a blend of Type I Portland cement and Fly Ash. Type I cement

and Fly Ash must not be less than 5 bags of Type I cement and 100 pounds of Fly Ash per cubic yard of concrete. Type I Portland cement must conform to the requirements of "Standard Specifications for Portland Cement," ASTM Designation C 150.

5. Fly Ash will conform to the requirements of "Tentative Specifications for Fly Ash for Use As an Admixture in Portland Cement Concrete," ASTM Designation C 618, except that the Free Carbon will not exceed 3.0 percent. **Fly Ash is not to be used in concrete mixtures to be in contact with water main pipe and / or other exposed metals for thrust restraint systems and appurtenances.**

6. The fine aggregate for concrete must conform to grade FA2 of the SSRBC.

C. Portland Cement Concrete for Pavements, Base Course, Sidewalks, Curbs and Gutters, Driveways and Alley Aprons.

1. The materials, proportioning, mixing, transporting, curing and protection of Portland cement concrete must be in conformance with Section 1020 of the SSRBC, except that air entrainment in the concrete must be produced by the use of "Darex" or other approved air-entraining agent.

2. Classes of Portland Cement Concrete.
   a. Class SI for Normal Strength– general use, utility structures, sidewalks, curbs, sign footings, and miscellaneous uses. Minimum Compressive Strength 3500 PSI at 14 Days.
   b. Class PP-1 for High Early Strength – use for patching pavements. Minimum Compressive Strength 3200 PSI at forty eight (48) hours.
   c. Class PV, High Early Strength (HES) Concrete – use for all concrete pavements. An IDOT/CDOT approved patching mixture shall be used with a minimum cement factor of

6.50cwt and a maximum cement factor of 7.05cwt. Type III cement shall not be permitted. Minimum Compressive Strength 3500 PSI at three (3) Days.

3. Concrete Slump for ADA Ramps must be between 2" and 4" inclusive

4. Rapid Hardening Cement, IDOT Class PP-5 [From IDOT BDE Specification Revised November 1, 2007]:

   a. Maximum and Minimum Cement factor:
   6.75 cwt/cy (400 kg/cm).

   b. Cement shall be calcium aluminate meeting the standard physical requirements for Type I cement according to ASTM C 150, except the time of setting shall not apply. The chemical requirements shall be determined according to ASTM C114 and shall be as follows: minimum 38 percent aluminum oxide (Al_2O_3), maximum 42 percent calcium oxide (CaO), maximum 1 percent magnesium oxide (MgO), maximum 0.4 percent sulfur trioxide (SO_3), maximum 1 percent loss on ignition, and maximum 3.5 percent insoluble residue.

   c. Maximum final set time of 25 minutes according to Illinois modified ASTM C 191.

   d. The cement shall have a Minimum compressive strength of 2,000 psi at 3.0 hours and 4,000 psi at 24.0 hours according to Illinois modified ASTM C 109.

   e. The cement shall have a Maximum drying shrinkage of 0.050 percent at seven days, according to Illinois modified ASTM C596.

f. The cement shall have a Maximum expansion of 0.020 percent at 14 days according to Illinois modified ASTM C 1038.

g. The cement shall have a Minimum 80% relative dynamic modulus of elasticity; and shall not have a weight (mass) gain in excess of 0.15% or a weight (mass) loss in excess of 1.0 percent, after 100 cycles, according to Illinois modified AASHTO T 161, Procedure B. At 100 cycles, the specimens are measured and weighed at 73 degrees Fahrenheit (23 degrees Celsius).

D. Joint Filler

1. Bituminous preformed joint filler must conform to the requirements of Section 1051 of the SSRBC.

E. Protective Coat for Exposed Concrete Surfaces

1. The protective coat is to consist of a mixture of linseed oil and petroleum spirits and conform to the requirements of Section 1023 of the SSRBC.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Contractor shall notify the Commissioner, giving sufficient time in advance of removal of surface features, excavating, erecting formwork and placing concrete, to permit thorough inspection.

3.2 PREPARATION

.

A. Provide excavation, bedding and backfill as specified in Section 31 23 10 - Excavation, Trenching and Backfilling.

B. Locate and stake out all forms and establish all lines, levels and elevations. Construct formwork in accordance with the approved Shop Drawings and in a manner that will produce finished concrete surfaces conforming to the indicated design and within specified tolerances. The forms must be coated with oil or other suitable substance to obtain a smooth concrete surface. Maintain all surfaces upon which concrete is to be placed free of debris and mud.

C. Place concrete under the observation of the Commissioner and with the Contractor's Quality Control Representative present to document requirements and results of the placement.

D. Whenever possible, place concrete during normal working hours. When concrete- placement schedules require concrete placement at times other than normal working hours, ensure that the Commissioner is notified and is present at the time of placement.

E. Do not place concrete until conditions and facilities for the storage, handling, and transportation of concrete test specimens are in compliance with the requirements of ASTM C31 and are approved by the Commissioner.

F. Prior to placement of concrete, the subgrade must be in a firm, well-drained condition, and of adequate and uniform load-bearing nature to support construction personnel, construction materials, construction equipment, and steel reinforcing mats without tracking, rutting, heaving, or settlement. As directed by the Commissioner, all weak, soft, saturated, or otherwise unsuitable material must be removed and replaced with structural backfill or lean concrete.

3.3 TRANSPORTING

A. Transport concrete to the jobsite in a manner that will assure efficient delivery of concrete to the point of placement without adversely altering

specified properties with regard to water-cement ratio, slump, air entrainment, and homogeneity.

3.4 REINFORCING STEEL

A. Furnish and place reinforcement in accordance with Section 03 20 00 - Concrete Reinforcing.

3.5 CONVEYING AND PLACING

A. Placement Standards: Conveying and placing of concrete must conform with applicable requirements of ACI 301, ACI 302.1R, ACI 304R, and ACI 318.

B. Handling and Depositing:

1. Concrete placing equipment must have sufficient capacity to provide a placement rate that will preclude cold joints and that must deposit the concrete without segregation or loss of ingredients.

2. Concrete placement, once started, must be carried on as a continuous operation until the section of approved size and shape is completed.

3. Concrete must be handled as rapidly as practicable from the mixer to the place of final deposit by methods that prevent the separation or loss of ingredients. Concrete must be deposited, as nearly as practicable, in its final horizontal position to avoid redistribution or flowing.

4. Prevent segregation of materials while depositing concrete. During chuting, provide for a continuous flow without increasing the water over that specified. The discharge end of the chute must be provided with a baffle plate to prevent segregation. Slopes of chutes are not to be flatter than 1 to 3 or steeper than 1 to 2.

Concrete must not be dropped into place a distance greater than 3 feet. A tremie is to be used for placement to reach places that are otherwise inaccessible. Concrete must be deposited to maintain a plastic surface approximately horizontal.

5. Concrete that has partially hardened must not be deposited in the work. The discharge of concrete must be started not later than 60 minutes after the introduction of mixing water. Placing of concrete must be completed within 90 minutes after the first introduction of water into the mix.

6. Once started, the placing of concrete in any unit must be a continuous operation. If any unavoidable break in the operation occurs before the completion of a unit, a construction joint must be formed at the proper location, either by bulk heading, or in case of a vertical pour, by leveling off. The joint must be properly keyed, as specified in Section 03 30 00 (Paragraph 3.8), and if required, additional reinforcement bars must be placed as directed by the Commissioner, without additional cost to the City.

3.6 COLD WEATHER OPERATIONS

A. The Contractor must not place concrete when the temperature is, or is forecast by the U.S. Weather Bureau to be less than 20 degrees Fahrenheit.

B. Whenever temperatures are forecast by the U.S. Weather Bureau to be between 20 degrees Fahrenheit and 40 degrees Fahrenheit, it is the contractor's responsibility to implement the following provisions for protection of the concrete against freezing:

1. Mixing water must be heated but must not exceed a temperature of 175 degrees Fahrenheit.

2. Aggregates must be heated, either by steam jet, steam coils or other approved means prior to being placed in the mixer.

Aggregate containing frozen lumps, snow or ice must not be allowed to enter the mixer.

3. Concrete must be mixed as dry as practicable for the class or work and must reach the forms at a temperature not lower than 50 degrees Fahrenheit, nor higher than 90 degrees Fahrenheit. Freshly placed concrete and the surrounding air must be maintained at a temperature of not less than 50 degrees Fahrenheit, for a period of five (5) days after placement in the work. If necessary, the contractor must house the section being concreted, by placing canvas or other suitable covering, so that the specified temperature will be maintained.

4. When placing a concrete arch or roof slab, as soon as hardening of concrete will permit, the upper surface of the concrete must be covered with loose, dry straw or hay to a depth of at least 12 inches. Such covering must remain in place until it is replaced by at least one foot of unfrozen backfill material. The Contractor must provide continuous and sufficient circulating artificial heat inside the structure whenever it is necessary to maintain the required curing temperature. Heating appliances must not be placed in such a manner as to endanger formwork or centering or expose any area of concrete to drying out or other injury due to temperatures in excess of those specified above.

5. Before placing concrete in any form or on any surface, heat must be applied in such a manner that all ice or snow is completely removed. Concrete must not be placed on or against forms, other concrete, earth or rock containing frost.

B. All concrete or mortar damaged by freezing must be removed and replaced with new concrete or mortar as directed by the Commissioner.

C. All additional cost to the Contractor for the protection of concrete during cold weather or the removal and replacement of frozen concrete or mortar must be included in the unit or lump sum prices to be paid for the work

necessary under the appropriate items, and no additional payment therefore will be made to the contractor.

3.7 CONSOLIDATION

A. Concrete must be thoroughly consolidated and compacted by mechanical vibration during placement in accordance with the requirements of ACI 309R.

B. All concrete must be thoroughly worked into place and consolidated around reinforcement, ladder rungs, pipes or other shapes by internal or external vibrators, or both, of types acceptable to the Commissioner. Such vibration must be continuous with the placing of the concrete and must continue until no further settlement of the concrete mass is observed.

C. Conduct vibration in a systematic manner by competent, skilled, and experienced workers, with regularly maintained vibrators, and with sufficient back-up units at the jobsite.

D. Conduct vibration so as to produce concrete that is of uniform texture and appearance, free of honeycombing, air and rock pockets, streaking, cold joints, and visible lift lines.

3.8 CONSTRUCTION JOINTS

A. Construction joints are permitted only where indicated or approved by the Commissioner. Locate joints that are not indicated so that the strength of the structure is not impaired. Joint types and their locations are subject to prior approval of the Commissioner.

B. Provide and prepare construction joints in accordance with the applicable requirements of ACI 301 and ACI 304R.

C. Make construction joints straight and as inconspicuous as possible, and in exact vertical and horizontal alignment with the structure, as the case may be.

D. The top and end surfaces of the concrete first placed must be grooved or stepped. Use approved key, at least 1-1/2-Inches in depth, at joints unless otherwise indicated or approved by the Commissioner.

E. Thoroughly clean the surface of the concrete at construction joints and remove laitance, loose or defective concrete, coatings, sand, sealing compound and other foreign material. Prepare surfaces of joints to remove laitance and expose aggregate uniformly.

F. Immediately before new concrete is placed, wet the joint surfaces and remove standing water. To allow for shrinkage, do not place new concrete against the hardened concrete side of a construction joint for a minimum of 72 hours.

G. Ensure that reinforcement is continuous across construction joints.

H. Where bonding of the joint is required, provide epoxy adhesive in accordance with ACI 503.2.

I. Retighten forms and dampen concrete surfaces before concrete placing is continued.

J. At vertical surfaces, the freshly placed concrete must be worked sufficiently to obtain an excess of mortar against the joint. Horizontal or near horizontal surfaces, after being cleaned, must be completely coated with not less than a ½ Inch of mortar, composed of equal parts of Portland cement and sand.

K. Allow at least 72 hours to elapse before continuing concrete placement at a construction joint. Approval for accelerating the minimum time elapsing between adjacent placements will be based on tests and methods that confirm that a minimum moisture loss at a relatively constant temperature will be maintained for the period as necessary to control the heat of hydration and hardening of concrete, and to prevent shrinkage and thermal cracking.

3.9 PARTS SET IN CONCRETE

A. Before concreting, the Contractor must carefully place all pipe, castings, ladder rungs and other miscellaneous parts in the work as shown on the Plans or as directed by the Commissioner.

3.10 CURING AND PROTECTION

A. Curing of concrete must conform to the applicable requirements of ACI 301 and ACI 308. A curing compound must be administered to all concrete surfaces constructed and opened to traffic in accordance with SSRBC. Curing with earth, sand, sawdust, straw, and hay will not be permitted.

B. Keep concrete in a moist condition from the time it is placed until it has cured for at least ten (10) days. Keep forms damp and cool until removal of forms.

C. Immediately upon removal of forms, exposed concrete surfaces must be kept moist by applying an approved curing compound.

D. Concrete must not be permitted to dry during the curing period because of finishing operations.

E. Protect fresh concrete from hot sun, drying winds, rain, damage, or soiling. Fog spray freshly placed slabs after bleed water dissipates and after finishing operations commence. Allow no slabs to become dry at any time until finishing operations are complete.

F. Protect concrete from injurious action of the elements and defacement of any kind. Protect exposed concrete corners from traffic or use that will damage them in any way.

G. Protect concrete during the curing period from mechanical and physical stresses that may be caused by heavy equipment movement, subjecting the concrete to load stress, load shock, or excessive vibration.

3.11 FINISHING

A. Finish all interior surfaces to a smooth form finish per ACI.

B. Finish monolithic concrete sewer inverts to a smooth troweled finish per ACI.

3.12 REPAIR OF SURFACE DEFECTS

A. Repair surface defects in conformance with the applicable requirements of ACI.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Contractor must provide an IDOT qualified PCC testing agency independent of said contractor to perform tests and inspections and to submit reports for all Work. The cost of this testing is incidental to all concrete work.

B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. or fraction thereof of each concrete mixture placed each day.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 degree Fahrenheit and below and when 80 degree Fahrenheit and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M; cast and field cure **two** (2) sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at forty-eight (48) hours for PP-1, three (3) days for SI and PV and one set of two specimens at fourteen (14) days for all mixes.

7. Test results shall be reported in writing to the Commissioner within forty-eight (48) hours of testing. Reports of compressive-strength tests shall contain Contract Number, project number, project location, and date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at twenty-eight (28) days, concrete mixture proportions and materials, compressive breaking strength, and type of break for all tests.

8. The Contractor must replace all deficient Work to the satisfaction of the Commissioner.

END OF SECTION 03 30 00

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SECTION 05 10 00

STRUCTURAL AND MISCELLANEOUS STEEL

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes requirements for structural and miscellaneous steel, including all ferrous metals, whether wrought, rolled, fabricated or assembled, except construction castings (frames, grates, solid lids, & steps), pipe (ductile or steel) and steel plates. The classification includes steel angles and bracing, steel sheet piling, inserts, pins, bolts, nuts, washers, and similar items used for constructing temporary or permanent supports for excavations or work specified in other sections of this specification.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM) and American Institute of Steel Construction, Inc. (AISC), latest edition:

1. AISC Steel Construction Manual.
2. ASTM A36 – Carbon Structural Steel.
3. ASTM A195 – Alloy-Steel and Stainless Steel Bolting Materials.
4. ASTM A194 – Carbon and Alloy Steel Nuts for Bolts
5. ASTM A276 – Stainless Steel Bars and Shapes.
6. ASTM A307 – Carbon Steel Bolts and Studs.
7. ASTM A325 – Structural Bolts
8. ASTM A328 – Steel Sheet Piling.
9. ASTM A500 – Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
10. ASTM A529 – High-Strength Carbon-Manganese Steel of Structural Quality
11. ASTM A572 – High Strength Low Alloy Columbium-Vanadium Structural Steel.
12. ASTM A992 – Structural Steel Shapes

1.3 SUBMITTALS

A. Refer to Book I for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.

B. Complete data on date of manufacture, date(s) of initial installation and extraction, and service for used sheet piling, must be furnished to the Commissioner for all sheet piling used in the Work.

PART 2 - PRODUCTS

2.1 STRUCTURAL AND MISCELLANEOUS STEEL

A. Structural and miscellaneous steel must meet the requirements of the following standards, except as specified otherwise:

1. Structural Steel Shapes and Plate - ASTM A36

2. Bolting material for flanges and fittings – ASTM A193

3. Nuts – ASTM A194

4. Stainless Steel Anchor - ASTM A193 Bolts Type 304, ASTM A194 Nuts, ASTM A276 Bars and Shapes

5. Standard Bolts - ASTM A307

6. High Strength Bolts – ASTM A325

7. Steel Sheet Piling - ASTM A328, A572 Grades 45, 50 and 55

8. Structural Tubing and Shapes – ASTM A500, Rectangular Grade B

9. W Shapes – ASTM A992

2.2 BOLTS AND NUTS

A. Bolts and nuts must be of the best quality mild steel, except where bronze, aluminum, stainless steel, or other materials are shown or required.

B. Bolts must have hexagonal nuts.

C. Threads must be clean cut of American Standard size.

2.3 SHEET STEEL PILING

A. All piling must be new or good quality used material approved by the Commissioner.

B. All sheet piling must be true and straight with undamaged interlocks or ends.

C. Used sheet piling must have been driven only one (1) time before being offered for use on this project.

D. Used sheet piling must be made available for inspection by the Commissioner before it is shipped to the job Site.

2.4 ANCHORS

A. Anchors must be designed for rigid fastening to the structures, whether directly or through brackets.

B. The design of all anchors is subject to the approval of the Commissioner.

C. Anchors for piping must be of the cast iron chair type with steel straps, except where anchors form an integral part of pipe fitting, or where an anchor of special design is required.

2.5 INSERTS

A. Inserts must be designed to permit the rods to be adjusted horizontally in one (1) plane and to lock the rod nut or head automatically.

B. Inserts must be recessed near the upper flange to receive reinforcing rods.

C. Inserts must be so designed that they may be held in position during concrete pouring operations.

D. Inserts must be designed to carry safely the maximum load that can be imposed by the rods, which they engage.

E. Inserts for concrete must be galvanized.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. The design, workmanship, and erection must conform to the requirements of the AISC Specifications for Design, Fabrication, and Erection of Structural Steel for Buildings, unless otherwise shown, specified, or required.

B. The Contractor is responsible for the correctness of all shop and field fabrication and fit. Members must be straight, must fit closely together, and the finished work must be free from burrs, twists, bends, and open joints.

C. Where shop assembly of field connections is shown, specified or required, the unmatched holes must be reamed and the pieces match marked before disassembly. No drifting will be allowed.

D. In case the eccentricity is too great for good work or the strength of the joint is liable to be weakened by reaming, the piece will be rejected and a new satisfactory one must be provided at the Contractor. This process is considered incidental to the construction and no additional payment will be allowed.

3.2 FIELD CONNECTIONS

A. Weld or bolt all field connections as hereinafter specified unless riveted connections are approved by the Commissioner.

3.3 WELDING

A. Welding must be performed by qualified welders in accordance with the requirements of the AISC Specifications.

B. In assembling and during welding, the component parts of built-up members must be supported and held by sufficient clamps and other adequate means to hold the parts in proper relations for welding.

3.4 STEEL SHEET PILING

A. Drive steel sheet piling to depth as shown, or as approved by the Commissioner.

B. Drive all sheet piling plumb and tight to the lines and grades shown and as directed.

C. The driven sheet piling must be stiffened horizontally, as necessary to meet the requirements of Section 31 23 10 – Excavation, Trenching and Backfilling.

3.5 NUTS, BOLTS, AND ANCHORS

A. Anchors must be furnished and installed when specified, shown, or required for holding the pipelines and equipment in position or alignment.

B. Set anchor bolts accurately set to maintain elevation and location, and if placed after concrete is cast, all necessary drilling and grouting must be considered incidental to the construction process and no additional payment will be allowed.

C. Coat anchor bolt threads heavily with grease while concreting.

D. Self-Drilling bolt anchors must be of the sizes indicated or approved.

E. All anchor bolts and nuts submerged or subject to periodic wetting must be of stainless steel unless shown or specified otherwise.

3.6 INSERTS

A. Install inserts in the concrete structures where required for fastening supporting devices.

END OF SECTION 05 10 00

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SECTION 31 23 10

EXCAVATION, TRENCHING AND BACKFILLING

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

This specification includes the requirements for excavation, bedding, backfilling and compaction, of utility trenches for water and sewer mains and associated appurtenances.

1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 01 55 26 - Traffic Control.
B. Section 02 60 00 - Special Soils Excavation and Disposal.
C. Section 05 10 00 - Structural and Miscellaneous Steel.
D. Section 31 23 19 - Dewatering Excavations.
E. Section 32 90 00 - Landscape Restoration.

1.3 REFERENCES

A. CDOT Regulations for Openings, Construction and Repair in the Public Way (CDOT Specifications), latest edition.
B. IDOT Standard Specifications for Road and Bridge Construction (SSRBC), latest edition.
C. IDOT Supplemental Specifications and Recurring Special Provisions (SSRSP), latest edition.
D. ASTM D1557 - Laboratory Compaction Characteristics of Soil, latest edition.
E. Department of Labor, Occupational Safety and Health Administration 29 CFR Part 1926, Occupational Safety and Health Standards – Excavations; Final Rule (OSHA), latest edition.

1.4 DEFINITIONS

A. Soil types are defined as follows.

1. Trench Excavation. Excavation of soil for the purpose of installing water and sewer mains, their appurtenances, and for the restoration of surface features. The excavated material may be classified as either clay or sandy soil, a mixture of each, and may contain varying mounts of loam, silt, gravel, organic material, or rock fragments less then one (1) cu yd in volume. Trench excavation excludes all material defined as Rock Excavation and Unsuitable Soil.

2. Rock Excavation. Excavation of naturally occurring deposits of limestone, sandstone, shale or other indigenous rock occurring as bedrock, rock ledges, outcroppings, or boulders, one (1) cu yd or larger in volume necessitating removal by the use of systematic drilling, expansive jacks, or backhoe mounted pneumatic hole punchers or rock breakers.

3. Unsuitable Soil Materials. This soil material includes varying amounts of material classified as slag, cinders, trash, debris and rubble; organic or contaminated soil and material; asphalt and concrete pavements (including aggregate sub-base); sidewalks and curbs; concrete slabs concrete or masonry foundations; metal beams, bracing, and sheet piling; or similar matter.

1.5 SUBMITTALS

A. Submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples must be submitted in accordance with Book I – Terms and Conditions for Construction, latest edition, issued by the City of Chicago, Department of Procurement Services.

B. Provide to the Commissioner copies of all contractual agreements, permits and / or licenses for proposed disposal sites for all material and waste removed from the job site.

C. Shop Drawings and supporting calculations for excavation support systems must be submitted to the Commissioner for review and approval.

1. Excavation Support Systems:

a. Prepare and submit a written schedule and procedure, along with detailed drawings, of the proposed excavations and excavation support systems.

b. Include installation procedures; method of concrete placement; excavation sequence; interface details; protection measures for existing structures and facilities; instrumentation and monitoring procedures to check performance, sequence, and method of removal; and contingency plans for excessive wall or foundation movements.

c. The program must take into account that excavations cannot extend beyond the right-of-way into adjacent properties above or below grade, unless otherwise indicated. Where Contractor requires the installation of part of excavation protection system on private property, the Contractor will be solely responsible

for securing permission from adjacent property owners to install such temporary and permanent systems.

i. Any such permission from adjacent property owners must be in writing, and the owner's signature, granting such permission, must be witnessed and properly notarized. Certified copies of all such permissions must be submitted to the Commissioner for record purposes.

2. Shop Drawings: Submit Shop Drawings and specifications for support systems, lagging, and internal bracing. Include the following:

a. Specific description of field quality control measures.

b. Details of interface with permanent structures.

c. Details of bracing struts and wales, if used, and the proposed installation procedures, including method and sequence of preloading.

d. Details of required preloading systems, pre-stressing systems, load measuring facilities, systematic schedule of preloading and pre-stressing operations, and sequence of construction.

e. Method and details for securing lagging in support system openings.

f. Proposed method of providing for utility penetrations.

g. Assembly and erection details of members and connections for the system.

3. Plating of Excavations: When requested submit design calculations stamped by a Structural Engineer Licensed in the State of Illinois as proof of the structural integrity of the plating provided.

4. Calculations: Submit appropriate design calculations to support Shop Drawings. Include maximum theoretical deflections of supporting members. Include calculations indicating the expected magnitude of vertical and lateral movement.

5. Professional Engineer's Certification: The excavation support systems program, Shop Drawings, calculations, and test reports must be prepared, sealed, and signed by a Structural Engineer Licensed in the State of Illinois.

a. Where CTA/METRA or other private railroad company approval for excavation support or shoring is required, submit calculations and related documents prepared, signed, and sealed by a Structural Engineer Licensed in the State of Illinois.

D. The Contractor, before starting work, must submit to the Commissioner for approval, a layout of his construction procedures and the equipment to be used in maintaining the trees in place without damage.

E. Provide for CLSM (Flowable Fill) backfill quality control (QC) and quality assurance (QA) in accordance with the IDOT SSRSP, Check Sheet #31 "Quality Control Quality Assurance of Concrete Mixes".

PART 2 – PRODUCTS

2.1 GENERAL

A. Pipe bedding and trench backfill material must conform to the requirements and gradation specified in Section 1003, Fine Aggregates (FA), or Section 1004, Coarse Aggregates (CA), of the SSRBC.

B. Coarse Aggregate (CA) material classified, as Chert or Novaculite Gravels, or Slag from any source, are not permitted for use as bedding or backfill material**.**

C. Fine Aggregate (FA) material classified as Silica Sand, Slag Sand from any source, or Construction Debris Sand, are not permitted for use as bedding or backfill material.

D. All material must be dry and free of organic matter, clay, garbage, paper, wood or similar material, boulders or large particles of frozen material.

2.2 PIPE BEDDING

A. Pipe Bedding for Water Main Construction

Coarse aggregate (CA) material classified as mechanically crushed gravel, mechanically crushed stone, mechanically crushed limestone, or mechanically crushed recycled concrete conforming to IDOT gradation CA-16 for water mains 16 inches in diameter or smaller, CA-11 for water mains larger then 16 inches in diameter, unless otherwise authorized by the Commissioner. Material must be washed, angular, have uniform properties, and non-corrosive. Material must have a pH range between 7.5 and 10.

B. Pipe Bedding for Sewer Main Construction

Coarse aggregate (CA) material classified, as crushed gravel, crushed stone or crushed concrete must conform to gradation CA-11, unless directed otherwise by the Commissioner. Material must have a pH range between 7.5 and 10.

2.3 BACKFILL MATERIAL

A. Backfill Material for Water Main Construction

1. Coarse aggregate (CA) material classified as mechanically crushed gravel, mechanically crushed stone, mechanically crushed limestone, or mechanically crushed concrete conforming to IDOT gradation CA-16 unless authorized otherwise. Material must be washed, angular, have uniform properties, and non-corrosive. Material must have a pH range between 7.5 and 10.

B. Backfill for Sewer Construction

1. Fine aggregate (FA) material classified as sand, crushed concrete sand or stone sand must conform to gradation FA 6 unless directed otherwise by the Commissioner.

C. Controlled Low Strength Material, CLSM (Flowable Fill Material)

1. Materials for Flowable Fill must meet requirements of IDOT SSRBC Sections 593 and 1019 for Controlled Low Strength Material, CLSM.

a. Flowable fill material placed adjacent to water mains must be of a non-fly ash type mix design, mix # 2.

2.4 GEOTEXTILE FABRIC

A. Geotextile fabric must be Fabric for Silt Filter Fence and must conform to the requirements of Section 1080.02 in the SSRBC.

2.5 AGGREGATE FOR STABILIZATION OF TRENCH BOTTOMS

A. When required aggregate used to stabilize trench bottoms must have an aggregate such that the majority of the material passes a 1½ to 2½-inch sieve, with no more than 10% of the material passing the No. 16 sieve. The quality of the aggregate must meet requirements established for aggregate bedding.

PART 3 - EXECUTION

3.1 WORK AREA PREPARATION

A. Existing Work Area Condition

1. All information on subsurface exploration available to the Department, if any, will be made available to the Contractor for examination. However, the Department in no way takes responsibility for, the interpretation, accuracy, or thoroughness of the information. It will be the responsibility of the Contractor to make such subsurface explorations as deemed necessary, to supplement information provided by the Department, at no additional cost to the Department.

2. Prior to excavating, thoroughly investigate the limits of the proposed trench to ascertain the existence and location of any underground structures, existing utilities or other items that might interfere with the pipe installation. Notify the Commissioner of any obstructions that will prevent the installation of the pipe or appurtenances as indicated on the Drawings.

B. Clearing Work Area

1. Before starting trench excavation, all obstructions, which must be removed or relocated, must be cleared. Pavement, curbs, walks, trees, shrubs, utility poles, and other structures, which are to be preserved, must be properly braced and protected. Unless otherwise shown or directed by the Commissioner, all trees and large shrubs must be preserved with minimal damage inflicted on the root structure. When required, small trees and shrubs may be removed and replaced with equivalent specimens if approved in advance by the Commissioner.

C. Segregation and Disposal of Soil Material

1. Topsoil suitable for final grading and landscaping, and excavated material suitable for backfilling, as described in Section 32 90 00, - Landscape Restoration, may be stockpiled separately within the Work Area if approved by the Commissioner.

2. Surplus excavated material and excavated material unsuitable for backfilling, final grading, and landscaping, must be transported off of the Site and disposed of in disposal areas obtained by the Contractor and approved by the Commissioner.

3. Excavated material must not be stockpiled along the route of the work unless authorized beforehand by the Commissioner.

D. Pavement Removal

1. The Contractor must saw cut all concrete and asphalt pavements to their full depth prior to breaking and removing the pavement. On pavements consisting of an asphalt overlay on a concrete base, the Commissioner reserves the right to order the removal of up to 6 additional inches beyond the edge of the concrete base. This additional asphalt removal must be removed to a neat saw cut edge and will be considered incidental to the Work.

2. Utilizing drop weight equipment for the purpose of breaking the pavement is not permitted.

E. Protection or Removal of Existing Trees

1. Comply with CDOT Specifications Chapter 4, "Excavation Pavement Removal" for protection of trees, shrubs, and other improvements.

2. The Contractor is not permitted to remove trees beyond the limits of the trench excavation except as specified in these Specifications, or as shown on the Plans, or as ordered by the Commissioner.

3. The Contractor must arrange his construction operations and use the necessary equipment required, so as not to remove or damage any existing trees due to the Work to be performed under this Contract.

4. To protect the trunks of existing trees from damage, the Contractor must place 2" x 4" boards, six (6) feet long, vertically and about 6 inches apart around all trees located in the parkways along the route of the work. The boards must be held in place by wire looped around the circumference of the tree trunk. After completion of all work, the protective boards and wires must be carefully removed.

5. Any pruning of trees and roots required to permit the operation of the Contractor's equipment must be kept to a minimum, subject to the approval of the Commissioner, and must be done symmetrically by a licensed arborist. The arborist is required to obtain a permit from the City of Chicago, Bureau of Forestry, Plans and Permits Section of the Department of Streets and Sanitation, to trim and spray or in any way affect the general health or structure of trees in the public way. Prior to this approval, the Bureau will conduct an investigation at the sites of the proposed sewer. They will work with the Commissioner and the Contractor, and request 48-hour notice prior to starting any tree work.

F. Trench Excavations Over 12-feet Deep

1. Comply with CDOT Specifications Chapter 4, “Excavation Pavement Removal” for trenches over twelve (12) feet deep.

G. Excavating Over or Adjacent to Existing Utilities

1. The Contractor must verify the location of existing utilities in the vicinity of the work before starting construction. The Contractor is responsible for protecting, and repairing utilities damaged by the work under of this contract, at no additional cost to the City. The Contractor must coordinate all work with the owner of the utility.

H. Erosion Control

1. Install geotextile fabric under each storm inlet, catch basin and sewer manhole cover to prohibit dirt, debris and backfill material from entering the sewer system, but to permit drainage. The geotextile fabric is to be maintained until restoration is completed. After restoration is completed, remove the geotextile fabric.

I. Plating of Excavations

1. Unattended excavations in public streets, alleys, driveways, and walkways necessitated by the work must be plated, if the excavation has not been backfilled, or a temporary paved surface has been provided, or specifically authorized otherwise by the Commissioner. Open excavation(s) that are considered unattended excavation(s) include, but are not limited to, the following:

    a. Open excavations not attended by Contractor personnel during Contractor’s working hours.
    b. Open excavations during Contractor’s non-working and overnight hours.
    c. Any other condition determined by the Commissioner as unattended excavation(s) requiring Plating in accordance with these specifications.

2. Steel Plate(s) must be large enough to safely span the excavation with sufficient overlap beyond the edge of the excavation to provide firm support as appropriate for the type of pavement and soil encountered. Plate(s) must be firmly bedded and secured to the adjacent pavement to prevent rocking or movement, and of adequate thickness to carry anticipated loads. When plating is left in place during off-work periods, or if the Commissioner feels vehicular or pedestrian safety may be compromised, a bituminous ramp is to be provided at the perimeter of the plate(s) as appropriate to provide a smooth transition

between the surface of the plate(s) and the adjacent pavement or walkway.

3. Plating subjected to vehicular traffic must be capable of carrying AASHTO H-20 traffic loading without movement or excessive deflection. The plating must be secured to the adjacent paved surface in such manner so as to prevent rocking or other movement which could expose the excavation. The name of the Contractor must be indicated on both sides of the plating.

4. When steel plates are used and left in place beyond normal working periods, a bituminous ramp must be provided at the perimeter of the plate(s), to provide a smooth transition between the surface of the plate(s) and the adjacent street pavement or walkway, unless authorized otherwise.

5. Plating of excavations is not intended as a substitution for providing traffic control, which must be provided in accordance with Section 01 55 26 of these specifications.

J. Protection of Existing Water Main from Contamination

Protect existing water mains from contamination by groundwater, dirt, debris, or other foreign material:

1. Prevent groundwater and surface water, dirt, debris, and other foreign material from entering the open pipe.

2. Provide water tight temporary closure of pipe before leaving work site at the end of the work day.

3. Equipment, cables, hoses, supports and all appurtenant equipment placed in the water main must be thoroughly cleaned of dirt and debris, and disinfected with chlorine solution with a chlorine concentration of at least fifty (50) parts per million.

4. Workers entering pipe must wear clean temporary disposable coveralls.

5. Install foot bath and brush and have workers entering the pipe clean footwear with chlorine solution with a chlorine concentration of at least fifty (50) parts per million.

3.2 EXCAVATION PROTECTION

A. General Requirements

1. Excavations must be protected in accordance with applicable rules, laws and regulations of Federal, State and City ordinances applicable to underpinning, shoring of excavations, and other work affecting adjoining property and the safety of worker, but must not be less than the standards and regulations established by OSHA.

2. Structural support systems are required for all excavations exceeding five (5) feet in depth. Structural support systems are to be used in all excavations in soils that are determined to be unstable or subject to cave-ins, regardless of the depth of the excavation.

3. Protective systems for any excavation exceeding ten (10) feet in depth must be designed and approved by a Structural Engineer Licensed in the State of Illinois.

4. The Contractor must remove and replace, or provide the means to support any surface features when their location posses a hazard to workers in the excavation.

5. Whenever excavations cross the location of an existing underground utility, the Contractor must proceed with caution and use appropriate methods of excavation to avoid damaging the utility. The Contractor is responsible for coordinating all work with the owner of the utility.

6. Ramps, runways or ladders must be provided for ingress and egress by workers from excavations exceeding four (4) feet in depth in accordance with OSHA.

7. Surface or ground water entering excavations must be controlled by the use of appropriate equipment. If the trench interrupts the natural flow of surface water, diversion ditches or dikes must be used.

B. Protection of Adjacent Structures

1. When the stability of adjoining buildings, walls, sidewalks, pavements or other structures are endangered by the excavation operations, structural support systems such as shoring, bracing or underpinning must be used to ensure the stability of the structure.

2. The Contractor is responsible for posting and issuing all notices required to inform adjacent or adjoining property owners or other parties and such notice or notices must be served in sufficient time as not to delay the progress of the Work under this Contract.

3. Excavation below the foundation of an adjacent structure requires either of the following:

   a. A Structural Engineer or Professional Engineer Licensed in the State of Illinois has determined that the structure is located far enough away from the excavation so as to be unaffected, or
   b. A Structural Engineer Licensed in the State of Illinois has designed and approved a structural support system to provide adequate protection to the existing structure.

C. Structural Support Systems

Structural support systems may consist of pre-engineered systems such as aluminum hydraulic shoring, trench shields, trench boxes, or systems constructed on the job site such as timber or steel shoring or steel sheet piling.

1. Pre-Engineered System

   a. Pre-engineered structural support systems installed in accordance with the manufacturer's recommendations do not require certification by a Structural Engineer when trench depth is less than twenty (20) feet. However, the Commissioner, at his sole discretion, may require a manufacturer's certification indicating the support system is suitable for the intended use and site conditions.

   b. Pre-engineered structural support systems will require analysis and certification by a Structural Engineer Licensed in the State of Illinois, when trench depth exceeds twenty (20) feet.

2. Site Constructed Systems

   a. Construct steel sheet piling system in accordance with Section 05 10 00 – Structural and Miscellaneous Steel.

   b. Structural support systems built in place and made of timber constructed in accordance with OSHA Standards, do not require certification by a Structural Engineer licensed in the State of Illinois, provided trench depths shown in the OSHA Standard, relative to the soil type at the site, are not exceeded.

   c. If the OSHA Standard is not followed for timber shoring and the depths of trenches exceed those in the tabulated data; or soil conditions have been determined to be substantially

different that those given in the OSHA Standard; the design must be performed and certified by a Structural Engineer Licensed in the State of Illinois.

d. A structural support system built in place and consisting of materials other than a timber shoring systems will require design and certification by a Structural Engineer Licensed in the State of Illinois.

e. When close-sheeting is used, it must be driven so as to prevent adjacent soil from entering the trench either below or through such sheeting. Tight-sheeting must be used in that portion of the excavation in or along streets or alleys below the intersection of a 1 to 1 slope line from the nearest face of the excavation to the edge of the pavement.

f. Sheeting must not be in contact with existing pavement but must bear uniformly against the sides of the excavation.

3. Where structural support systems, such as steel or wood sheeting are used for stabilizing excavations, the width of the trench may be increased as necessary to accommodate installation of the work. When soils in the lower limits of the excavation have been determined to have adequate stability; the Contractor may end the shoring elements above the bottom of the excavation. If soil begins moving into the excavation below the shoring during construction, the Contractor is solely responsible for making corrections to the excavation and for lowering the shoring, at his own expense.

4. When structural support systems are required to be left in place, they must be cut off at the same elevation as the bottom of the water main, unless otherwise directed by the Commissioner. Bracing that is to remain in place must be driven up tight. The right of the Commissioner to request sheeting and bracing to be left in place, is not meant to construe any liability or obligation on behalf of the Commissioner to issue such orders.

5. Structural support systems that are not to be left in place may be removed only when the excavation has been backfilled to such an elevation so as to prevent the collapse of the sides of the excavation. Any voids created by the removal of the structural support system members, must be filled and compacted in an acceptable manner.

3.3 EXCAVATION

A. Trench Excavation (Open Cut)

1. The width of the trenches must provide adequate space for workers to place and join the pipe properly, and must be kept to the minimum practical width. Unless otherwise approved by the Commissioner, the total clear width of the trench at the level of the top of the pipe and at grade must be at the Neat Lines as detailed on the Drawings.

2. The Contractor must excavate a minimum of 6-Inches below the bottom of the pipe unless otherwise shown, specified, or directed, so bedding material can be placed in the bottom of the trench and shaped to provide a continuous firm bearing for the pipe barrel. Bell holes must be provided for proper make-up of the joints.

3. The open excavated trench preceding the pipe laying operation and the unfilled trench with pipe in place must be kept to a minimum length causing the least disturbance. The maximum length of open trench must not exceed 300-feet unless otherwise directed by the Commissioner. Comply with Article 4G, CDOT Specifications, for other trench opening length requirements within the public right-of-way.

4. Excavation In Arterial Streets. Comply with Article 4C, CDOT Specifications, for protection requirements when working within arterial streets.

5. Contractor must saw cut existing pavement prior to excavating. Width of saw cut pavement must be such that any sheeting provided for excavation protection is not in contact with the pavement.

6. Where water is encountered in the excavation, the excavation must be dewatered in accordance with Section 31 23 19 – Dewatering Excavations of these specifications.

7. Wherever the nature of the ground will permit, the bottom of the excavation for monolithic and brick sewers must have the shape and dimensions of their outside invert and for pipe sewers the shape and dimensions of the outside of their lower quarter. If the bottom of the trench cannot be shaped to the required form and maintained until a section of the sewer is safely constructed, then the bottom and sides of the trench must be made to conform as nearly as possible to the external shape and dimensions of the sewer, and the space between the outer surface of the sewer and the bottom and sides of the trench must be filled with suitable material for stabilization of the trench bottom.

B. Rock Excavation (open cut)

1. Whenever rock, stone, masonry or other hard, unyielding material is encountered at or above the required trench bottom elevation, remove it to provide a clearance of no less that 6-inches below and on each side of pipes and associated fittings, valves and other appurtenances. Backfill the over excavated area with granular bedding material.

2. Removal of Rock by blasting or by use of a drop hammer is not permitted under this contract.

3. Excavate rock as near as practicable to the outside shape of the work as shown on the Plans. Solid rock, not loosened from the adjacent solid rock, may extend within the neat outside surfaces of these shapes no more than two (2) inches, provided no single projection exceeds one and one-half (1.5) square feet in area at the neat surfaces of the excavation and provided that on any ten (10) foot section of the excavation the total area of such projection at the neat outside surfaces of the section does not exceed twenty (20) percent of the area of the section.

4. The Contractor is required to remove all loose rock and other material from the excavation and in the event that the excavation is enlarged beyond the outside shape of the sewer or sewer structures as shown on the Plans, the Contractor will not be entitled to any payment for the additional Class SI concrete needed to fill the voids caused by such over-breakage.

5. Where rock is encountered, excavate to eight (8) inches below the bottom of the pipe for bedding placement.

C. Trench Excavation (Short Tunnel Construction)

1. In some instances, trees, fire hydrants, sidewalks, and other obstructions may be encountered, the proximity of which may be a hindrance to open cut excavation. In such cases, the Contractor must excavate by means of short tunnels in order to protect such obstructions against damage. Short tunnel work will be considered incidental to the construction and no additional payment will be allowed.

D. Additional Trench Excavation

1. If the soils encountered at the elevations specified are not suitable, or it is determined necessary to go to an additional width and depth, or required to fill designated areas for work done under Section 02 60 00 - Special Soils Excavation and Disposal, the excavation must be carried to such additional width and/or depth and must fill such

excavated areas with approved backfill material as required or directed by the Commissioner.

E. Unauthorized Excavation

1. Wherever the excavation is carried beyond or below the lines and grades shown on the Drawings all such excavated space must be refilled with select fill materials and in such manner as may be directed in order to insure the stability of all affected structures. Beneath all structures, space excavated without authority must be refilled by the Contractor with approved backfill materials and will be considered incidental to the construction and no additional payment will be allowed.

F. Trenching Across or Over Existing Excavations or Utility Trenches

1. In the event that the trench passes over or through a previous excavation, carefully compact and stabilize the bottom of the new trench or excavation to a density equal to or greater than 95% of the maximum dry density as determined by ASTM D1557. Perform this compaction carefully to avoid damaging the existing utility or structure.

G. Special Excavation

1. Remove unsuitable materials to provide two (2) feet minimum horizontal and vertical clearance around water mains or related structures as applicable, unless otherwise directed by the Commissioner.

H. Excavation in Tunnel

1. The tunnel must be excavated and trimmed to such size and shape as will allow the placing of the full section of the pipe as shown on the Plans after all lining is in place.

2. The Contractor must excavate the tunnel and support the surrounding earth so there is no movement of the earth over or adjacent to the work at any time. The Contractor must excavate the tunnel and support the surrounding earth so at no time there is more than 5 feet, measured horizontally, unsupported by bracing as approved by the Commissioner.

3. The Contractor must use extreme care in excavating and trimming to insure that a full section will be placed without materially deviating from the correct lines and grades of the finished structure.

4. In case, due to bad soil conditions, the Contractor requests that the outside outline of the sewer be changed to a minor extent to accommodate his

method of construction, such a change will be allowed provided the strength of the structure is not impaired. Any such modification will not alter the price per foot specified to be paid for the completed sewer, whether such minor modification results in a minor addition or subtraction from the theoretical quantity for the section herein specified.

5. If permission is given the Contractor to excavate the tunnel for a specified distance without immediately placing the concrete lining, the proposed method of bracing the tunnel and the extra bracing necessary must be submitted for approval.

6. No additional payment or allowance of any nature will be made for timber cants, steel plates or other forms of tunnel lining used for supporting the earth during construction. All such tunnel lining must be left in place.

3.4 PLACEMENT OF PIPE BEDDING

A. Pipe Bedding

1. Pipe laid in trenches must be bedded in accordance with the details shown on the Drawings. Bedding material must consist of compacted; well-graded crushed stone fill material as shown and as specified, or as directed by the Commissioner.

2. Existing underground structures, tunnels, conduits, and pipes crossing the excavation must be bedded with compacted sand. Bedding material must be placed under and around each existing underground structure, tunnel, conduit, or pipe as required to stabilize the excavation.

3. At each joint, enough depth and width must be provided around the pipe so that joints can be properly made up.

B. Bedding Placement – Vaults and Structures

1. Pipe bedding beneath precast bases, cast-in-place bases and other foundations must be 6-Inches in thickness and thoroughly compacted in place to not less than 95% of the maximum dry density as determined by ASTM D1557.

C. Bedding and Backfill for Short Tunnel

1. Pipes placed in short tunnels must be bedded in sand. The annular space between the pipe and undisturbed earth must be completely filled with compacted sand fill material. Pipelines in short tunnels must be supported to permit the placement of backfill.

3.5 BACKFILLING EXCAVATIONS

A. General

1. All excavations must be backfilled to the original surface of the ground or to such other grades shown on the Drawings or as directed by the Commissioner. For areas to be covered by topsoil, backfill must be left 6-inches below the finished grade or as shown on the Drawings, or directed by the Commissioner. All backfilling must be done as soon as possible after water main piping has been installed and inspected, and as soon as mortar for masonry or thrust blocks have sufficiently set, unless directed otherwise by the Commissioner.

2. Crushed stone fill material must be used for trench and structure backfill and other areas as shown, specified, or ordered by the Commissioner.

3. Unsuitable material and material rejected by the Commissioner must immediately be removed from the Site and disposed of by the Contractor at his expense.

4. Construction equipment used to backfill against and over cast-in-place concrete structures must not be permitted to travel over these structures until the designated concrete strength has been obtained, as verified by concrete test cylinders. In special cases where conditions warrant, as determined by the Commissioner, the above restriction may be modified if the concrete has gained sufficient strength, as determined from test cylinders, to satisfy design requirements for the removal of forms and the application of load.

B. Backfill Procedure

1. Crushed stone fill material must be used for backfill where roadways, driveways, sidewalks or other pavements are to be placed on the backfill or where the edge of the trench excavation is 5 feet or less from any county or state highway, any city or village street pavement, and in any trenches crossing pavements or sidewalks from a distance beyond the edge of the pavement or sidewalk equal to the depth of the trench. Crushed stone fill material must be used as backfill in trenches parallel to roadways, driveways or other pavements from the top of the bedding to a depth below the ground surface equal to the distance between the inner face of the trench and the closest edge of the pavement.

2. Where pavements and appurtenances for streets are to be placed over the trenches, the backfill material must be placed in uniform layers not greater than 6-inches in thickness and compacted in place. Each layer must be compacted to or not less than 95% of the maximum dry density as determined by ASTM D1557.

3. All pipe sewers must be surrounded and covered by trench backfill above the granular embedment as soon as they are laid. The trench backfill must be properly compacted and tamped to a depth of at least one foot above the top of the pipe prior to placing the remainder of backfilling.

4. For sewer pipe construction with FA 6 backfill, water jet the backfill to the depth of approximately two-thirds of the depth of cover over the sewer. The distance between jetting holes must not exceed 10 foot along the length and width of the trench, or as directed by the Commissioner. Water jetting of the trench backfill must proceed as soon as practicably, as determined by the Commissioner. The Contractor, in this manner, must place and compact the trench backfill to the level of the sub-grade.

5. Excavated material can be re-used as backfill only if directed or approved by the Commissioner.

6. Where railroad tracks or pavements for highways are to be placed over trenches, the backfill must be placed in conformance with the standards set forth by the respective agency having jurisdiction over the railroad or highway.

7. Trench backfilling work must be done in such a way so as to prevent damage to any pipe, utility, or structure.

8. On monolithic concrete sewers and structures cast-in-place, trench backfill must not be placed until the concrete has attained a compressive strength of 2,000 psi.

C. Backfill under a Supported Water Main

1. Backfill the open trench under the water main and 10 feet beyond the water main sides with approved material up to a level of 1-foot below the invert of the supported water main. The backfill material must be placed in layers of 12-Inches with each layer mechanically compacted to 95% of the maximum dry density as determined by ASTM D1557.

2. Place pipe bedding material from 1-foot below the water main invert to the water main centerline and compact to achieve 95% of the maximum dry density as determined by ASTM D1557.

3. Remove the water main pipe support systems, supporting beams, and pipe support straps; and cut-off and remove soldier piles to a level at least four (4) feet below finished grade.

4. The water main pipe must be inspected for leakage and joint integrity and repaired if necessary, prior to backfilling above the water main.

5. After approval by the Commissioner, continue backfilling with approved material. The open trench must be backfilled up to the required sub grade level. The backfill material must be placed in layers of 12-Inches with each layer mechanically compacted to 95% of the maximum dry density as determined by ASTM D1557.

D. Backfilling with Controlled Low Strength Material (CLSM) - Flowable Fill

1. Do not place the mix on frozen ground, in standing water, or during wet weather conditions. Mixing and placing may begin only if the air temperature is 35 °Fahrenheit minimum and rising. At time of placement, the material temperature must be 40 °Fahrenheit minimum. Mixing and placing must stop when the air temperature is 40 °Fahrenheit and falling.

2. Place the mix directly from the chute into the space to be filled. Other placement methods may be approved by the Commissioner if the mix design is appropriate.

3. When backfilling against structures, place the mix in layers to prevent damage by lateral pressures. Side slopes must be stepped or serrated to prevent wedging action of the backfill against the structure. Allow each layer to harden prior to placing the next layer.

4. When backfilling pipe trench, distribute the mix evenly on each side of the pipeline to prevent movement.

5. The mix must not be exposed to freezing temperatures or wet weather conditions during the first twenty (24) hours after placement.

6. The mix may be subjected to loading upon approval by the Commissioner, or when a penetration of 39 mm / blow or less has been obtained with the Dynamic Cone Penetrometer test.

7. Polyethylene encasement material shall be used as a bond breaker between the water main pipe and CLSM flowable fill. Polyethylene must be either 8-mil, low density or 4-mil, cross-laminated, high density polyethylene tubing in accordance with AWWA C105.

3.6 FINISH GRADING

A. Finish grading must be performed in accordance with the completed contour elevations and grades shown and must be made to conform to the existing ground surface. All finished graded surfaces must be left smooth and firm and graded to permit positive drainage.

3.7 TRAFFIC CONTROL

A. The Contractor is responsible for traffic control and the protection of vehicular and pedestrian traffic from the work. For detailed requirements see Section 01 55 26 Traffic Control.

END OF SECTION 31 23 10

SECTION 31 23 19

DEWATERING EXCAVATIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes requirements for dewatering excavations when necessary to provide a safe working environment and protect the Work so as to provide a satisfactory installation.

1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 01 11 00 – Summary of Work.

1.3 SUBMITTALS

A. Refer to Book I for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.

B. Prior to commencing excavation work at the project site, the Contractor must submit to the Commissioner for review and comment a method for removing water which has entered the excavation either from groundwater sources, surface drainage, or other source such as the dewatering of a new or existing water or sewer main. The submittal must include a description of the source of the water, equipment to be used to dewater the excavation, the arrangement of the equipment, time needed to dewater the excavation, method of disposal, and discharge rate of the equipment expressed in gallons per minute. No excavation is to be started until authorization has been given by the Commissioner to proceed with the excavation work.

C. When applicable for sewer projects, the Contractor is to submit the proposed method for by-pass pumping and fluming of sewage to the Commissioner for review and comment.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PREPARATION

A. Capacity of Facilities

1. Facilities for the removal and disposal of water must be of sufficient capacity to keep the excavation dry under all circumstances.

B. Standby Facilities

1. Adequate standby facilities must be provided to insure that the excavation will be kept dry in the event of power failure or mechanical breakdown.

C. Well Points

1. If well points are used, the Contractor must make provisions for removing and resetting individual well points without taking any part of the dewatering system out of service.

3.2 CONSTRUCTION

A. Dewatering

1. At all times during the excavation period and until completion of the Work and acceptance at final inspection, ample means and equipment must be provided with which to promptly remove and properly dispose of all water entering any excavation including leakage from the existing water main which is to be replaced. All excavations associated with the Work must be kept dry. Water must not be allowed to rise over, or to come in contact with, masonry and concrete until the concrete and mortar has attained a set satisfactory to the Commissioner and, in any event, no sooner than twelve (12) hours after placing the masonry or concrete.

B. Groundwater Levels

1. The Contractor must maintain the groundwater level at least 12-Inches below the bottom of the excavation until the excavation until the Work has been completed and the excavation has been backfilled.

C. Water Management

1. Water pumped or drained from the Work must be disposed of in a suitable manner without damage to adjacent property, other Work under construction, street pavement, and parks. Water must not be discharged onto streets without adequate protection at the point of discharge. No water containing settleable solids may be discharged into sewers.

2. All damages caused by dewatering the Work shall be the responsibility of the Contractor and must be promptly repaired at the Contractor's expense.

3. Limit dewatering flow rates to current operating capacity of City sewers. See Section 01 11 – Summary of Work for any limitations on discharge rates.

D. Pumping, Bailing and Diversion

1. The Contractor must at all times during construction provide and maintain ample means and devices for the temporary diversion of flow in existing sewers and drains and the prompt removal and proper disposal of all water or sewage entering the tunnels, trenches or other parts of the work, and must keep said excavations as dry as practicable until the structures to be built therein is completed. All water pumped or drained from the work and from existing sewers must be disposed of in a suitable manner without damage to adjacent property, or to sewers, pavements, electrical conduits or other work or property. The Contractor must provide all temporary flumes or pipe lines and pumping equipment required for the proper diversion of sewage and removal of drainage from the work.

2. Whenever the Contractor removes an existing bulkhead, he must install a screen suitable for the purpose of preventing construction debris from floating into the completed portions of the sewer system. As work progresses, Contractor must clean the completed portions of the sewer by removing rails, jacks, lumber, sandbags and all other construction equipment, excess material and debris.

3. The Contractor must place and maintain all temporary dams, flumes, bulkheads or other structures necessary to prevent water from adjacent sections of the sewer system from entering the work under this Contract in such a manner as to injure it, and must completely remove all such temporary structures from the completed portion of the work as rapidly as practicable. The Contractor must not place a dam, flume or bulkhead in any sewer without first obtaining the approval of the Commissioner. The Contractor must ascertain the possibility of sewage backing up into basements and causing damage and he will be held responsible for any such damage.

4. The City does not assume responsibility for providing the Contractor with an outlet for any storm water or sewage which must be disposed of during the construction work under this

Contract. Until the acceptance of the work, the Contractor will, if so ordered by the Commissioner, keep the entire work pumped free of water and sewage and before the acceptance of any part of the work. Contractor must clean the entire length of such finished part of the work to the satisfaction of the Commissioner.

5. Water must not be allowed to flow over or stand on the pipe or structure invert in such a manner as to cause scouring of the surface.

6. Route all water pumped from trenches or other excavations to settling basins (five feet by ten feet by two feet deep with three compartments) before entering the City of Chicago sewer system. Discharge from the settling basin must be by gravity to the catch basin.

END OF SECTION 31 23 19

SECTION 33 01 11

ELASTOMERIC INTERNAL JOINT SEALS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes furnishing and installing elastomeric internal joint seal for pipe sizes 16-inch diameter and larger, when shown on the Plans, specified, or when requested by the Commissioner.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. ASME SFA 5.9 - Bare Stainless Steel Electrodes and Rods.
2. ASTM A240 - Stainless Steel Plate, Sheet, and Strip.
3. ASTM C150 - Portland Cement.
4. ASTM D117 - Electrical Insulating Oils of Petroleum Origin.
5. ASTM D395 - Rubber Property Compression Set.
6. ASTM D412 - Vulcanized and Thermoplastic Rubber.
7. ASTM D562 - Consistency of Paints Using the Stormer Viscometer.
8. ASTM D573 - Rubber Deterioration in an Air Oven.
9. ASTM D638 - Tensile Properties of Elastics.
10. ASTM D1171 - Rubber Deterioration - Surface Ozone Cracking.
11. ASTM D1248 - Polyethylene Plastics Molding and Extrusion Materials.
12. ASTM D2000 - Rubber Products in Automotive Applications.
13. ASTM D2240 - Rubber Property - Durometer Hardness.
14. ASTM D3568 - Evaluation of EPDM Including Mixtures with Oil.
15. ASTM D3900 - Determination of Ethylene Units in EPM and EPDM.

B. AWS Class A5.9 (ASME SFA 5.9) - Bare Stainless Steel Electrodes and Rods, latest edition.

C. Food and Drug Administration, Title 21 Code of Federal Regulations: a. Section 177.2600, Rubber Articles Intended for Repeated Use, latest edition.

D. ANSI / NSF Standard 61, Drinking Water Components – Health Effects, latest edition.

1.3 WORK SPECIFIED ELSEWHERE

A. Section 01 32 38 – Televised Inspection of Water Mains.

1.4 QUALITY ASSURANCE

A. Minimum qualifications and work experience for supervisory personnel for work done under this project is as follows:

1. Superintendent - Superintendent will have significant experience on internal sealing of pipe with proposed system, experience in the construction industry, and as a supervisor as determined by the Commissioner.

2. Foreman - Foremen will have significant experience on internal sealing of pipe with proposed system, experience in the construction industry, and as a supervisor as determined by the Commissioner.

3. Technicians - Technicians will be expected to have at least moderate experience on internal sealing of pipe with proposed system and in the construction industry as determined by the Commissioner.

1.5 SUBMITTALS

A. Installation data to be submitted prior to award.

1. List of equipment to be used.

2. Technical data for proposed internal joint seal, including material safety data sheets, application instructions and product data.

3. Only seal technologies having an approved testing mechanism will be approved.

B. Proof of minimum qualifications and work experience for supervisory personnel.

1. List of references showing significant experience.

2. List of similar projects completed using the specified seals of the size range specified.

C. Copies of joint repair records.

PART 2 - PRODUCTS

2.1 JOINT LINER

A. The requirements of Underwriters Laboratory, Inc., and the National Electric Code must apply to the extent applicable.

B. EPDM rubber derivative membrane manufactured in compliance with ASTM D2000.

1. Material must be an EPDM polymer where all the ingredients are listed in FDA Title 21, Code of Federal Regulations, Section 177.2600 with the final material not supporting microbiological growth when used in potable or sea water or in humid aerobic conditions.

2. The volume change of the rubber must not exceed 3% after immersion in fresh or sea water at 212º F for seventy (70) hours.

3. The stress relaxation must not exceed 12% when tested from a time of thirty (30) minutes to twenty-four (24) hours.

C. Joint Liner Splicing

1. The seal splice must be made using a transfer molding method with a virgin rubber, of the same compound from which the seal is manufactured, with a ¼-Inch minimum width at the interface.

2. Vulcanization must occur at 330 Deg. Fahrenheit with 2000-psi pressure.

3. No adhesive or glue may be used.

4. As a test, the seal must be gripped at a point 6-inch on each side of the splice and must be bent in both directions as sharply as possible. The splice must be capable of passing this bend test without visible separation. No voids or cracks are allowed.

D. All seals used in potable water applications must comply with ANSI / NSF Standard 61.

E. Each EPDM rubber membrane must be individually sealed in a plastic bag and packaged in a manner that will not damage or deform it. Membranes must be stored in a cool, dry environment away from direct sunlight. The seals must not be removed from the plastic bags prior to use.

F. Seals must meet the requirements of the following standards: ASTM D2000, ASTM D3568, ASTM D412, FDA Section 177.2600, ASTM D395, ASTM D2240, ASTM D573, and ASTM D1171.

2.2 SEAL MANUFACTURING PROCESS

A. Extrusion process for belt material.

B. All joints to be transfer molded.

C. Manufactured in U.S.A.

D. All material specifications must be certified.

E. Material Safety Data Sheet must be provided.

2.3 BANDS, SHIMS, AND SET SCREWS

A. Bands, spacers, shims, clips and set screws for securing rubber membrane across piping joints must be Type 316 stainless steel, manufactured in accordance with ASTM A240 for heat-resisting chromium and chromium-nickel stainless steel plate, sheet, and strip for pressure vessels.

B. Chemical Composition

1.	Carbon (T304)	0.08%
2.	Manganese	2.00%_
3.	Silicon	1.00%
4.	Chromium	18%-20%

5. Nickel 8%-10.50%

C. Typical Mechanical Properties:

1. Finish/Condition - Annealed

2. Yield Strength - 30,000-pounds per square inch

3. Tensile Strength - 75,000-pounds per square inch

4. Elongation in 2-inch minimum % - 40

5. Rockwell B Hardness - 92

6. Reference standard - ASTM A240

D. Method for Manufacturing Bands

1. Bands must be rolled to the radius of the pipe being renewed. Obtain measurement information from inspection reports.

2. Bands must have minimum dimensions of 1/8-Inch thick x 2-Inch wide for pipe sizes 16-Inch - 30-Inch, 3/16-Inch thick x 2-Inch wide for pipe sizes 36Inch – 60-Inch, ¼-Inch thick by 2-Inch wide for pipe sizes 66-Inch – 120-Inch, 3/8-Inch thick by 2-Inch wide for pipe sizes 138-Inch and larger.

3. Each band must be checked on a fixed radius gauge.

E. Cleated Ends

1. To be manufactured from the same manufacturer lot number as the band.

2. All shop and field welds are to be made by certified welders with a minimum of two (2) years experience on this alloy. The welds are to be made with stick or wire of T-8 alloy. All shop welds to be accomplished in an A-1025-Helium/$C0_2$ gas atmosphere when using wire.

3. Welding Wire to be T-308 AWS Class A5.9 (ASME SFA 5.9) with:

C	Mn	Si	Cr	Ni	Effective Fn
0.04	1.90	0.45	20.5	9.8	12

4. Field Welding to be made with coated electrode 308/308H, AWS Class A5.4 E308/308H, AC-DC-16, with tensile strength of 86,000-pounds per square inch and yield strength of 65,000-pounds per square inch.

5. All material sourcing and manufacture must be accomplished in the U.S.A.

6. All material specifications must be certified.

F. Radiused Shims

1. Material specifications 16 to 22 gauge X 2-Inch X 6-Inch T-304.

2. Manufacture by rolling to the radius of the pipe.

3. All edges to be deburred.

4. Provide a polyethylene-backing band

2.4 CEMENT MORTAR

A. Cement Mortar for pipe joint sealing and preparation must be the fast setting type suitable for sea water, wet/dry conditions. Cement Mortar must be Type Five or approved equal as specified in ASTM C150.

2.5 LIQUID JOINT LUBRICATION

A. Liquid joint lubricant to assist in installation of the rubber membrane and bands must be a non-toxic vegetable based lubricating gel.

B. Required properties include:

1. Does not deteriorate or decompose while in storage for a minimum of two (2) years.

2. A soft pasty consistency suitable for use intended from 0º Fahrenheit to 120º Fahrenheit.

3. Does not have any deteriorating effect on natural or synthetic rubber gaskets.

4. Will not impart taste or odor to water.

5. Has no objectionable odor.

6. Is non-toxic and does not support the growth of bacteria.

7. pH - 9.6 minimum - 11 maximum (pH Meter).

8. Method of Test, Modified ASTM D562

9. Does not contain any petroleum based oils or grease.

10. Does not contain any materials considered toxic.

2.6 EPOXY

A. Provide epoxy with the following characteristics;

1. Coating Appearance - Smooth white thixotropic liquid.

2. Gel Appearance - Smooth white mastic of stiff consistency.

3. Exotherm Temperature (3.5 oz. mix) - 179º Fahrenheit.

4. Heat Distortion Temperature - 221º Fahrenheit.

5. Flexural Strength - 13,900-pounds per square inch.

6. Flexural Modulus - 4.4 X 10.

7. Yield Compressive Strength - 16,800-pounds per square inch.

8. Compression modulus at 10% - Deformation less than 4.2 X 10.

9. Tensile Strength - 12,400-pounds per square inch.

10. Ultimate Elongation - 4.5%.

11. Hardness - 68-70 Shore D Scale.

12. Impact Resistance - 16-Inch-pounds.

13. Adhesive Tensile Shear - 1000-pounds per square inch.

14. Pot Life 3.5 oz mix @ 77º Fahrenheit - forty (40) minutes

15. Salt spray - No peeling, flaking, or damage.

16. Coefficient of Linear Thermal - -67º F + 77º F = 34.4 x 10 in/in/ºF + 77º F = 96.0 x 10 in/in/ºF.

17. Flash Point - Coating and Gel - Part A, >400º F; Part B, 200º F.

18. Solids Content - 100%.

19. Solvents Present - None.

20. Odor - Slight Ammonia (Part B only).

21. Drying time -

Ambient Temperature	Tack Free	Thorough Cure
90º F	4 hours	18 hours
70º F	8 hours	36 hours
34º F	2 days	3 days

22. Chemical Resistance - Very good resistance to common acids, bases, solvents, and oils.

2.7 THREAD SEALING COMPOUND

A. Thread sealing compound must be non-toxic paste type with “Teflon”.

B. Teflon components required properties:

1. Flash Point: 410º F closed cup.

2. Density: 1.4 - 1.42.

3. Viscosity: 200,000 - 275,000 centipoise.

4. Temperature Range: -50º F to 500º F.

5. Pressure Application: Maximum 10,000-pounds per square inch.

2.8 HYDRAULIC EXPANDER

The hydraulic expander for installation of steel and stainless steel expansion bands must be capable of hydraulic expansion pressures of 6,000-pounds per square inch.

PART 3 - EXECUTION

3.1 GENERAL

A. All work and testing must comply with applicable federal codes, including OSHA, the Construction Safety Act of 1969 as amended, and the applicable state and local codes and standards.

B. Prior to fitting, seals must be given a thorough visual examination by a qualified installation technician, paying particular attention to the ribbed (lip seals) section of the seal. If quality of material construction or condition is in doubt, the seals may not be used.

3.2 INSPECTION, REPORTING, AND CLEANING

A. Inspect, clean, and map, numbering joints, service taps, abandoned plugs, exiting branches, cracks, or broken sections.

B. Provide the Commissioner with a map and written report of the inspection.

C. Thoroughly clean the areas in which the joints are to be repaired and sealed of grease, dust, debris, roots and solid and semi-solid matter prior to start of sealing procedures.

D. Remove all roots penetrating joints.

E. Protect pipeline from damage during cleaning and root removal operations.

3.3 JOINT PREPARATION

A. The area of pipe either side of the joint where the actual lip seals make contact with the pipe must be prepared to a finish which will allow the “lip seals” to interface consistently, and so provide a permanent seal.

1. All high/low surface imperfections running axially through or part way through the sealing surface must be removed before installation of the seals. Any joint gaps, deep imperfections, or low areas must be properly filled with approved nontoxic joint filler and rendered smooth to suit the prepared surface of the joint area.

2. Joints are to be filled to the full depth of the gap and rendered flush with the internal surface of the pipe.

a. The filling material must be quick setting plaster/cement mortar.
b. All surplus material/spillage must be removed from the joint area prior to the surface preparation of the seal area.

B. The extent of the prepared area on either side of the joint is to be compatible with the lip seals and at least 1-inch extra preparation is recommended either side of the ribbed section of the seal.

C. Pre-mark the grinding areas and seal position within the pipe prior to surface preparation.

D. When the pipe is concrete or reinforced concrete, it is necessary to apply a coat of approved epoxy to the preparation area where the seal will be placed.

3.4 SURFACE PREPARATION

A. Immediately prior to fitting the seal, the area must be cleaned and coated with lubricant.

1. Lubricant must be a nontoxic vegetable soap compatible with the composition of the seal.

2. Apply the lubricant over the prepared area.

3. Care must be taken not to acquire debris from the surrounding unprepared surface into the lubricant.

4. Lubricant acceptability is subject to approval of the Commissioner.

3.5 POSITIONING THE SEAL

A. The seal must be checked that it is undamaged and the test unit is tight before fitting the seal in place.

B. Place seal in position bridging the joint gap, guided by the chalk marks indicating seal position.

1. Position seal accurately on the prepared areas.

2. Locate the test unit is the seal at either 9 o'clock or 3 o'clock position.

3. Position the seal parallel to the joint gap.

3.6 POSITIONING THE RETAINER BAND

A. Before placing the stainless steel bands, place two (2) stainless steel radiused shims, 6-Inch long by 18-22 gauge in the grooves provided in the seal; place shims underneath the wedge area in the grooves.

B. When two (2) or three (3) piece bands are used, temporarily lock in position the band pieces prior to expansion of the joint seal.

3.7 EXPANDING THE SEAL INTO POSITION

A. Apply a set pressure, as recommended by the joint seal manufacturer, expanding the retaining bands of the seal.

1. When positioning an hydraulic expander in line with the retaining bands, ensure that the band remains in the groove of the seal, and does not become moved or dislodged.

2. Ensure that the hydraulic expander is positioned correctly on the band prior to expansion.

3. Hold set pressure for a minimum of two minutes.

B. Fit a radiused-locking piece called a “wedge” on the exposed gap of the expanded band ends.

1. Select a size of wedge having a slight interference fit between the band ends.

2. Select a wedge radius equal to the radius of the pipe.

C. Tap the wedge into position, locking in the compression of the seal.

D. Release the pressure from the expander and repeat the procedure on the second retaining band of the seal.

D. Repeat this entire operation (i.e., re-expansion) after at least thirty (30) minutes have elapsed since the first expansion.

E. Once the expanding procedure is completed, the overlap locking device for the wedge, if required, must be tightened down to a torque of 15-inch- pounds.

3.8 PRESSURE TESTING

A. Internally sealed areas are to be individually pressure-tested, by Test 1 and Test 2, prior to completion of Work.

1. Test No. 1:

a. The test is applied after each section has been completed and not before thirty (30) minutes have elapsed after final fitting of the seal.

b. Pressurize the seal to 10-psig through the test valve and maintain the pressure with a regulated air supply. Apply a soap and water solution to the outer edge of the seal to detect any leak.

c. A restraining device called a "test band" is to be locked in its expanding position during testing to prevent excessive ballooning to the center membrane of the seal.

2. Test No. 2:

a. Apply a pressure of 5-psig to the seal through the test valve and maintain test pressure with a regulated air supply. Apply a soap and water solution to the outer edge and the entire body of the seal to detect any leak.

B. TEST VALVE ASSEMBLY

1. Following Test 2, seal the test valve with a counter sunk hex head completion plug using a nontoxic thread-sealing compound on the threads.

C. Televise a sample of each phase of the work and submit such inspection to the Commissioner in accordance with Section 01 32 38 – Televised Inspection of Water Mains.

END OF SECTION 33 01 11

SECTION 33 05 21

UTILITY PIPE JACKING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes requirements for work associated with jacking or augering casing pipe, for locations shown on the drawings.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. ASTM A139 - Electric Fusion Arc Welded Steel Pipe.
2. ASTM C76 - Reinforced Concrete Storm and Sanitary Sewer Pipe.
3. AWWA C203 - Coal Tar, Enamel, and Hot-Applied Tape Coatings.
4. AWWA C206 - Field Welding Steel Water Pipe.

1.3 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 01 55 26 – Traffic Control.
B. Section 31 23 10 – Excavation, Trenching and Backfilling.
C. Section 03 30 00 – Cast in Place Concrete.

PART 2 - PRODUCTS

2.1 GENERAL

Casing pipe must be either steel pipe or reinforced concrete pipe, as specified here, unless otherwise shown on the Plans, or approved by the Commissioner.

2.2 STEEL PIPE

All casing pipes must be smooth welded steel pipe meeting the requirements of ASTM A139, Grade B. The exterior of casing pipe must have coal-tar enamel in accordance with AWWA C203 and must be of the following diameters and wall thickness(es):

Carrier Pipe Nominal Diameter	Casing Pipe Outside Diameter	Casing Pipe Wall Thickness
6"	20"	0.344"
8"	20"	0.344"
12"	24"	0.375"
16"	30"	0.469"
24"	42"	0.625"
36"	54"	0.781"
48"	72"	1.000"

2.3 CONCRETE PIPE

Concrete pipe must conform to ASTM C76, Class V, straight wall reinforced concrete pipe. Pipe must have "O" ring joints conforming to ASTM C361. Concrete pipe will not be permitted for use as casing pipe where the required casing pipe diameter is less than 36-Inches in diameter.

2.4 CARRIER PIPE SPACERS

Spacers for carrier pipes must be either the two-piece metal band type with 2-Inch wide non-metallic runners or units manufactured entirely out of high-density polyethylene. On two-piece metal band type spacers, bands and fasteners must be of corrosion resistant material. All spacers must be rated for heavy-duty service, manufactured by (PSI) Pipeline Seal & Insulator, Incorporated, Cascade Waterworks Manufacturing Company or RACI Spacers North America.

PART 3 - EXECUTION

3.1 GENERAL

A. Where shown on the Plans, directed by the Commissioner, or otherwise specified, the pipeline must be installed in a casing pipe beneath roadways, railroads or other structures, which prohibit excavation by open cut.

B. Excavate jacking and receiving pits in locations as shown on the Plans or as directed by the Commissioner and as specified in Section 31 23 10 – "Excavation, Trenching and Backfilling".

C. Provide a minimum 4-Inch concrete mud slab, as specified in Section 03 30 00 – "Cast-In-Place Concrete", in the jacking pit as a working surface. All casing pipes installed by augering and jacking must conform to the lines and grades shown on the Plans, specified, or as directed by the Commissioner.

D. The casing pipe must be installed by simultaneously augering and jacking the casing pipe into place in the location shown on the Drawings. All operations must conform to the regulations of the railroad, highway department, or other agency having jurisdiction over the crossing installation. After approval of the crossing, the Contractor must give a one (1) week advanced notice to the Commissioner and all other authorities having jurisdiction over the installation, before starting construction. The Contractor is responsible for complying with all permits associated with the casing pipe installation. All insurance requirements must be submitted prior to starting construction.

3.2 INSTALLATION OF CONCRETE CASING PIPES

A. In general, the use of reinforced concrete pipe for casing pipe must have prior approval from the Commissioner.

B. Before installing the casing pipe, it must be inspected for damage or manufacturing defects such as cracks or damaged joints. Such defect if found is cause for rejection of the pipe, and rejected pipe is to be removed from the site at the Contractor's expense.

C. The casing pipe must be installed so as not to create any voids between the surrounding soil and the casing pipe. Any voids must be filled in accordance with the requirements set forth by the permitting agency having jurisdiction over the crossing. If no such requirements exist, void spaces are to be grouted to the satisfaction of the Commissioner.

D. To avoid concentrated loads at the joints from pipe to pipe, a resilient cushioning material should be inserted around the circumference of the pipe between the joints as each pipe is placed ahead of the thrust ring. Resilient materials must also be used between the pipe end and the thrust ring.

3.3 INSTALLATION OF STEEL CASING PIPES

A. Steel casing pipes must be joined together in the field prior to jacking them in place and must be seamless pipe or pipe having not more than one longitudinal weld. All joints must be fully butt-welded together per AWWA C206. After welding, the welded area must be covered and treated with hot tar 1/8-Inch thick. The tar must then be allowed to cool prior to jacking the casing pipe in place.

B. The casing pipe must be installed so as not to create any voids between the surrounding soil and the casing pipe. Any voids must be filled in accordance with the requirements set forth by the permitting agency having jurisdiction over the crossing. If no such requirements exist, void spaces are to be grouted to the satisfaction of the Commissioner.

3.4 INSTALLATION OF CARRIER PIPES IN CASING PIPES

A. Prior to insertion in the casing, each length of pipe must be supported on casing spacers in such a manner that at no time will the weight of the pipe bear on the bell or any part of the pipe touch the casing.

B. All pipes must be jointed prior to being pushed or pulled through the casing pipe. After placement of the carrier pipe through the casing, the ends of the casing are to be sealed with brick and mortar, rubber end seal, or other appropriate method, to the satisfaction of the Commissioner and completely leak-tight. Backfilling of the casing pipe must be as detailed on the Plans, directed by the railroad or other authority having jurisdiction over the installation, or as directed by the Commissioner.

3.5 PEDESTRIAN AND VEHICLE PROTECTION

A. Provide traffic control and protection to provide a safe and convenient public traveled way per the requirements of Section 01 55 26 – Traffic Control. The Contractor must provide any flagmen required for warning and directing vehicular or railroad traffic as required.

B. The Contractor will be held responsible for all damage or injury regardless of barricades, signs, lights, reflectors, and flagmen furnished during the installation of the casing pipe, Jacking and Receiving Pits, and Carrier Pipe.

END OF SECTION 33 05 21

SECTION 33 05 23

TRENCHLESS UTILITY INSTALLATIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section describes the requirements for the installation of water services and water mains as shown on the Drawings using the trenchless directional drilling method of installation.

1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 31 23 10 - Excavation, Trenching and Backfilling.
B. Section 33 12 13 - Water Services 2-Inches and Smaller.
C. Section 31 23 19 - Dewatering Excavations.
D. Section 32 90 00 - Landscape Restoration.
E. Section 32 12 16 - Asphalt Pavement.
F. Section 32 13 13 - Concrete Pavement.
G. Section 32 16 21 - Concrete Curbs, Gutters & Walks.

1.3 REFERENCES

A. City of Chicago Plumbing Code, latest edition.

1.4 SUBMITTALS

A. Trenchless Directional Drilling Plan.

1. Pipe and equipment manufacturer's data on installation procedures.

2. Describe method to be used for containing, handling, and disposing of drilling fluid. Emergency procedure for containing fluids, which may be discharged by accident, or failure of equipment.

3. Submit operational drilling plan a minimum of thirty (30) days prior to beginning drilling.

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION

A. Locate and mark all existing utilities, which may interfere with new service routings.

B. Excavate all necessary test holes for determination of drill path centerline depth.

C. Layout routing of services between new water main and existing shutoff valves, and locations and size for entrance and receiving drilling pits.

D. Provide adequate supplies of soil lubricant, grout mixture, dewatering equipment, pipe sections, and drill rods and boring equipment to ensure that steady, continuous drilling operations can be maintained when boring begins.

E. Contractor is responsible for dewatering, diverting water, and controlling elimination of discharged water from drilling operations. Drill fluid is not to be disposed of in City sewers. Collected drill fluid must be disposed of in the same off-site location acceptable to the Commissioner.

F. Contractor must determine types of soil material, which may be found and determine the proper drilling fluid mixture to be used.

3.2 INSTALLATION

A. Directional Drilling

1. Guide directional drilling continuously and accurately monitoring the drill head location and depth. Verify line and grade of drill head, at a maximum of five (5) feet intervals or less, in areas of potential conflict with existing utilities, foundations of structures or plantings.

B. Installation of Service Piping

1. Install service piping through drilled hole, at depth and grade shown on the drawings, unless approved otherwise by the Commissioner.

a. Provide winch systems designed to protect structures, provide directional stability, and capable of pulling pipe from insertion to exit point without causing damage to the pipe being pulled.

b. Install copper service piping in a continuous operation from point to point. No joints will be allowed in service pipe between entrance and exit drilling pits.

c. Provide lubricants when applicable or as specified by pipe manufacturer to avoid stressing of pipe during insertion.

2. Installed piping and service connections must meet the requirements specified in Section 33 12 13 - Water Services 2-Inches and Smaller.

C. Contractor must excavate, maintain, dewater backfill and restore all entrance and receiving drilling pits required by this operation per the requirements this Section as well as Section 31 23 10 - Excavation, Trenching and Backfilling; Section 31 23 19 – Dewatering Excavations; Section 32 90 00 - Landscape Restoration; Section 32 12 16 - Asphalt Pavement; Section 32 13 13 - Concrete Pavement and Section 32 16 21 - Concrete Curbs, Gutters, & Walks.

D. When drilling in the vicinity of sewers or sewer services monitor the adjacent upstream and downstream manholes for the intrusion of drilling fluid.

END OF SECTION 33 05 23

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SECTION 33 07 00

INSULATION FOR WATER MAIN PIPE AND APPURTENANCES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section covers the requirements for insulating water mains and their appurtenances installed with less then the recommended depth of cover as specified in SECTION 33 11 13 – Ductile Iron Water Pipe and Fittings, detailed on the Drawings, or as directed by the Commissioner.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. ASTM C578 - Rigid, Cellular Polystyrene Insulation.
2. ASTM D1621 - Test Method for Compressive Properties.
3. ASTM C272 - Test Method for Water Absorption.

B. Illinois Department of Transportation Standard Specifications for Road and Bridge Construction, (SSRBC), latest edition.

PART 2 - PRODUCTS

A. Rigid insulation must be closed cell extruded polystyrene foam meeting the requirements of ASTM C578, Type VI.

B. Minimum width of the insulation board must be 2 feet, the minimum length must be 4 feet, and the minimum thickness must be 2-Inches.

C. The insulation must have the following properties:

1. Compressive strength of 40 pounds per square inch average, when tested in accordance with ASTM D1621.

2. Maximum water absorption of 0.1% by volume when tested in accordance with ASTM C272.

D. Furnish mastic approved by the insulation manufacturer for use with the insulation provided.

E. Silica based sand backfill around insulation board must be of gradation FA 7 or FA 6 and conform to Section 1003, Fine Aggregates, of the SSRBC, unless directed otherwise by the Commissioner.

PART 3 - EXECUTION

A. Provide insulation where water main pipe has less than 5 feet of cover only when shown on the Drawings or as directed by the Commissioner.

1. Refer to Specification Section 33 11 13, Part 3.12.A, Table D – Minimum Depth of Cover for Water Main, for minimum depth of cover required for each diameter or range of water main size.

B. Excavate the water main trench to the width required for the rigid board insulation.

C. Spread and compact sand beneath and around all sides of the insulation board. Do not damage the insulation board during compaction. Lay the insulation board flat with no breaks or cracks. Stagger joints of the insulation board not less than 1 foot joint to joint.

D. Insulation must consist of two (2) layers of insulation board. Minimum total thickness of insulation must be 4-Inches.

E. Cover all joints with minimum 2-Inch thick insulation board that is minimum 6-Inches wide. Connect all joints together with mastic. The bond strength of all joints must be proved at least equal to the material strength before any backfill is placed.

F. Spread sand over the insulation board and compact it by suitable mechanical means prior to backfilling.

G. Cut and fit insulation board around valve and service boxes.

END OF SECTION 33 07 00

SECTION 33 07 10

PVC ENCASEMENT FOR WATER PIPE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section covers the requirements for PVC encasement of water mains and water service pipe and their appurtenances installed with less than the required minimum vertical clearance between a sewer as specified in CONSTRUCTION DETAILS D-50, detailed on the Drawings, or as directed by the Commissioner.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. ASTM D1784 – Standard Specification for Rigid PVC Compounds and CPVC Compounds.
2. ASTM D1785 – Standard Specification for PVC Plastic Pipe, Schedules 40, 80, and 120.
3. ASTM D2241 – Standard Specification for PVC Pressure-Rated Pipe (SDR Series).

PART 2 - PRODUCTS

A. Use PVC pipe conforming to ASTM D1785 and materials designated Class 12454B (PVC 1120) or Class 12454C (PVC 1220).

B. For copper carrier pipe, schedule 40 PVC pipe shall be used. For ductile iron carrier pipe, schedule 80 PVC pipe shall be used.

C. All PVC pipe is required to have an SDR rating of 26 or less.

D. The ends of the PVC casing pipe should be sealed with brick and mortar, rubber end-seal, or other appropriate method to provide a leak tight seal.

PART 3 - EXECUTION

A. Provide PVC encasement where water main pipe used for distribution, water service pipe, and branch connections have less than the required minimum vertical clearance between a sewer as specified in

CONSTRUCTION DETAILS, D-50 and D-51, detailed on the drawings, or as directed by the Commissioner.

B. The "Proposed Cover At Sewer" is the depth of cover the proposed water main needs to meet sewer separation requirements. This is a calculated depth and may need to be adjusted due to field conditions. Any adjustments must still provide the specified sewer and water main clearance.

C. When vertical bends are used, restrain all pipe joints between the outermost bends.

D. After placement of the carrier pipe through the casing, seal the ends of the casing with brick and mortar, rubber end-seal, or other appropriate method to provide a leak tight seal.

E. When encasing copper carrier pipe, no pipe joints are allowed inside the casing. The copper pipe may rest directly on the inside of the bottom of the casing.

F. When encasing ductile iron carrier pipe, only one joint is allowed within the casing and that joint must be restrained. When bends are used outside the ends of the casing, all joints between the bends, including the joint within the casing, must be restrained. Casing spacers are not required; however the pipe must be supported outside each end of the casing to prevent deflection of the restrained joint within the casing. Install an extra layer of polyethylene encasement around the bell at this joint.

G. Install PVC casing pipe in accordance with the following table:

Carrier Pipe	**PVC Casing Size**
1" Type K Copper	2"
1 ½" Type K Copper	2 ½"
2" Type K Copper	3"
4" Ductile Iron	12"
6" Ductile Iron	14"
8" Ductile Iron	14"
12" Ductile Iron	20"

END OF SECTION 33 07 10

SECTION 33 11 00

CONCRETE PIPE WATER MAINS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes requirements for the installation of pre-stressed concrete cylinder pipe and fittings as shown on the Drawings or specified here.

1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 31 23 10 - Excavation, Trenching and Backfilling.
B. Section 33 13 00 - Hydrostatic Testing and Disinfecting Water Mains.

1.3 REFERENCES

A. AWWA C301 - Prestressed Concrete Pressure Pipe, Steel-Cylinder Pipe, latest edition.
B. AWWA C304 - Design of Prestressed Concrete Cylinder Pipe, latest edition.
C. AWWA M9 - Concrete Pressure Pipe, latest edition.
D. ASTM A570 - Structural Quality, Hot Rolled Carbon Steel, latest edition.
E. ASTM C150 - Standard Specification for Portland Cement, latest edition.

1.4 SUBMITTALS

A. Refer to Book I for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.

B. Before fabrication of the pipe and fittings, the Contractor must furnish shop drawings showing the details of the pipe, fittings, and connection pieces. The shop drawings must show the laying lengths of all pipe, fittings and connection pieces and how the pipe and fittings to be used in the Work are to be assembled.

C. The Contractor must submit certified copies of all test reports showing that all tests have been conducted and all specifications met.

1.5 QUALITY ASSURANCE

A. The Commissioner may reject the pipe at the job site if the pipe does not comply with these specifications. Each manufacturer supplying pipe for water mains under this Contract must furnish all facilities, personnel, and materials

required to conduct tests, as applicable, to the pipe being supplied. The cost of all these tests required as proof of the acceptability of the pipe will be considered incidental to the construction and no additional payment will be allowed.

B. **The Work necessary for the installation of concrete pipe and fittings must be performed by a plumber licensed in the State of Illinois or the City. This Work includes, but is not limited to joining all pipe, fittings, adapters, and installing joint gaskets required for proper installation of the pipe.**

C. Original Proof of Design Test

1. All tests must be conducted in an approved laboratory or shop.

2. The following tests must be performed no later than twenty-eight (8) days after the pipe has been cast. The two (2) tests require two (2) different pieces of pipe. The pipe tested under one test may not be used for the other test.

   a. One piece of standard length pipe must be given an internal hydrostatic test. There must be no evidence of failure for the pipe under internal pressures up to 150-pounds per square inch.

   b. One piece of standard length pipe must be given an external three-point loading test. This test may only be conducted after application of the mortar coating. The loads must be applied by steps and the effect on the pipe noted on each step. There must be no evidence of failure for the pipe with external loads up to 150% of those for which the pipe is designed in the trench.

3. A complete record of each procedure must be kept for the above tests.

4. All other routine shop and yard tests called for under the details of this section apply to and must be in process or completed for the test specimens.

5. If the test requirements are met, the Contractor will be notified in writing to proceed with the Work.

6. In the event that a test specimen fails to meet the requirements of these tests two additional test specimens will be required to

meet the requirements of either or both tests that failed. The cost of additional tests will be borne by the Contractor; no additional payment will be allowed.

7. Testing will be considered incidental to the cost and no additional payment will be allowed.

1.6 WARRANTY

A. All materials furnished by the Contractor must be guaranteed against failure or defects by the pipe manufacturer for one year from acceptance of the pipe by the Commissioner. The pipe manufacturer must replace, rebuild, repair, or restore any non-conformity resulting from failure or defects of the pipe or fittings for the guarantee period.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Pre-stressed concrete cylinder pipe of 36-Inch nominal diameter conforming to the requirements of AWWA C301, AWWA C304 and as stated here.

B. Pipe Design Parameters

1. External Conditions:

a. Depth of cover - Ranging from a minimum of 3-feet of cover to a maximum of 10-feet of cover.
b. Soil Density - 150-pounds per cubic foot.
c. Laying Conditions - Type "R3", 60^{o} (AWWA M9), flat bottom trench with tamped backfill.
d. Live Load - Computed by the procedure in AWWA M9 for two (2) passing trucks with adjacent wheels 4 feet apart with 12,000-pounds on each rear wheel plus 50% impact load (values must equal or exceed AASHTO static H-20 loading).

2. Internal Pressure (Design Criteria: Working + Surge Pressure):

a. Maximum Working Pressure
50 pounds per square inch
b. Maximum Surge Pressure
100-pounds per square inch
c. Maximum Test Pressure
100-pounds per square inch

3. Nominal Length = 20 feet.

4. Provide adapters to connect from Concrete Pipe bell end and spigot end to bell or plain end Ductile Iron Pipe Class 52 or Ductile Iron Fitting end as required.

C. Pipe Marking

1. Pipe markings must be 3-Inch high letters painted on the inside of the bell end.

2. Each length of pipe must be marked with the nominal diameter, the laying length, and a piece number corresponding to the pipe laying schedule. Pipe lengths with heavy gage cylinder and / or harnessed joints must be marked indicating the heavy gage cylinder and/or harnessed joints.

3 Each length of bevel pipe, bevel adapter, and bend must be marked with the degree of deflection, laying length, and nominal diameter. In addition, the long and short side must be marked on the face of the spigot with a center punch and a paint stripe.

4. All fittings and connection pieces must be marked with the nominal diameter, description per manufacturer's standard abbreviations, types of joints at all ends, and laying length.

D. Outlets

1. For pipe 24-Inch diameter and larger, an outlet may be used in place of a tee fitting. The maximum allowable diameter of an outlet is one-third (1/3) of the parent pipe diameter. The outlet must be shop-fabricated by the pipe manufacturer. Outlets must have additional reinforcement where the outlet connects to the parent pipe.

E. Restrained Joints

1. Restrained joints must be provided at all elbows and bends in excess of 6º. A bevel adapter installed adjacent to the spigot end of a bevel pipe will be considered as a single bend. Restrained joints must also be provided at all tees, valves, reducers, caps and other fittings.

2. All restrained joints must be designed to withstand thrust forces resulting from an internal hydrostatic pressure of working pressure plus surge pressure. Restrained joints must be designed to fully transfer the thrust forces to the pipe cylinder in the adjacent length of pipe. Working stresses for restrained joints and pipe cylinders transferring thrust forces must not exceed 17,000-pounds per square inch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Field Test

1. After each section of pipeline has been laid, the new section will be filled with water and then subjected to a hydrostatic pressure test in accordance with Section 33 13 00 – Hydrostatic Testing and Disinfecting Water Mains. Leaks which are apparent are not to be included in allowable leakage. All defective materials must be repaired or replaced at the expense of the Contractor and the tests must be repeated until the allowable leakage criterion is not exceeded.

B. Inspection of Pipe Installation

1. The Commissioner may require the Contractor furnish a representative of the pipe manufacturer who is to be present when the pipe or fittings are installed. The representative's duty is to advise the Commissioner regarding the assembling of the joints and the handling of the pipe during installation.

C. Defective Pipe and Material

1. All pipe and materials not conforming to the requirements of this Section or found to be damaged at point of delivery will be considered as defective and removed from the Site. Any pipe found defective after installation must be removed by the Contractor and replaced with acceptable materials. Replacement of defective materials will not be considered for additional payment.

D. Joints for Prestressed Concrete Pipe

1. Steel joint rings must be cleaned before making up each joint.

2. Each joint must be inspected to determine whether the gasket is in the position recommended by the pipe manufacturer. If the gasket is out of position, the pipe must be withdrawn and the gasket examined for cuts. The Commissioner may require the gasket be replaced before the pipe is rejoined. The cost of the replacement gasket will be borne by the Contractor; no additional payment will be allowed.

3. Pipe joints are to be encased in diapers that act as forms for cement mortar grout. The diapers are to be left in place permanently.

4. The joint space within each diaper must be filled with cement mortar, just thin enough to run around the joint. Before the mortar has taken its initial set, the diaper must be examined and, if not completely filled, additional mortar must be forced into the joint.

5. Cement mortar for joints must be made of Portland cement and sand conforming to the pipe manufacturer's recommendations.

E. Interior/Exterior Welding of Concrete Pipe Joints

1. Furnish all labor, equipment, and materials needed for welding pipe joints on prestressed concrete cylinder pipe.

2. All work is to be performed by ASME-certified welders trained in current techniques and equipment. They must be capable of performing necessary exterior welding procedures while the water main is in full operational mode.

3.2 DISINFECTION OF PIPE AND FITTINGS

A. Protect new and existing pipe and fittings from water, debris and foreign materials as specified in Section 31 23 10 – Excavation, Trenching and Backfilling.

B. In addition to disinfection of the pipe in accordance with Section 33 13 00 – Hydrostatic Testing and Disinfecting Water Mains, swab each new pipe piece before installation with chlorine solution with a chlorine concentration of at least 100 parts per million.

END OF SECTION 33 11 00

SECTION 33 11 13

DUCTILE IRON WATER PIPE AND FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes requirements for the installation of ductile iron water pipe and fittings as shown on the drawings and specified here.

1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 31 23 19 - Dewatering Excavations.
B. Section 31 23 10 - Excavation, Trenching and Backfilling.
C. Section 33 11 15 - Thrust Restraint for Water Main Piping.
D. Section 33 13 00 - Hydrostatic Testing and Disinfecting Water Mains.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. AWWA C104 - Cement Mortar Lining for Ductile Iron Pipe and Fittings.
2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure pipe and Fittings.
5. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. AWWA C116 - Protective Fusion-Bonded Epoxy Coatings Int. and Ext. Surf. Ductile-Iron/Gray-Iron Fittings.
7. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
8. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast.
9. AWWA C153 - Ductile Iron Compact Fittings for Water Service.
10. ASME/ANSI B16.1 - Flanges and Flanged Fittings.
11. ANSI B16.21 - Metallic Gaskets for Pipe Flanges.
12. ASME B18.2.1 - Square and Hex Bolts and Screws.
13. ASME B18.2.2 - Square and Hex Nuts.
14. ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
15. ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel.
16. ASTM A240 - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip, for Pressure Vessels and for General Applications.
17. ASTM A307 - Carbon Steel Bolts and Studs.

18. ASTM A536 - Ductile Iron Castings.
19. ASTM A767 - Zinc Coated (galvanized) Steel.
20. ASTM A775 - Epoxy Coated Steel.
21. ASTM A780-93 - Repair of Zinc Coated (Galvanized) Steel.
22. ASTM B308 – Stainless Steel Alloy Standard Structural Shapes, Rolled, or Extruded.
23. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
24. ANSI A21.5/AWWA C105 - Polyethylene Encasement.

1.4 SUBMITTALS

A. Refer to Book I for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.

B. The Contractor must give notice in writing to the Commissioner, sufficiently in advance of his intention to purchase or place a special order for any pipe required to be installed under this contract. Fully dimensioned drawings and/or manufacturers' catalog cuts are to be submitted for review.

C. The Contractor must submit to the Commissioner certified copies of all test reports for test conducted on the pipe by the manufacturer when so requested by the Commissioner.

D. The Contractor must provide the Commissioner with a notarized statement that all tests have been made and met as specified.

1.5 QUALITY ASSURANCE

A. Each manufacturer supplying pipe for water mains under this contract must furnish all facilities, personnel, and materials to conduct tests required as applicable to the type of pipe being supplied, when requested by the Commissioner. The cost of all plant tests required as proof of the acceptability of the water main pipe will be considered incidental to the Work and no additional payment will be allowed.

B. **The Work performed on joining all pipe and fittings, must be performed by a plumber licensed in the State of Illinois or the City. This Work must include, but not be limited to, joining all pipe and fittings, installing joint gaskets, assembling all joints, installing continuity wedges, and tightening all gland nuts and bolts, as applicable for the installation.**

1.6 NOTIFICATION AND LIMITATIONS OF WATER MAIN SHUT DOWNS

A. **Whenever an existing water main or a section thereof is to be shut down during the course of construction, every individual consumer**

must be notified at least seventy-two (72) hours prior to the shut down. The Contractor must never operate, under any circumstances, an existing valve for a shut down or other purpose without first notifying and obtaining approval from the Commissioner.

B. **The time for a consumer shut down must not exceed eight (8) hours. Absolutely no shut downs will be permitted before 8:00 AM without approval from the Commissioner.**

C. In case of emergency shut downs, the Contractor must notify customers immediately. Notification may be verbal on a door-to-door basis. However, if a consumer cannot be contacted, a written notice must be placed at the property site showing all pertinent information regarding the shut down. The notice must show a telephone number the consumer may call for information or to express any problem that the consumer may have with the shut down.

D. If a consumer cannot withstand a planned shut down due to a dialysis machine being present or other medical reason, the Commissioner must be notified immediately.

E. All valves 16-Inches in diameter and larger must be operated only by personnel of the Department. Notify the Commissioner seventy-two (72) hours prior to the need for operation of the valve.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE

A. Ductile iron pipe must conform to the requirements of AWWA C151 and with the additions or substitutions specified in this Section.

B. Pipe bells must be designed to provide a watertight joint without leakage and must be capable of withstanding pressures exceeding those that will rupture pipe of this class and thickness without requiring additional jointing material.

C. Electrical conductivity must be provided at each joint on all push-on and mechanical jointed pipe 16-Inches in diameter and smaller, to facilitate thawing of frozen pipe and building water services. It must also be provided on pipe 24-inches in diameter and larger when building services are directly connected to the water main. Conductivity is to be accomplished by installing serrated silicon wedges as recommended or supplied by the pipe manufacturer. **The use of lead tip gaskets will not be allowed.** Wedges are to be installed in accordance with the requirements of paragraph C in Articles 3.6 and 3.7 of this specification.

D. All pipes must be manufactured so that where a cut is made at any point along the barrel, the cut end will fit properly into a standard mechanical joint bell and be drip tight at hydrostatic test pressure. All pipes shall be "gauged full length".

E. Exterior of pipe must be coated with a petroleum asphaltic material in conformance with AWWA C110, Section 10-10. Interior of pipe must be cement-mortar lined only, in accordance with AWWA C104; an asphaltic seal coat is not allowed, and shall not be used.

F. Pipe thickness and classes must conform to standards shown in Table A.

TABLE A PIPE THICKNESS AND CLASS

Pipe Size	Nominal Wall Thickness	Thickness Class
3-inch	0.34-inch	54
4-inch	0.38-inch	55
6-inch	0.40-inch	55
8-inch	0.45-inch	56
10-inch	0.47-inch	56
12-inch	0.49-inch	56
14-inch	0.48-inch	55
16-inch	0.46-inch	54
18-inch	0.44-inch	53
20-inch	0.45-inch	53
24-inch	0.50-inch	54
30-inch	0.47-inch	52
36-inch	0.53-inch	52
42-inch	0.59-inch	52
48-inch	0.65-inch	52
54-inch	0.73-inch	52
60-inch	0.77-inch	52

2.2 JOINTS

A. **LEAD JOINTS ARE NOT TO BE USED UNDER ANY CIRCUMSTANCES.**

B. Pipe joints must be push-on type joints unless otherwise noted on the drawings, specified here, or directed by the Commissioner. Push-on type joints must conform to AWWA C111.

C. Restrained joints when specified are to meet the following requirements:

1. Mechanical joint pipe with mechanical joint restraint glands. Mechanical joints must conform to AWWA C110. Gaskets must conform to Section 2.4 of this specification.

2. Restrained joint pipe with manufactured weldment, field weldments or manufactured locking rings, locking segments and runner retainers and appurtenances conforming to AWWA C110. Acceptable products are Super-Lock Pipe manufactured by Clow Water Systems Company; FlexRing Pipe or Lok-Ring Pipe manufactured by American Ductile Iron Pipe; or TRFLEX manufactured by United States Pipe and Foundry Company.

D. Mechanical Joint Restraint Glands.

1. Provide restraint glands at all mechanical joints.

2. Restraint glands must be designed for use with the standardized mechanical joint bell pipe conforming to AWWA C110 and AWWA C153. Restraint is to be incorporated into the design of the gland. Acceptable products for this use are Mega Lugs manufactured by EBAA Iron Works; Uniflange manufactured by Ford Meter Box; or Star Grip manufactured by Star Pipe Products.

3. Restraint is to be accomplished by the use of multiple, wedge style restraints. Proper actuation of the wedges is to be ensured with torque limiting twist off nuts.

4. Glands 3-Inches through 16-Inches are to be pressure rated at 350-psi; glands 18-Inch through 48-Inch are to be rated at 250 psi.

5. The gland body and restraint components are to be made from ductile iron conforming to ASTM A536, 65-45-12. Ductile iron wedges are to be heat-treated within a range of 370 to 470 BHN.

6. The joint is to be capable of full deflection during assembly and joint deflection after assembly

7. Provide glands with minimum weights and number of wedges as shown in Table B.

8. Retainer glands are not acceptable.

TABLE B – MINIMUM WEIGHT & NUMBER OF WEDGES PER RESTRAINED JOINT

Pipe Size.	Number of Wedges	Minimum Weight
3-inch	2	6.0-lbs
4-inch	2	7.0-lbs
6-inch	3	11.0-lbs
8-inch	4	14.5-lbs
10-inch	6	23.0-lbs
12-inch	8	28.5-lbs
14-inch	10	46.0-lbs
16-inch	12	52.0-lbs
18-inch	12	63.6-lbs
20-inch	14	71.0-lbs
24-inch	16	90.0-lbs
30-inch	20	190.7-lbs
36-inch	24	226.5-lbs
42-inch	28	400.0-lbs
48-inch	32	488.0-lbs

E. Flanged joints, when shown on the Drawings, specified, or directed by the Commissioner, must conform to the following:

1. Flanged joints must conform to AWWA C115. Flanges must be the long hub type, screwed on the threaded end of the pipe in the shop. There must be no leakage through the pipe threads. The flanges must be designed to prevent corrosion of the threads from the outside.

2. Flanges must be drilled according to the requirements of ANSI/ASME B16.1, Class 125 unless special drilling is called for on the Drawings, specified, or directed by the Commissioner. Bolt holes must be equally spaced, drilled smooth and true. When stud bolts are used flanges must be drilled and tapped to accommodate the studs.

3. The face of the screwed-on flange and plain-end of the pipe must be accurately refaced together, at right angles to the pipe axis. After facing and drilling, the face of the screwed-on flange must immediately be covered with an appropriate rust-preventive coating.

4. Flanged joints must be secured with either bolts and nuts, or stud bolts with a nuts. Bolts, stud bolts, and nuts must meet the

requirements of ASTM A307, Grade B. Bolts and stud bolts must conform to ANSI/ASME B18.2.1. Nuts must conform to ANSI/ASME B18.2.2. All bolts, stud bolts, and nuts must be primed with bitumastic paint after the bolts and nuts have been installed and tightened.

5. Gaskets must conform to Section 2.4 of this specification.

2.3 FITTINGS

A. Fittings to be furnished and installed as specified or shown on the Drawings must be mechanical joint, ductile iron, and full body type in accordance with AWWA C110. Laying length of mechanical joint castings must be as shown in AWWA C110. Wall thickness and allowable variation in the thickness of mechanical joint castings must conform to AWWA C110 and have a 250-psi pressure rating.

B. Compact fittings may not be used unless otherwise approved by the Commissioner.

C. Plain ends of mechanical joint fittings must be beveled and gauged to properly seat in push-on joint bells.

D. The fittings must be smooth and free from defects of every nature that would make them unfit for the use that they were intended. Plugging of fittings is not allowed. Repairing of defects by welding will be allowed if such repairs will not adversely affect the serviceability of the fittings or their ability to meet the strength requirements of the referenced AWWA standards.

E. All castings must be coated with a petroleum asphaltic material in conformance with AWWA C110, Section 10-10. Interior of pipe must be cement-mortar lined only, in accordance with AWWA C104; an asphaltic seal coat is not allowed, and shall not be used.

F. Flanged fittings must conform to AWWA C110, and have a 150-pound per square inch pressure rating.

2.4 GASKETS

A. All gaskets for pipe, fittings and appurtenances must be vulcanized natural or vulcanized synthetic rubber, non-porous, free of foreign materials and visible defects. Recycled rubber may not be used.

B. When soil conditions do not permit the use of natural or synthetic rubber gaskets and when directed by the Commissioner, all gaskets for pipe, fittings and appurtenances must be Nitrile (acrylonitrile butadiene), nonporous, free of foreign materials and visible defects.

C. Gaskets for flanged joints must be of the ring type, 1/16-Inch thick, and meet the requirements of ANSI Standard B16.21. Acceptable manufactures for gaskets type as manufactured by the Crane Company; Garlock Packing Company; or U.S. Rubber Company.

D. Gaskets must be stored in a cool place and protected from light, heat, oil, or grease until installed. Any gasket showing signs of cracking, weathering, abrasion or other deterioration will be rejected.

2.5 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement material must be either 8-mil, low density or 4-mil, cross-laminated, high-density polyethylene tubing in accordance with AWWA C105.

2.6 TRANSITION SLEEVES

A. Transition sleeves for pipe 16-inches in diameter and smaller must be of type as manufactured by Dresser, Style 253 Modular Cast Couplings; Smith Blair, Type 441 Cast Transition Couplings; Ford, Style FC2A Transition Couplings; Power Seal, Model 3501 Transition Couplings; or JCM Industries Model 212 Transition Couplings.

Transition sleeves for pipe diameter greater than 16-inches must be of type as manufactured by Ford, Style FC2A or Style FC5 Transition Couplings; Romac Industries, Style 501 Transition Couplings; Dresser Style 38, Style 62, or Style 138 Transition Couplings; or Power Seal, Model 3501 Transition Couplings; or Smith Blair, Type 441 Cast Transition Couplings.

B. Transition sleeves must be designed to join class "B" pit cast iron pipe to AWWA C111/C151 standard ductile iron pipe. They must provide for pipe misalignment and settlement deflection and make a leak proof non-soldered joint, which allows for limited line movement due to expansion and contraction. Design couplings for a minimum rated working pressure of 150-pounds per square inch.

C. Transition sleeves pipe 16-Inches in diameter and smaller must be constructed of ductile iron conforming to ASTM A536. Transition sleeves for pipe diameters greater than 16-Inches must be constructed of ductile iron conforming to ASTM A536 or carbon steel conforming to ASTM A36. Ends must have a smooth inside taper for uniform gasket seating. The follower flanges must be ductile iron conforming to ASTM A536 or carbon steel conforming to ASTM A36.

D. Transition sleeves must be shop coated inside and outside with fusion bonded epoxy coating conforming to AWWA C-213.

E. Gaskets must be of molded rubber conforming to ASTM C564 for potable water service.

F. Bolts and nuts must be 5/8-Inch in size and must be Grade 304L stainless steel, annealed. Nuts must be Teflon coated to prevent galling during storage.

G. Each transition sleeve must be supplied with four electrical continuity brackets for electrical continuity across the sleeve. The angle bracket must be made from ASTM A240-T304 stainless steel with a stainless steel set screw.

H. Contractor must field measure the existing cast iron water main for exact size of outer dimension and degree of out-of-roundness at the location to install the transition sleeve prior to ordering and installing the transition sleeve for that location.

2.7 PIPE SUPPORT SYSTEMS AND HANGERS (INTENDED FOR PERMANENT INSTALLATIONS)

A. Manufactured pipe support systems, fasteners, and miscellaneous hardware must be fabricated from high strength stainless steel conforming to ASTM B308, or hot-dipped galvanized steel conforming to ASTM 123 and ASTM 153. Pipe support systems must be designed to have a minimum load safety factor of three (3) times the anticipated loading.

B. Field fabricated pipe support systems, fasteners, and miscellaneous hardware must be cold-galvanized by painting metal surfaces with a 2-mil thick coating of ethyl silicate in-organic zinc-rich paint primer per manufacture's directions. Galvanized primer must be completely dry before backfilling the excavation. Field fabricated pipe support systems must be designed to have a minimum load safety factor of three (3) times the anticipated loading.

C. Repair damaged galvanized coated surfaces in accordance with ASTM A780-93. Apply 2-mil thick coating of ethyl silicate in-organic zinc-rich paint primer per manufacturer's directions. Zinc primer must be allowed to completely dry before backfilling the excavation.

D. Cold-galvanizing zinc primer paint must be of the inorganic, ethyl silicate type, containing at least 60% zinc dust and 40% adhesive binders, and conform to ASTM 780-93, type as manufactured by Tnemec Products, Kansas City, MO., Brite Products, Detroit, Mich., or Valspar Coatings, Minneapolis, MN.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All ductile iron pipe, fittings, and appurtenances must be installed in accordance with the manufacturer's recommendations and requirements.

B. All pipe, fittings, and accessories must be delivered, unloaded, strung, and laid as specified here.

C. The water mains must be laid with depths of cover as indicated under Article 3.12 of this specification, unless otherwise shown on the drawings, or directed by the Commissioner. The pipes must be laid true to line and grade.

D. Fittings as specified must be used where shown on the drawings and where grade or alignment changes require offsets greater than those recommended by the pipe manufacturer.

3.2 TRANSPORTATION, DELIVERY AND STORAGE

A. Every precaution must be taken to prevent damage to the pipe during transportation and delivery. Pipe ends, fittings, valves and hydrants must be sealed with caps or by another suitable method upon transportation from the supplier. Caps or end seals must be sturdy, secure, and wind-resistant so as to protect the pipe at all times prior to installation. Pipe ends, fittings, valves, and hydrants discovered without proper end caps or seals, upon delivery or during construction, will not be accepted until the unprotected pipe has been cleaned, swabbed, and or pressure washed by the contractor to the satisfaction of the Commissioner. Extreme care must be taken in loading and unloading the pipe and fittings. Such work must be done slowly with skids or suitable power equipment and the pipe must be under complete control at all times. Under no conditions may the pipe be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the pipe. When handling the pipe with a crane, a suitable pipe hook or rope sling around the pipe must be used. Under no condition may the sling be allowed to pass through the pipe unless adequate measures are taken to prevent damage to the pipe ends and lining.

B. If in the process of transportation, handling, or installation, any pipe or fitting is damaged, such pipe or fitting must be replaced by the Contractor and be considered incidental to the construction and no additional payment will be allowed.

C. The Contractor must store pipe in a manner that will prevent damage. Pipe must be placed on wooden timbers or another suitable support on level ground. The Contractor must prevent the pipe from rolling. The procedures used to prevent rolling must be approved by the Commissioner

3.3 PREPARATION FOR LAYING PIPE

A. Materials, coatings, and linings must be as specified herein, shown on drawings, or directed by the Commissioner. Water mains and services must be installed where shown on the drawings. Installation must be in accordance with standards as recommended by the pipe manufacturer, and as specified herein.

B. Proper and suitable tools and appliances for the safe and convenient cutting, handling, and laying of the pipe and fittings must be used.

C. Before laying, all pipe and fittings must be thoroughly examined for defects and no piece may be installed which is known to be defective. If defects are discovered after pipe or fittings have been installed, the Contractor must remove the defective pipe and/or fitting and replace it with a sound one at his expense and to the satisfaction of the Commissioner.

D. The pipe and fittings must be thoroughly cleaned before they are laid and must be kept clean until they are accepted in the finished work. Care must be exercised to avoid leaving bits of wood, dirt, rock and other foreign particles in the pipe. If any such materials are discovered before the final acceptance of the work, they must be removed and the pipe and fittings replaced, if necessary. All pipes must be kept absolutely clean during construction and must be stopped off with night plugs or caps at the end of each day's work so as to provide a watertight seal. Exposed ends of uncompleted lines and existing water mains and services cut and not abandoned must be capped or otherwise temporarily sealed watertight at all times when pipe laying is not in progress.

E. When cutting ductile iron pipe, it must be neatly cut perpendicular to the longitudinal axis of the pipe without damaging the pipes lining or coating or jointing surface area.

3.4 LAYING WATER MAIN PIPE

A. All pipelines must be laid in trench excavations on bedding or other foundations, as shown on the drawings, specified herein, or ordered by the Commissioner. The pipe must be properly secured against movement and pipe joints must be made in the excavation as required. Pipes must have solid bearing throughout their entire length.

B. At locations where pipe thrust is anticipated to occur, pipe and fittings must be anchored or restrained as shown on the drawings, specified in Section 33 11 15 – Thrust Restraint for Water Main Piping, or as directed by the Commissioner. **Polyethylene encasement is to be installed on all new water main pipe and fittings before pipe is installed and braced against movement**. Care must be taken so as not to damage the polyethylene

encasement during the installation or blocking of the pipe and fittings. If damage occurs, the Contractor must repair or replace the polyethylene encasement at his expense to the satisfaction of the Commissioner.

C. Pipe laying will be permitted only in dry trenches having a stable bottom. Groundwater or water from other sources must be removed as per Section 31 23 19 – Dewatering Excavations. If the trench bottom is unsuitable for the pipes foundation, the kind of stabilization to be utilized will be ordered in writing.

D. If, in the opinion of the Commissioner, the Contractor has failed to obtain an acceptably dry trench bottom using conventional methods of dewatering, the Commissioner may order the Contractor to excavate below the intended grade and to place sufficient sub-grade material as may be suitable over the trench bottom in accordance with Section 31 23 10 – Excavation, Trenching and Backfilling.

E. The Contractor must also take such required precautions to prevent flotation of the new pipeline.

3.5 ASSEMBLY OF FLANGED JOINTS

A. Flanged joints must be made with bolts or bolt studs with nuts as specified in Section 2.2 of this specification.

B. Tighten flange bolts as recommended by the gasket manufacturer to ensure an evenly compressed gasket and leak tight joint.

C. After the bolts and nuts have been properly installed, tightened, and cleaned, prime them with bitumastic paint.

3.6 ASSEMBLY OF MECHANICAL JOINTS

A. Thoroughly brush the surfaces with which the rubber gasket comes in contact with a wire brush just prior to assembly of the joint. Brush lubricant over the gasket and the plain end just prior to installation. In making up mechanical joints, the spigot must be centered in the bell.

B. The gasket and gland must be placed in position, the bolts inserted, and the nuts tightened finger tight. The nuts must be tightened by means of a torque wrench in such a manner that the gland must be brought up evenly into the joint.

C. Joints are to be made up to allow electrical continuity from one pipe to another by installing wedges as specified in Article 2.1, Paragraph C of this specification and are to be installed in the following manner:

1. Use two (2) wedges per joint for 3-Inch to 12-Inch diameter pipes. Wedges must be placed on opposite sides of the joint at an equal distance apart (9 and 3 o'clock positions) around the joint.

2. Use four (4) wedges per joint for 16-inch to 24-inch diameter pipes. Wedges must be installed side by side in pairs placed on opposite sides of the joint at an equal distance apart (9 and 3 o'clock positions) around the joint.

3. Use six (6) wedges per joint for pipes larger than 24-inches in diameter only if building services are directly connected to the main. Wedges must be installed side by side in pairs 120 degrees apart at the 12, 4, and 8 o'clock positions around the joint.

D. The following range of bolt torques must be applied as specified in Table C. If sealing is not obtained at the maximum torque requirements listed in Table C, the joint must be disassembled, thoroughly cleaned, and reassembled.

TABLE C – BOLT TORQUE REQUIREMENTS

Bolt Size	Torque Range
5/8-inch	45-60 ft-lbs
¾-inch	75-90 ft-lbs
1-inch	85-100 ft-lbs
1 1/4inches	105-120 ft-lbs

3.7 ASSEMBLY OF PUSH-ON RUBBER GASKET JOINTS

A. Thoroughly brush the gasket seat in the bell with a wire brush and wipe the gasket and gasket seat with a cloth. Place the gasket in the socket with the large round end entering first so that the groove fits over the bead in the seat. Apply a thin film of NSF 61 approved joint lubricant to the inside surface of the gasket that will come into contact with the entering pipe.

B. Thoroughly brush the plain end of the pipe with a wire brush and placed it in alignment with the bell of the pipe to which it is to be joined. Make up the joint by exerting sufficient force on the entering pipe so that its plain end is moved past the gasket until it makes contact with the base of the socket.

C. Joints are to be made up to provide electrical continuity from one pipe to another by installing wedges as specified in Article 2.1, Paragraph C of this specification and are to be installed in the following manner:

1. Use two (2) wedges per joint for 3-Inch to 12-Inch diameter pipes. Wedges must be placed on opposite sides of the joint at an equal distance apart (9 and 3 o'clock positions) around the joint.

2. Use four (4) wedges per joint for 16-Inch to 24-Inch diameter pipes. Wedges must be installed side by side in pairs placed on opposite sides of the joint at an equal distance apart (9 and 3 o'clock positions) around the joint.

3. Use six (6) wedges per joint for pipes larger than 24-Inches in diameter only if building services are directly connected to the main. Wedges must be installed side by side in pairs 120 degrees apart at the 12, 4, and 8 o'clock positions around the joint.

D. Assemble restrained joint pipe in accordance with manufacturer's instructions.

3.8 TEMPORARY BULKHEADS

A. At ends of constructed sections where adjoining water mains or structures have not been completed and are not ready to be connected, temporary bulkheads must be used.

3.9 SHORT TUNNEL CONSTRUCTION

A. Pipes to be placed in short tunnels must be jointed prior to being pulled into position. Pipe must be pushed or pulled into position in a manner arranged to keep joints tight and to prevent deflection.

3.10 ENCASING DUCTILE IRON PIPE IN POLYETHYLENE

A. All cast and ductile iron pipe and fittings must be encased in polyethylene tubing before being installed, blocked, or braced.

3.11 USE OF DAMAGED, DEFECTIVE, OR NON-SPECIFIED CASTINGS AND FITTINGS

A. All construction castings and pipe fittings that are determined to be damaged, defective or do not meet these specifications and are stored within the Work area must be marked for non-use and removed and replaced with fittings that conform to these Specifications.

3.12 DEPTH OF PIPE COVER

A. Unless otherwise shown on the Plans or directed by the Commissioner, all water mains and services must be installed so a minimum pipe cover is achieved as shown in Table D.

TABLE D – MINIMUM DEPTH OF COVER FOR WATER MAINS

Size of Pipe	Depth of Cover
3/4 to 3-inches	5-ft 6-inches ± 3-inches
4-inch	5-ft 6-inches ± 3-inches
6-inch	5-ft 6-inches ± 3-inches
8-inch	5-ft 3-inches ± 3-inches
12-inch	5-ft ± 2-inches
16-inch	5-ft ± 2-inches
24-inch	4-ft 6-inches ± 2-inches
30 to 42-inches	3-ft 6-inches (min) or as detailed on drawings
48-inches & Larger	3-ft (min) or as detailed on drawings

3.13 ABANDONMENT OF EXISTING WATER MAINS

A. All openings on abandoned pipe or conduit are to be sealed with a concrete mortar plug of a minimum of one (1) foot in length within the pipe. Pipe 16-Inches in diameter and larger must be filled with fine graded aggregate or controlled low strength material (CLSM) flowable fill, as appropriate, or directed by the Commissioner. CLSM flowable material must meet standards specified in Section 31 23 10, "Excavation, Trenching and Backfilling", paragraph 2.3, C of these specifications.

3.14 DISINFECTION OF PIPE AND FITTINGS

A. Protect new and existing pipe and fittings from water, debris and foreign materials as specified in Section 31 23 10 – "Excavation, Trenching and Backfilling".

B. All new pipe, fittings, and valves must be disinfected in accordance with Section 33 13 00 – "Hydrostatic Testing and Disinfecting Water Mains", and the requirements of the Bureau of Water Quality which may be contacted at 312.744.8190.

C. Swab all pipe and fittings that will not be pressure tested or chlorinated with a chlorine solution during installation. Extra precautions must be taken to prevent debris or ground water from entering the section of water main to be swabbed. Incorporate untested section of water main into the flushing routine

when the work is necessitated, or part of, a water main replacement project. When connecting pipes to the existing city water system use normal operating pressure to visually inspect for leaks. If feasible, inspect for leaks prior to backfilling the excavation. Comply with all standards and requirements of the Bureau of Water Quality.

3.15 WATER MAIN SUPPORT SYSTEMS

A. Support and anchor all piping in proper position and alignment with due allowance for expansion and contraction.

B. The type, location, and arrangement of hangers and supports must be as shown on the drawings, or as directed by the Commissioner. Pipe supports and hardware must be appropriate to meet installation conditions, anticipated loading, and fabricated from corrosion resistant materials described in paragraph 2.7 - Pipe Support and Hangers, of this specification. All support systems whether pre-manufactured or field fabricated must have a minimum load safety factor of three (3) times the anticipated loading. Corrosion protective coatings damaged during installation of the pipe support system must be repaired per the manufacturer's requirements, or as directed by the Commissioner to maintain corrosion protection.

3.16 SEPARATION BETWEEN WATER AND SEWER MAINS

A. When a water main crosses above a sewer main and the vertical separation is between 18 and 6-Inches, as measured between the bottom of the water main and crown of sewer pipe, the sewer must be constructed of ductile iron pipe (or PVC pipe as directed by the Commissioner) with rubber gasketed joints to a distance one foot beyond the wall of the trench excavation. Flexible transition coupling must be used to join the ductile iron pipe to the sewer pipe and be encased in bentonite as shown on the drawings. This sewer separation work (between 18 and 6-Inches) shall be approved by the Commissioner prior to commencing and completing this work.

B. When a water main crosses below a sewer main, the sewer pipe must be constructed of ductile iron pipe with rubber gasket joints for a perpendicular distance of 10 feet on each side of the center line of the water main, and an 18-Inch vertical separation must be maintained. Flexible transition couplings must be used to join the ductile iron pipe to the sewer pipe.

END OF SECTION 33 11 13

Section 33 11 15

THRUST RESTRAINT FOR WATER MAIN PIPING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes the requirements for providing thrust restraint for the installation of water mains and services as shown on the Drawings and specified here.

1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 33 11 13 – Ductile Iron Water Pipe and Fittings.

1.3 Design Requirements

A. Calculated thrust restraint must be based on the frictional force and bearing resistance between the pipe and the surrounding soil, with an allowance made for the polyethylene wrap on ductile iron pipe installations.

1.4 REFERENCES

A. ANSI B1.1 - Unified Inch Screw Threads.

B. American Society for Testing and Materials (ASTM), latest edition:

1. ASTM A193 – Steel and Stainless Steel Bolting Materials
2. ASTM A194 – Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both
3. ASTM A325 - Heat Treated Structural Steel Bolts.
4. ASTM A449 – Quenched and Tempered Steel Bolts and Nuts
5. ASTM A536 - Ductile Iron Castings.
6. ASTM A563 – Carbon and Alloy Steel Nuts
7. ASTM A615 – Standard Specification for Deformed and plain Billet Steel Bars for Concrete Reinforcement.

C. IDOT Standard Specifications for Road and Bridge Construction (SSRBC), latest edition.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE RESTRAINT

A. Mechanical joint thrust restraint glands must be used unless otherwise

directed. Where such glands cannot be used to provide sufficient thrust restraint, concrete thrust blocks must be used, unless directed by the Commissioner.

2.2 CONCRETE THRUST BLOCK RESTRAINT

A. All concrete used in the construction of thrust blocks must be Class SI of the SSRBC.

B. All reinforcing steel used in the construction of thrust blocks must conform to the requirements of ASTM A615.

2.3 TIE ROD PIPE RESTRAINT

A. Where the use of tie rods to restrain thrust is approved by the Commissioner, they must meet the following ASTM Designations:

Tie Rod Diameter	**Rods**	**Nuts**	**Washers**
Up to 1-1/2"	A449	A563 Grade D	A325
Over 1-1/2"	A193	A194 Grade 2H	A325

B. Tie rod threads must be the Unified Coarse Thread Series conforming to ANSI B1.1 for rods 1-inch in diameter and smaller and 8-inch pitch thread series for larger diameters. Nuts must be hexagonal. Harness tie rod nuts must have a standard chamfer on the back face with finished spherical bearing surface. The nuts must seat in steel plate washers having similar finished concave spherical seats. Where the use of mechanical joint retainer glands are called for on the Plans or approved by the Commissioner, they must conform to ASTM A536. All special castings must be made of good quality ductile iron of such character and so adapted in chemical composition to produce spheroidal graphite structure. The iron must be of such character to provide superior mechanical properties of strength and ductility; the iron must be soft enough to satisfactorily allow drilling and cutting.

C. The minimum physical properties will be as follows:

1. Tensile strength- 60,000 pounds per square inch.

2. Yield strength- 42,000 pounds per square inch.

3. 2-Inch Elongation.-10%.

D. In addition to the standard required tests, the following requirements must be met: Keel Block Tests as detailed in ASTM A536-Standard 0.50-Inch diameter tensile test bars must be machined from keel block coupons cast from each heat and of the same hardness range as the special castings. Minimum test requirements are as specified above.

PART 3 - EXECUTION

3.1 GENERAL

A. Install all joint anchorage in accordance with the requirements of Section 33 11 13- Ductile Iron Water Pipe and Fittings. Install all joint anchorage for concrete pipe and fittings in accordance with manufacturer's installation instructions unless directed otherwise by the Commissioner.

3.2 DUCTILE IRON PIPE

A. All fittings and conditions, which result in tangential forces on the piping, must be provided with thrust restraints, unless otherwise specified or approved by the Commissioner.

3.3 CONCRETE PIPE

A. Whenever the harnessing of pipe joints by itself does not provide sufficient thrust restraint, the Contractor must provide additional thrust restraint as required. The Contractor must provide anchorage against thrust for water mains and appurtenances wherever the deflection of the pipeline exceeds six (6) degrees. The anchorage must be accomplished by placing concrete thrust blocks adjacent to the fittings to be anchored. All anchorage must be designed to withstand working pressure plus surge pressure. The Contractor must submit to the Commissioner complete design calculations and plans for all thrust restraints bearing the seal of a Structural Engineer licensed in the State of Illinois.

END OF SECTION 33 11 15

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SECTION 33 12 13

WATER SERVICES 2-INCHES AND SMALLER

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes the requirements for the installation of water services 2-Inch and smaller in diameter as shown on the Drawings and specified here.

1.2 REFERENCES

A. City of Chicago Plumbing Code, latest edition.
B. ASTM B62 - Composition of Bronze or Ounce Metal Castings, latest edition.
C. ASTM B63 - Resistivity of Metallically Conducting Resistance and Contact Materials, latest edition.
D. ASTM B88 - Seamless Copper Water Tube, latest edition.
E. ASTM B584 – Copper Alloy Sand Castings for General Applications, latest edition.
F. AWWA C800 - Underground Service Line Valves and Fittings, latest edition.
G. NSF / ANSI Standard 61 – Drinking Water System Components – Health Effects

1.3 SUBMITTALS

A. Refer to Book I for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.

B. The Contractor must provide the Commissioner, prior to the use of any materials in this section, certified test and inspection reports from an approved testing laboratory, or at the point of manufacture, that all materials and/or equipment to be utilized in this work are in accordance with the Contract Documents.

C. All tests as specified are to be performed at the point of manufacture. The cost of testing is considered incidental to the construction and no additional payment will be allowed.

D. Each individual unit must be pressure tested and guaranteed for service at pressures minimally equal to pressure ratings specified for design purposes in AWWA C800. Additionally, all materials must comply with NSF 61. The Contractor must provide an affidavit that materials furnished comply with the above standards.

1.4 QUALITY ASSURANCE

A. The Work necessary for the installation of new, or modification to existing services, must be performed by a plumber licensed in the State of Illinois or the City. This Work will include, but is not limited to, tapping the main; installing corporation cocks; cutting and flaring the ends of copper tubing; installing copper tubing, fittings, and roundway (curb stop) valves; and connecting new service tubing to existing services, as specified herein.

PART 2 - PRODUCTS

2.1 COPPER TUBING

A. Type "K" (soft) copper tubing, seamless annealed conforming to ASTM B88.

2.2 ROUNDWAY (CURB STOP)

A. All roundways must be ball valve type with copper flare connections on both ends and Minneapolis type curb box threads. The roundway must conform to requirements of AWWA C800. Minneapolis thread size for 1-Inch roundway will be 1 ½-Inches; 1 ½-Inch and 2-Inch roundways will be 2-Inches.

B. Roundways must be composed of bronze or ounce metal alloy conforming to the chemical and physical requirements of ASTM B62 and AWWA C800. Castings must be high grade, smooth, and free from sand, blowholes, shrinkage, or other foundry defects. No roundway can be plugged or filled in any manner. All threads must be cut full and without defects.

C. Any brass part of the fitting or valve in contact with potable water shall be made of a “No-Lead Brass”, defined as UNS Copper Alloy No. C89520 or C89833 in accordance with the chemical and mechanical requirements of ASTM B584 and AWWA C800. This “No-Lead Brass” alloy shall not contain more than one quarter of one percent (0.25% or less) total lead content by weight.

D. Acceptable manufactures and products for roundway valves are A.Y. McDonald, model # 6104, Ford Meter Box, model # B22-M, or Mueller, model # B-25154.

2.3 SHUT-OFF BOX

A. Shut-off boxes must conform to details for the “Plastic Shut-off Box - Type B” shown in the Drawings, as manufactured by C.P. Test Services-Valvco, Inc.

B. The shut-off box is to be manufactured from ABS plastic, and be of a two (2) piece tubular design, employing sliding friction between the upper and lower tube sections to maintain length adjustments. A threaded bushing is to be bonded to the plastic of the bottom end section to enable attachment to a roundway (curb stop) shut-off valve. A cast iron lid and rim is to be bonded to the plastic of the top section of the unit. The lid is to have a removable pentagon head bolt for locking the lid into the rim. The letters "WATER" must be cast on the top of the lid. The total length of the plastic shut-off box must be a minimum of 72-Inch when fully extended.

2.4 BRASS CORPORATION COCKS

A. Corporation cocks for water service connections must be of a plug type design conforming to ASTM B62 and AWWA C800. Corporation cocks shall be furnished with a 1/8-bend tailpiece coupling, inlet end swivel nut with female flare copper thread and gasket, and outlet end copper flare connection, as manufactured by A.Y. McDonald, model # 4701L, with model # 4750S couplings, or equivalent. Reference CONSTRUCTON DETAIL D-16, in Appendix A.

B. 1-Inch corporation cocks used for test taps (Valves 8-Inch to 12-Inch) must be ordered without gasket, coupling nut and tailpiece, and be of type manufactured by A. Y. McDonald, model # 3120C, or equivalent. Reference CONSTRUCTON DETAIL D-13, in Appendix A.

2-Inch corporation cocks used for test taps (Valves 16-Inch and larger) must be ordered without gasket, coupling nut, and tailpiece, and be of type manufactured by A.Y. McDonald, model # 3131, or equivalent. Reference CONSTRUCTON DETAIL D-13, in Appendix A.

C. Corporation cocks must be manufactured from composition bronze or ounce metal alloy conforming to ASTM B62 and AWWA C800. The valve castings must be high grade, smooth, and free from sand, blowholes, shrinkage, or other foundry defects. Castings must not be plugged or filled in any manner. All threads must be cut full and without defects. All gaskets, screws, or other parts necessary for proper installation and operation of the corporation stop must be supplied.

D. Any brass part of the fitting or valve in contact with potable water shall be made of a “No-Lead Brass”, defined as UNS Copper Alloy No. C89520 or C89833 in accordance with the chemical and mechanical requirements of ASTM B584 and AWWA C800. This “No-Lead Brass” alloy shall not contain more than one quarter of one percent (0.25% or less) total lead content by weight.

2.5 COMPRESSION COUPLINGS

A. Provide compression couplings to join lead or iron water services to brass fittings and copper water services. Couplings must be manufactured from composition bronze or ounce metal alloy conforming to ASTM B62 and AWWA C800. Castings must be high grade, smooth, and free from sand, blowholes, shrinkage, or other foundry defects. No coupling may be plugged or filled in any manner. All threads must be cut full and without defects.

B. Any brass part of the fitting or valve in contact with potable water shall be made of a "No-Lead Brass", defined as UNS Copper Alloy No. C89520 or C89833 in accordance with the chemical and mechanical requirements of ASTM B584 and AWWA C800. This "No-Lead Brass" alloy shall not contain more than one quarter of one percent (0.25% or less) total lead content by weight.

C. Couplings must be equipped with clamps or setscrews to engage the pipe and act as locking devices. Screws must be manufactured from silicone bronze or stainless steel.

D. Furnish the appropriate type and number of compression couplings listed below for connecting existing water services to the brass fittings or copper water services:

1. 1-Inch strong lead to 1-Inch copper flare.

2. 1 ½-Inch extra strong lead to 1 ½-Inch copper pack fitting.

3. 2-Inch extra strong lead to 2-Inch copper pack fitting.

4. 1-Inch strong lead to 1-Inch MIP thread.

5. 1 ½-Inch extra strong lead to 1 ½-Inch MIP thread.

6. 2-Inch extra strong lead to 2-Inch MIP thread.

7. 1-Inch strong lead to 1-Inch strong lead.

8. 1-Inch extra strong lead to 1-Inch copper flare.

9. 1-Inch extra strong lead to 1-Inch MIP thread.

10. 3/4-Inch strong lead to 3/4-Inch FIP thread.

11. 3/4-Inch strong lead to 3/4-Inch strong lead.

12. 3/4-Inch iron pipe to 3/4-Inch FIP thread.

13. 5/8-Inch strong lead to 3/4-Inch FIP thread.

14. ½-Inch strong lead to 3/4-Inch MIP thread.

D. Acceptable manufactures for compression coupling kits are Ford Meter Box, "Lead-Pak" and "Pack Joint" kits; A.Y. McDonald, "Mac-Pak" or "Compression Coupling" kits; or Mueller "Pack Joint" kit.

2.6 BRASS AND COPPER PIPE FITTINGS AND COUPLINGS

A. Fittings and couplings must be manufactured from composition bronze or ounce metal alloy conforming ASTM B62 and AWWA C800. Castings must be high grade, smooth, and free from sand, blowholes, shrinkage, or other foundry defects. No coupling or fitting may be plugged or filled in any manner. All threads must be cut full and without defects.

B. Any brass part of the fitting or valve in contact with potable water shall be made of a "No-Lead Brass", defined as UNS Copper Alloy No. C89520 or C89833 in accordance with the chemical and mechanical requirements of ASTM B584 and AWWA C800. This "No-Lead Brass" alloy shall not contain more than one quarter of one percent (0.25% or less) total lead content by weight.

C. Furnish the appropriate number of brass and copper fittings and couplings listed below needed to connect the existing water services to the new main.

1. 3/4-Inch FIP X 1-Inch flare.

2. 1-Inch FIP X 1-Inch flare.

3. 1 ½-Inch FIP X 1 ½-Inch flare.

4. 2-Inch FIP X 2-Inch flare.

5. 3/4-Inch MIP X 1-Inch flare.

6. 1-Inch MIP X 1-Inch flare.

7. 1 ½-Inch MIP X 1 ½-Inch flare.

8. 2-Inch MIP X 2-Inch flare.

9. 3/4-Inch FIP X 1-Inch MIP.

10. Unions, 1-Inch, 1 ½-Inch, 2-Inch, three parts, flared both ends.

11. Tube nuts, 1-Inch, 1 ½-Inch, 2-Inch.

C. Furnish fittings and couplings by A.Y. McDonald, Ford Meter Box, or Mueller.

2.7 2-INCH COMBINATION AIR RELIEF VALVE ASSEMBLY

A. Where shown or specified, the Contractor must furnish 2-Inch combination air relief assemblies. The 2-Inch combination air relief assemblies must be Val-Matic Model 202 C or APCO Model 145C.

PART 3 - EXECUTION

3.1. ADJUSTMENT OF SHUT-OFF BOXES AND VALVE BOXES

A. The Contractor is responsible for vertically adjusting existing water service shut-off boxes and valve boxes to the proper surface elevation as shown on Plans, or directed by Commissioner. The Contractor must obtain copies of information for water service pipe from the Department to verify and confirm the exact location of water shut-off boxes or valve boxes to be adjusted. The Contractor must notify the Department seventy-two (72) hours before the excavation of sidewalk or parkway commences to determine if the services are active and also to clarify any discrepancies with water service pipe plats and field survey.

B. If a service is inactive, the Contractor must cut the top part of the box 36-Inches below the proposed grade and backfill.

C. If the service is active and the shut-off/valve box is made of plastic or other approved materials, the Contractor must excavate and vertically adjust the box to proposed grade. If the existing shut-off/valve box is made of cast iron, the top 36-Inches of the box must be replaced with a length of plastic tubing sleeved over the existing shut-off/valve box. The cast iron rim must be bonded to the top of the plastic tubing. The materials and dimensions of the plastic tubing and cast iron rim must conform to the requirements as specified herein and shown in the Drawings for Plastic Shut-off Box-Type B.

3.2 DIRECT TAPPING OF DUCTILE IRON PIPE ENCASED IN POLYETHYLENE FILM

A. Installation procedures must be a method as recommended by the Ductile Iron Pipe Research Association:

1. Method 1: Apply two (2) or three (3) wraps of polyethylene adhesive tape completely around the pipe to cover the area where the tapping machine and chain will be mounted. After the tapping machine is mounted, install the corporation stop directly through

the tape and polyethylene. After the direct tap is completed, inspect the entire circumferential area for damage and repair as needed.

2. Method 2: Directly tap through the polyethylene film without applying a layer of tape on the encasement. Mount the tapping machine directly on the polyethylene encased pipe and install the corporation stop using normal tapping procedures. Once the direct service connection is completed, repair all polyethylene that may have been damaged during the procedure. Inspect the bottom of the encased pipe where the mounting chain has been in contact with the polyethylene for damage and repair as needed.

3. Method 3: Make an X-shaped cut in the polyethylene and temporarily fold back the film at the point where the corporation stop will be installed. Then mount the tapping machine over the exposed pipe surface and make the service tap. After the tap is made and the corporation installed, remove the tapping machine and repair the "X" shaped cut with polyethylene-compatible adhesive tape.

B. Before backfilling. Inspect the polyethylene around the exposed circumferential area, particularly at the bottom where the mounting chain has been in contact with the polyethylene, to ensure that all damage is repaired.

C. House Services. Wrap the attendant corporation stop and a minimum clear distance of 3-feet of the copper service with polyethylene or a suitable dielectric tape.

3.3 WATER SERVICE GENERAL NOTES

A. It is the contractor's responsibility to determine the size and location of each service connection prior to installation of the proposed water main.

B. The Contractor must test all services for flow. If the service has water flow, it must be connected to the new water main.

C. It is the Contractor's responsibility to transfer all active services to the new water main.

D. If a water service is not in use, abandon the service with the existing main. When it is necessary to break a service that is to be abandoned with the existing water main, the service pipe must be crimped on each end to seal the abandoned pipe. Any shut off box for an abandoned service that is visible at the surface must be broken off two (2) feet below grade in the parkway or sidewalk, backfilled with CA-16 trench backfill material and restored to parkway or sidewalk, as appropriate.

E. Remove frames and lids and meters from abandoned meter vaults and fill with CA-16 trench backfill material and restore the surface. Return meters to DWM.

END OF SECTION 33 12 13

SECTION 33 12 16

WATER MAIN CONTROL VALVES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes requirements for the installation of gate valves, resilient wedge valves, and butterfly valves.

1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 33 13 00 – Hydrostatic Testing and Disinfecting Water Mains.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. ASTM A48 - Gray Iron Castings.
2 ASTM A126 - Gray Iron Castings for Valves, Flanges.
3. ASTM A436 - Austenitic Gray Iron Castings.
4. ASTM A439 - Austenitic Ductile Iron Castings.
5. ASTM B584 - Copper Alloy Sand Castings for General Application.

B. AWWA C110 - Ductile Iron and Gray Iron Fittings, latest edition.

C. AWWA C111 - Rubber Gasket Joints for Ductile Iron, latest edition.

D. AWWA C500 - Metal-seated Gate Valves for Water Supply Service, latest edition.

E. AWWA C504 - Rubber Seated Butterfly Valves, latest edition.

F. AWWA C509 - Resilient Seated Gate Valves, latest edition.

G. AWWA C550 - Standard for Protective Epoxy Interior Coatings for Valves and Hydrants, latest edition.

H. Federal Specification FF-B-575C - Bolts; Hex and Square, latest edition.

I. Federal Specification FF-N-836E - Nut; Square, Hex, Cap, latest edition.

1.4 SUBMITTALS

A. Contractor must provide an affidavit stating that all Butterfly Valves, valve operators, and torque overload protectors comply with all applicable provisions shown on the drawings and as specified in this specification.

B. Provide manufacturer's catalog cuts and/or certified drawings of all valves, valve operators, and torque overload protectors to be furnished. The manufacturer's catalog cuts and/or certified drawings shall indicate and provide all necessary information regarding dimensions, materials used, internal and external coatings specified herein, and other pertinent or unique item(s) or valve operation (clockwise to open) in conformance to requirements stated in these specifications.

C. All submittals must be reviewed and approved by the Commissioner prior to installation.

1.5 QUALITY ASSURANCE

A. Each valve must be hydrostatically tested at the manufacturer's shops and proven hydraulically tight at all pressures up to 200-pounds per square inch.

B. For gate valves, the following tests are required:

1. The first test consists of applying a 200-pound per square inch hydrostatic pressure between the discs through an opening in the bonnet casting.

2. The second test consists of applying a 200-pound per square inch hydrostatic pressure against the outside of each disc in the manner prescribed below:

a. The valves must be plugged or capped on both ends. The caps or plugs must be drilled and tapped to accept the pressure test piping.

b. With the pressure test piping in place, open the gates of the valve, the test-piping valve, and remove the plug in the bonnet. Fill the valve with water. When a discharge occurs at the outlet side, close the water supply line and insert the bonnet plug.

c. Close the gates of the valves, open test-piping valve, and apply a 200-pound per square inch hydrostatic pressure on the inlet side.

d. Hold test pressure for one (1) minute. During this time no water should discharge from the outlet end of the test piping. If no leak occurs, release pressure, reverse the test piping, and repeat the test procedures for the other gate. If a leak occurs, repair and / or replace the valve as directed by the Commissioner. Repeat the test procedures.

3. An affidavit must be furnished from the manufacturer to attest to the fact that each of the valves furnished under this Contract were proven hydrostatically tight in accordance with the specified test procedures.

C. Valves that do not meet the requirements of this Section will be rejected and removed by the Contractor, and replaced with valves that conform to this Section, within the time period allowed by the Commissioner. Gate valve removal and replacement will be considered incidental to the installation of the valves and no additional payment will be allowed.

D. **The Work performed for installing valves must be performed by a plumber licensed in the State of Illinois or the City. The Work may include, but not be limited to, setting the valve; cutting and joining all pipe; installing test taps, fittings, adapters, joint gaskets, and continuity wedges; and tightening all gland nuts and bolts, as applicable for the installation.**

PART 2 - PRODUCTS

2.1 GATE VALVES

A. All gate valves are to be Chicago Standard Gate Valves of the size shown on the drawings that are designed, manufactured, tested, and inspected in accordance with AWWA C500, and in accordance with the exceptions noted here. All valves are to be delivered fully assembled.

B. The following characters must be cast in ½-inch letters on the bonnet of each valve:

- Chicago
- Year of Manufacture
- Manufacturer's Name

C. Gate valves must be of mechanical joint type double disk and in the following sizes: 4-Inch, 6-Inch, 8-Inch, 12-Inch, and 16-Inch. Larger size valves must be of a butterfly style.

D. Material used must meet the requirements as to physical and chemical properties, as specified in this Section.

E. Valves found to contain defects such as blowholes, shrinkage or slag holes, cold shuts, or cracks will be rejected.

F. The thickness of metal in castings, whose standard thickness is less than 0.8-Inch, must not be more than 0.08-inch less than the standard thickness. The deficiency in thickness of castings, whose standard thickness is 0.8-inch or more, must not exceed 10% of the standard thickness. The above allowable deficiencies in thickness, however, must not extend over more than one-half of the area of the casting.

G. After being cleaned and tested, every assembled valve and all metallic parts must be coated inside and outside with a fusion bonded two-part epoxy coating in compliance with AWWA C550 standards. The outside must have a topcoat of two-part polyurethane similar in color to "Black" or approved equal.

H. The brass castings must comply with ASTM B584, Copper Alloy UNS No. C83600.

I. The bronze in the valve stem and in the stem nut must be manganese bronze, complying with ASTM B584, Copper Alloy UNS No. C86700. Stem seals are to be double o-rings complying with ASTM D2000 and ASTM 568A

J. The gaskets used between the flanges must be fully faced, 1/32-inch thick and made of heavy-duty, asbestos-free, fiber composition, suitable for water service.

K. Bolts and nuts must be made of cast iron or steel. Heads of seal plate bolts must conform to the dimensions shown on the Drawings (an alternate of hex or square head bolt is acceptable) while all other requirements of seal plate bolts must conform to Federal Specification FF-B-575C and nuts must conform to FF-N-836E. Heads of bolts must be unfinished and nuts must be semi-finished. Both bolts and nuts must be hot dipped galvanized as specified in the applicable Federal Specification.

L. The valves herein specified must be furnished complete with mechanical joint accessories. The mechanical joint accessories must consist of mechanical joint thrust restraint glands, rubber gaskets, and tee head bolts and hex nuts, all conforming to AWWA C110. Dimensions and tolerances for mechanical joints must conform to table 1of AWWA C110.

M. It will be the manufacturer's responsibility to provide the patterns and gauges necessary to perform the work to be done hereunder. The Department will not furnish these items.

N. The Department reserves the right to make at any time such tests as it may deem proper to determine that the materials used are proper for the Work and that the valves are of good mechanical construction. The manufacturer must give the authorized inspectors of the Department free

access to all places where valves are being made. At the Department's request, the manufacturer must furnish properly prepared standard test

specimens of the materials used and must provide facilities for testing them.

O. All valves must open by turning the operating stem clockwise.

P. Operating nuts must be 2 ½-Inches square at the base of the nut.

2.2 RESILIENT SEATED WEDGE GATE VALVES

A. The Contractor must furnish and install resilient-seated gate valves that are designed, manufactured, tested, and inspected in accordance with AWWA C509, with following exceptions, deletions, or additions:

1. Exceptions for Section 4.4.7. Valves are to be supplied with 2 ½-inch square operating stem wrench nuts.

2. Exception for Section 4.4.7.2. All valves must open by turning the operating stem clockwise as viewed from top of the valve.

B. Resilient seated wedge gate valves must be of the mechanical joint type supplied complete with joint thrust restraint glands, vulcanized natural or synthetic rubber gaskets, and tee head bolts and hex nuts, all conforming to AWWA C110. Dimensions and tolerances for mechanical joints must conform to Table 1of AWWA C110.

C. All valves must provide an unobstructed waterway of full size when open. Gates or stems must not extend into the waterway. Valves are to be supplied in sizes between 4 and 12-Inches as noted on the drawings.

1. The bronze in the valve stem and in the stem nut must be manganese bronze, complying with ASTM B584, Copper Alloy UNS No. C86700. Stem seals are to be double o-rings complying with ASTM D2000 and ASTM 568A.

2. After being cleaned and tested, every assembled valve and all metallic parts must be coated inside and outside with a fusion bonded two-part epoxy coating in compliance with AWWA C550 standards. The outside must have a topcoat of two-part polyurethane in manufacturer’s standard “Red” color or approved equal.

2.3 BUTTERFLY VALVES

A. Butterfly valves, as specified here, must be designed, manufactured, tested, and inspected in accordance with AWWA C504, Class 150Band with the requirements of this Section as listed hereafter:

1. Body Type: Short bodied mechanical joint, as specified.

2. Maximum Non-shock Shut-off Pressure: 100psi.

3. All valves must have flow through discs.

4. Each valve furnished must be subjected to the performance, leakage and hydrostatic tests described in Section 5.2 of AWWA C504.

5. A minimum of two (2) weeks prior to the test dates, the manufacturer must notify the Commissioner in writing when the shop testing of the valve will occur. Failure to notify the Commissioner will not be grounds for rejection.

6. The manufacturer must submit to the Commissioner records of all tests performed under Sections 2.3, 3.8.5, and 5.2 of AWWA C504.

7. Shaft seals must be either split V type packing or "0" ring seals. Shaft seals consisting of a stuffing box with pull down packing are not acceptable.

8. The shaft seal area must not be exposed to the environment. Should the valve design utilize an open packing bonnet area, that area must be enclosed with a 304 series type 18-8 stainless steel, minimum 1/4-Inch thick removable shroud. The shroud must be fully sealed and rated for buried service. An access cover must be provided on the shroud with a minimum opening of 6-Inches x 8-Inches.

9. The valve shaft must be 304 or 316 stainless steel.

10. The valve body must be made of cast iron conforming to ASTM A126, Class B or ASTM A48, Class 40 alloy cast iron ASTM A436, Type 1 and 2 or ASTM A439, type D2 with maximum of 0.003% lead. The valve disc must be ductile iron conforming to ASTM A536, and it must have a seating edge of 304 or 316 stainless steel. The seating edge may be installed in the valve body if the rubber seat is applied to the valve disc. The valve seats for 24-inch and larger butterfly valves must be capable of adjustment or replacement at the installation site.

11. Valve discs must be secured to shafts by means of solid, smooth-sided stainless steel or monel taper pins or dowel pins having a circular cross section. Each taper pin or dowel pin must be extended through the shaft and mechanically secured in place. The use of bolts, setscrews, knurled or fluted dowel pins, flat sided taper pins, expansion pins, roll pins, tension pins, spring pins, or other devices in lieu of the pins specified herein will not be acceptable.

12. The valves and valve operators must be rated for buried service, except electric actuators.

13. Valve operators must conform to AWWA C504 for Class 150B. Manual operators must be Limitorque worm gear, self-locking type designed to hold the valve in any intermediate position without creeping or fluttering. Operators must be equipped with torque overload protection to prevent over travel of the disc in the open and closed position. Spur gear must be furnished with an operator to increase the number of turns and reduce operating torque. A separate limit stop device must also be installed in accordance with "Torque Overload Protection", described below. Operators must provide position indication on the housing of the operator. Valves must open with a clockwise rotation of the nut. The valve and valve operator must be rated for bi-directional flow.

14. Valve operators must be equipped with a Chicago standard style hub nut. The hub nut must be attached to the input shaft of the operator by means of a shear pin. The shear pin must be sized such that it fails when 350 foot-pounds of input torque is applied to the hub nut. Three (3) additional shear pins must be furnished as replacement part for each valve ordered.

15. Corrosion resistant nameplates, as described in Section 6.1 of AWWA C504, must be permanently attached to both the valve and valve operator. There must be two (2) valve nameplates. One must be affixed to the valve body and the other must be affixed to the valve operator in a prominent location. In addition to the normal valve data, the plate must also include the number of turns required to operate the valve and the direction to open (clockwise to open). There must be one (1) operator nameplate affixed to the valve operator. The minimum number of turns to close the valve must be no less than 2 turns per inch (5 turns per centimeter) of valve size in order to minimize water hammer.

16. The manufacturer must provide all nuts, bolts, gaskets, and glands required to make connections.

B. Torque Overload Protection

1. Contractor must furnish torque overload protection devices. The device must be installed on top of the Chicago standard hub nut on butterfly valve operators and in conformance to the following requirements.

2. Purpose: The over torque protector must prevent butterfly valve and operator from damage due to excessive operating torque.

3. Operation: The device must transmit applied torque in either direction only up to a preset amount and automatically disengage if greater torque is applied. It must automatically reset if the applied torque is below the preset amount.

4. Description: The device must be of overall rugged and of durable construction suitable for long-term reliable operation and suitable for buried service.

5. The upper end must have an integral 2 ½-Inch square operating nut and the lower end must have a matching socket. The socket must have one (1) 2-Inch square head set screw in each of two (2) adjacent faces.

6. The operating mechanism must employ spring-loaded tapered rollers engaged in matching tapered detents. A ball bearing type design will not be accepted.

7. The manufacturer's identification must be cast in 3/8-inch or larger letters on an upper surface.

8. Corrosion Protection and Lubrication: The entire housing must be coated inside and outside with fusion bonded two-part epoxy coating in compliance with AWWA C550 standards. The outside must have a topcoat of two-part polyurethane in manufacturer's standard "Red" color or approved equal.

9. The operating mechanism must be permanently lubricated and sealed to withstand 50-feet of water head.

10. There must be no water-retaining external cavities.

11. Service Life: The device must have a minimum life of one-thousand (1000) trips from rated capacity.

12. Trip Torque Set Point: The device must be factory set to trip at 200 foot-pounds of applied torque.

13. Trip Torque Adjustment: Trip torque must be adjustable from 10% to 100% of rated capacity without dissembling the unit. The adjustment means must be sealed and concealed to prevent tampering.

2.4 QUARTER TURN AWWA ELECTRIC VALVE ACTUATORS (OPEN-CLOSE SERVICE)

A. When shown on the Plans, specified, or as directed by the Commissioner, the Contractor must furnish electric valve actuators in conformance with the following requirements.

1. The electric valve actuator must include the motor, actuator unit gearing, position limit switches, torque switches, declutch lever, and hand wheel, as self-contained unit. The actuator must meet the latest revision of the applicable AWWA specification. The actuator must be of sufficient capacity to operate the attached butterfly valve in a modulating action against 100-pounds per square inch pressure.

2. The motor must be rated for continuous duty, specifically designed for valve actuator service, and must be of high starting torque, totally enclosed, non-ventilated construction. Motor insulation must be a minimum NEMA Class F, with a maximum continuous temperature rating of 311° Fahrenheit (rise plus ambient) for the duty cycle specified. Provide optional insulation classes where specified or where service conditions warrant.

3. The motor must be of sufficient size to open or close the valve at the maximum torque. The motor must be capable of operating at plus or minus 10% of specified voltage. The motor duty rating must be sufficient for one (1) complete cycle (open-close-open, or reverse) without exceeding its temperature rating. Motor bearings must be of the anti-friction type, and permanently lubricated.

4. The motor must be an independent sub-assembly such that the power gearing must not be an integral part of the motor assembly, to allow for motor or gear changes dictated by system operation changes. The motor must be equipped with internal thermal contact, to protect against motor overload, and 120-volt heaters. The motor must be designed to operate on 230/460 VAC.

5. The actuator must be a multiple reduction unit with power gearing consisting of spur or helical and worm gearing. There must be a self-locking worm gear set in the drive train to maintain valve position. The spur or helical gearing and worm gear must be of hardened alloy steel, and the worm gear must be alloy bronze. All power gearing must be accurately cut; non-metallic, aluminum, or cast gearing must not be allowed. Anti-friction bearings with caged balls or rollers must be used throughout.

6. All rotating power train components must be immersed in grease with provisions for inspection and re-lubrication without disassembly. Lubricants must be suitable for ambient conditions between 20º F and 150º F. Adequate seals must be provided on all shafting.

7. The actuator must have a built-in device, which allows the motor to reach full speed before engaging the valve load when required by unseating applications.

8. A metallic hand wheel must be provided for manual operation, with an arrow to indicate "open" rotation. The hand wheel must not rotate during motor operation. A fused motor must not prevent manual operation. When in manual operating mode, the actuator must remain in this mode until the motor is energized, at which time the actuator will automatically return to electric operation. Changing from motor operation to manual operation must be accomplished by a positive, padlockable declutching lever, which mechanically disengages the motor and related gearing. It must be impossible for simultaneous manual and motor operation to occur. Friction type declutching mechanisms are not acceptable.

9. Position limit switches and associated gearing must be an integral part of the valve actuator. Limit switch gearing must be of the intermittent type, made of bronze or stainless steel, lubricated, and totally enclosed to prevent dirt and foreign matter from entering the gear train. Limit switch contacts must be heavy duty and silver-plated with wiping action. Where specified, the actuator must have sixteen (16) contacts, four (4) contact/four (4) rotor types, all of the same basic design. As an alternative, a limit switch assembly may be directly coupled to the valve stem, eliminating the need for intermittent gearing, and eight (8) single pole, double throw (SPDT) or eight (8) double pole, double throw, (DPDT) contacts. Contacts must be convertible from normally open, to normally closed, or reverse.

10. Switches must be adjustable, allowing for trip points from fully open to fully closed positions of valve travel. They must not be subject to breakage or slippage due to over-travel.

11. Switch design must permit visible verification of switch position without disassembly.

12. Each valve actuator must be equipped with a switch that will interrupt the control circuit in both the opening and closing directions when valve torque overload occurs. Contacts must be silver-plated. The torque switch must have graduated dials for both open and close directions of travel, and each must be

independently adjustable. The torque switch must include a positive means to limit adjustability so as not to exceed the actuator output torque capability. The activating spring back must be of the Belleville spring design.

13. The position limit switch and torque switch contact must be rated 600 volts per NEMA standard ICS 2-125, heavy duty.

14. The control compartment must be provided with a 120-volt space heater.

15. The valve and operator must be aligned in such a manner that when installed, the manual hand wheel is in a horizontal plane.

16. The operating time must be two (2) minutes for 90 º- valve travels.

PART 3 - EXECUTION

3.1 FIELD TESTING

A. All valves will be tested as specified in Section 33 13 00 - Hydrostatic Testing and Disinfecting Water Mains.

3.2 SETTING OF VALVES

A. Valves must be carefully installed in their proper positions, free from all distortion and strain, with mechanical or flanged joints, and must be packed and left in satisfactory operating condition.

3.3 SETTING OF VALVE BOXES

A. Valve boxes must be installed where shown on the drawings, or where ordered by the Commissioner, and must be set vertical and concentric with the valve box. Any valve box which has been moved from its original position by direct or indirect actions of the Contractor, so as to prevent the operation of the valve key extension, must be reset and/or replaced as applicable, by the Contractor. This work will be considered incidental to the construction and not considered for additional payment. Any valve key extension or stem, which has been damaged so that it is inoperable, must also be replaced, and will also be considered incidental to the construction and no additional payment will be allowed.

3.4 INSPECTION MANHOLES

A. Butterfly valves must be installed so that the side that allows adjustments and replacement of the rubber seat is accessible through the inspection manhole. For valves with seat rings on the disc, the valve must be installed so that when

the valve is closed, the seat rings are on the same side as the inspection manhole.

END OF SECTION 33 12 16

SECTION 33 12 17

WATER MAIN TAPPING CONNECTIONS AND VALVES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes the requirements for tapping iron and concrete water mains while maintaining the water main under line pressure without disrupting service to customers as shown on the drawings and specified here.

1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 03 30 00 – Cast-In-Place Concrete.
B. Section 33 11 13 – Ductile Iron Water Pipe and Fittings.

1.3 REFERENCES

A. ANSI A21.11 - Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings, latest edition.
B. ASME/ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, latest edition.
C. American Society for Testing and Materials (ASTM), latest edition:
    1. ASTM A126 - Gray Iron Castings for Valves.
    2. ASTM A240 - Stainless Steel for Pressure Vessels.
    3. ASTM A242 - High Strength - Low Alloy Structural Steel.
    4. ASTM A285 - Carbon Steel for Pressure Vessels.
    5. ASTM A351 - Castings for Pressure Containing Parts.
    6. ASTM A536 - Ductile Iron Castings.
D. AWWA C213 - Fusion Bonded Epoxy Coatings, latest edition.
E. AWWA C500 - Gate Valves for Water Supply, latest edition.
F. AWWA C550 - Standard for Protective Epoxy Interior Coatings for Valves and Hydrants, latest edition.
G. ANSI/AWWA-C110/A21.0 - Ductile Iron Flanged Fittings, latest edition.
H. MSS-SP60 - Connecting Flange Joint Between Tapping Sleeve and Valve, latest edition.

1.4 SUBMITTALS

A. Refer to Book I for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.

B. Provide an affidavit stating that tapping valves, tapping sleeves, and all appurtenances comply with all applicable provisions of the Drawings and the Specifications.

C. Provide manufacturer certified drawings (in triplicate) of the valves and sleeves that are proposed for the installation. The drawings must provide all necessary information regarding dimensions and materials used, including the tapping machine.

1.5 QUALITY CONTROL

A. The City reserves the right to make at any time such tests as it may deem proper to determine that the materials used are proper for the Work and that the sleeve and valve are of good mechanical construction. The manufacturer must provide authorized inspectors of the City free access to all places where sleeves and valves are being manufactured, furnish standard test specimens of materials specified for use, and access to testing facilities for testing material samples.

B. The Work necessary for direct tapping of iron or concrete pipe must be performed by a plumber licensed in the State of Illinois or the City. This Work may include, but not be limited to, the installation of tapping machinery and tapping of the pipe; the installation of tapping sleeves and taps; the installation of joint gaskets; the tightening of all gland nuts and bolts; and the tightening of continuity bolts, as applicable for the installation.

PART 2 - PRODUCTS

2.1 GENERAL

A. The tapping connection and valve must provide a branch connection at right angles to the existing water main being tapped without shutting down the main.

2.2 TAPS 12-INCH X 12-INCH AND SMALLER

A. The tapping connection must be the split sleeve, all stainless steel, full gasket type featuring low profile lugs with separate, replaceable bolts for assembly. All welds must be fully passivated to restore the original high corrosion resistance and appearance of the stainless steel. The sleeve sections must be connected with nuts and bolts, and must be designed to fit iron water pipe of the sizes as determined by field inspections. The inside diameter of the branch connection must be of full size so as to allow the free passage of a standard cutter.

B. The branch outlet of the sleeves (connection) must be either CF8 stainless steel per ASTM A351, type 304 stainless steel per ASTM A240, 125-

pounds drilling per ANSI B16.1, recessed for tapping valve per MSS-SP60, bonded flanged gasket.

C. All bolts and nuts must be type 304 stainless steel. Bolts must be separate, self-aligning, and replaceable. Nuts must be impregnated with anti-seizing lubricant. Integral bolts welded to the sleeve are not permitted.

D. The side flange gaskets for bolted sleeves to be furnished with each connection must be made of vulcanized natural or synthetic rubber.

E. The body of each connection must be stenciled with a range of pipe diameters that the connection will fit and also the diameter of the branch.

F. All sleeves shall be designed for 150-pounds per square inch working pressure rating.

2.3 TAPS LARGER THAN 12-INCH X 12-INCH

A. This tapping connection must be of the split sleeve, cast or ductile iron, mechanical joint end type, or the fabricated steel type with epoxy coating and stainless steel nuts and bolts. Sleeves must be sized to compensate for a normal amount of oversize and out-of-roundness in the pipe. In the mechanical joint type, the use of two (2) gaskets of different cross-sections to accomplish this will be acceptable. Supply all necessary mechanical joint accessories. The sleeve sections must be connected by means of bolts and nuts and must be designed to fit iron water pipe of the sizes as determined by field inspections.

B. The sleeve must be designed to fit Class "B" water pipe. The inside diameter of the branch connection must be full size so as to allow the free passage of standard cutters.

C. Sleeve Body

1. Mechanical joint type: must be gray cast iron conforming to ASTM A126 Class "B" or ductile iron conforming to ASTM A536.

2. Fabricated Steel type: Must be steel conforming to ASTM A285 Grade "C". A 10-mil minimum thickness of fusion-applied epoxy must coat the body. This epoxy coating must meet the requirements of AWWA C213.

D. The branch outlet of the sleeves must be flanged, 125-pound drilling per ASME/ANSI B16.1, and recessed for tapping valve as per MSS-SP60.

E. Bolts and Nuts

1. Mechanical joint type: High strength, low alloy steel conforming to ASTM A242 or stainless steel of the type 300 series Austenitic.

2. Fabricated steel type: Stainless steel 18-8 type 304.

F. All bolts must be separate, self-aligning, and replaceable. Stainless steel nuts must be impregnated with anti-galling lubricant.

G. Gaskets

1. Mechanical joint types: Side flange gaskets must be furnished with each connection.

2. Fabricated steel type: A minimum 7/8-Inch wide, recessed, BUNA-N gasket around the outlet.

H. The tapping sleeve must have a 3/4-Inch diameter bronze NPT test plug located in the branch outlet.

I. The body of the tapping sleeve must be stenciled with the range of pipe diameters the sleeve will fit and also the diameter of the branch.

J. All sleeves (30-Inches and less) shall be designated for 150-pounds per square inch working pressure rating.

K. All sleeves (greater than 30-Inches) shall be designated for 100-pounds per square inch working pressure rating.

2.4 TAPPING VALVES

A. The valves must be double-disc gate valves of a standard design and must open by turning in a **clockwise** direction.

B. Valves are subject to approval by the Commissioner and must conform to AWWA C500 for valves of sufficient strength to withstand 150-pounds working pressure. Body ring lugs must be cut out leaving an oversized circular waterway suitable for use with a standard sized cutter head.

C. Valves must have flange inlet by mechanical joint outlet. Furnish all accessories required for completing connections at both ends of the valve. The companion flange for the mechanical joint outlet must be designed to accept standard tapping machines.

D. Valve operating nuts must be 2 ½ -Inches square at the base of the nut.

E. The valve stem must show an ultimate tensile strength of not less than 60,000-pounds per square inch and a minimum elongation of 15% in 2-Inches.

F. The castings must be of gray iron conforming to ASTM A126 Class "B" and must be free from defects such as blow holes, blisters; cold shuts, cracks, etc. Castings must be true pattern, boldly filleted at angles, and free from flaws. Castings must not be filled or plugged in any manner.

G. All iron castings and all metallic parts of every assembled valve shall be coated inside and outside with a fusion bonded two-part epoxy coating in compliance with AWWA C550 standards. The outside must have a topcoat of two-part polyurethane similar in color to "black".

H. The diameter of the castings must not vary from the diameter given on the drawings by more than 0.08-Inch for castings 16-Inches or less in diameter, 0.10-Inch for 20-Inch and 24-Inch castings; 0.13-Inch for 30-Inch, 36-Inch, and 42-Inch castings; and 0.16-Inch for 48-Inch castings.

I. Tapping connections and valves found on inspection to contain defects, such as blowholes, shrinkage, slag holes, cold shuts, cracks, etc., will be rejected, removed from the Work area and replaced with tapping connections and valves that conform to this Section. This process will be considered incidental to the construction of the tapping connections and valves and no additional payment will be allowed.

J. Designs of sleeves to be utilized for use in tapping concrete pipe must be submitted for approval by the Commissioner for the particular pipe and circumstance for which they will be utilized.

2.5 FLANGES AND BOLTS

A. Provide flanged fitting on tapping saddle and provide Ductile Iron Blind Flange meeting ANSI/AWWA-C110/A21.0. Conform to Section 33 11 13 – Ductile Iron Water Pipe and Fittings. Class 125 rated for 250 psig working pressure.

B. Provide gaskets bolts, nuts and washers as required meeting requirements of Section 33 11 13 – Ductile Iron Water Pipe and Fittings.

2.6 CONCRETE ENCASEMENT

A. Provide concrete encasement as noted on the Plans as specified in Section 03 30 00 – Cast-In-Place Concrete. Concrete for encasement of water main and appurtenances must **NOT INCLUDE FLY ASH IN THE MIX**.

PART 3 - EXECUTION

3.1 TAPPING REINFORCED CONCRETE CYLINDER PIPE

A. Prior to tapping PCCP (Prestressed Concrete Cylinder Pipe) Mains in this work, coordinate with DWM (City of Chicago Department of Water Management) for isolation of each pipe section from system pressure using existing system isolation valves. Contractor may relieve pressure of isolated pipe section prior to tapping.

B. Coordinate with DWM details.

C. Tap reinforced concrete cylinder pipe to provide flanged outlets as follows: (Note: Reference CONSTRUCTION DETAILS FM-20 Sheets 1 of 5 to 5 of 5, AND FM-23; Appendix A)

1. Wire rubber gaskets (part #4; FM-20 sheet 1 of 5) under edges of saddle. Assemble saddle on concrete cylinder pipe (part #1, FM-20 sheet 1 of 5) with U-bolts (part #3, FM-20 sheet 1 of 5). Draw up saddle lightly against gaskets to seal space between saddle and pipe.

2. Pour mortar grout into space between saddle plate and pipe through grout holes (part #5, FM-20 sheet 1 of 5). After grout between saddle and pipe has taken its initial set, tighten saddle firmly against grout. Cut circumferential steel wires (part #7, FM-20 sheet 1 of 5) or rods away from outside of cylinder, even with edge of hole in saddle.

3. If area of cylinder to be tapped includes a longitudinal seam, carefully file weld down to sheet metal and fill recess with hot or cold solder.

4. For outlets larger than 12-Inches attach concrete lining of pipe to steel cylinder.

5. Place rubber gland gasket (part #8, FM-20 sheet 1 of 5) into groove of gland (part #9, FM-20 sheet 1 of 5). Insert gland through hole in saddle. Using studs and nuts (part #10, FM-20 sheet 1 of 5) pull gland toward the cylinder, compressing the gasket to make a watertight seal.

6. Place special blind flange on gland flange.

7. Fill outlet with water and apply pressure to check tightness of gland gasket. Remove blind flange.

8. For outlets with diameters 12-Inches and larger, wire form around outside of gland flange and saddle flange and pour mortar grout into space between flanges and between necks

of saddle and gland. Allow mortar to set-up before cutting. For outlets with diameters less than 12-Inches, this operation can be done after completing the cut.

9. Fill recess between inner end of gland and surface of cylinder with neat cement or mortar.

10. Attach tapping valve and tapping machine equipped with pilot drill and carbide tipped cutter. Drill and cut through cylinder and concrete pipe core. Retract drill and cutter, close valve, and remove tapping machine.

11. Encase all buried metal parts (saddle and U-Bolts) in 1:3 concrete or mortar mix with a minimum cover of 3 inches.

12. After placing the saddle and removing the outside concrete and circumferential reinforcement to expose the section of the core through which the tap is to be made, toggle bolts and stiffening ribs are installed under pressure.

13. Insert the toggle bolts, under pressure, as follows:

    Mount frame, shown as part #1, FM-20 sheet 2 of 5 on the details, firmly on the flange of the saddle. A gland (part #2, FM-20 sheet 2 of 5) with a corporation stop (part #3, FM-20 sheet 2 of 5) attached and jacking bolts (part #4, FM-20 sheet 2 of 5) are then mounted between the frame and the exposed steel cylinder. Jack the bolts against the frame to compress a rubber gasket between the gland and the steel cylinder and to hold the gland and corporation cock firmly in place. A standard drilling machine is then mounted on the corporation stop. With the corporation stop open, the drill is advanced through the stop and gland and a hole is then drilled through the steel and concrete core. After retracting the drill, the corporation is closed and the drilling machine removed.

14. A toggle inserting machine (part #5, FM-20 sheet 2 of 5) on the details, is then mounted on the corporation stop with a specially designed toggle bolt in place in the machine. A detailed sketch of the toggle bolt is shown on the details (FM-20 sheet 4 of 5). The machine is designed so that it will push the toggle bolt through the corporation stop, gland and core, pull it back engaging the toggles against the inner surface of the pipe and rotate the bolt so that it firmly tightens and holds the concrete core to the steel cylinder.

    Referring to Appendix A showing the details of the toggle bolt, and Appendix A, it will be noted that a conically shaped rubber stopper achieves the seal. The tightness of this seal is checked by a small

cock attached to the gland, (part #6, FM-20 sheet 2 of 5) on the details. Water stops coming out of the open cock when the seal is achieved. The conical pilot nut shown on the details helps center the toggle so that it will not "hang up" going through the hole in the core. The specially designed head of the toggle bolt allows it to be pushed, pulled, rotated, and released after the toggle bolt is tightened in place. Two (2) toggle bolts can be installed at each frame setting. As many toggle bolts can be placed as appear necessary to hold the concrete core. Two (2) have been found sufficient in 14-Inch, 20-Inch, 24-Inch, and 30-Inch taps; four (4) in ~~16~~ 36-Inch taps. Refer to FM-20 sheet 3 of 5.

15. After completing the installation of the toggle bolts, the stiffening ribs are installed. The ribs (part #7, FM-20 sheet 3 of 5) are circumferentially apposed as shown on the top view on the details. Each rib assembly consists of two (2) curved steel bars held parallel by one (1) or more welded steel cross members and they are curved to a radius-less than that of the outside of the cylinder so that they contact the cylinder only at their ends. Each rib is placed so that the two curved bars straddle a pair of toggle bolts, and two (2) screws (part #9, FM-20 sheet 3 of 5) on the details, passing through the clamp plates (part #8, FM-20 sheet 3 of 5) into holes threaded in the heads of the toggle bolts, hold the ribs tight to the cylinder.

D. The intent of the toggle bolts is to tie the concrete lining or sections of the concrete, if there is any cracking, to the cylinder so that the concrete portion of the core will be retracted with the steel cylinder portion of the core.

3.2 TAPPING IRON PIPE

A. Excavate and expose all iron pipes to be tapped and measure the outside diameter prior to ordering the taps. Install tapping connections per manufacturer’s instructions.

END OF SECTION 33 12 17

SECTION 33 12 19

FIRE HYDRANTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes requirements for supplying materials for and the installation of fire hydrants, as shown on the drawings and specified here.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:
   1. ASTM A108 - Standard Quality Carbon Steel Bars.
   2. ASTM A126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   3. ASTM A153 - Hot Dip Zinc Coating for Iron and Steel Hardware.
   4. ASTM A307 - Carbon Steel Bolts and Studs.
   5. ASTM A536 - Ductile Iron Castings.
   6. ASTM B62 - Composition Bronze or Ounce Metal Castings.
   7. ASTM B584 - Copper Alloy Sand Castings.
   8. ASTM B633 - Electrodeposited Zinc Coatings on Iron and Steel.
   9. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
   10. ASTM D395 - Test Methods for Rubber Property Compression Set.
   11. ASTM D412 - Test Methods for Rubber and Elastomers.
   12. ASTM D2000 - Classification of Rubber Products in Automotive Applications.
   13. ASTM D2240 - Durometer Test for Rubber Hardness.

B. AWWA C502 - Dry Barrel Fire Hydrants, latest edition.

C. Federal Specification FF-B-575C - Bolts; Hexagon and Square, latest edition.

D. Federal Specification RR-C 271D - Chains and Attachments, latest edition.

1.3 SUBMITTALS

A. Provide an affidavit from the manufacturer to attest to the fact that all hydrants furnished under this Contract were tested and proven hydrostatically tight and mechanically sound in accordance with the specified test procedures.

1.4 QUALITY ASSURANCE

A. After each hydrant is completely assembled, it must be mechanically and hydrostatically tested in conformance with AWWA C502, Sec 5.1.

B. **The Work performed for the hydrant installation must be performed by a plumber licensed in the State of Illinois or the City. The Work may include, but not be limited to, setting hydrants; joining all pipe, fittings, and valves; installation of joint gaskets and continuity wedges; and tightening of all gland nuts and bolts, as applicable for the installation.**

PART 2 - PRODUCTS

2.1 GENERAL

A. The hydrants must be of the City of Chicago standard design with mechanical joint bottom. The completed hydrants must be delivered finished, painted, and fully assembled.

2.2 FIRE HYDRANTS

A. The standpipe must include the manufacturer's name, year of manufacturing, and the letters "C.W.W." in letters 1-Inch high. This lettering must be positioned approximately 1 foot below the top flange.

B. Materials from which the various parts of the hydrants are constructed must be of the kind designated on the details. Each kind of material used must meet the requirements as to physical and chemical properties hereafter specified. Test bars required to established quality grade or strength under the ASTM standards must be made and machined by the manufacturer as part of the work.

C. 3/4-Inch x 2-3/4-Inch unfinished hex head machine bolts and 3/4-Inch American Standard regular hot press hex nuts must conform to Federal Specification FF-B-575C, Class B Steel, Class 1 fit or, hex head bolts and hex nuts must conform to ASTM A307 Grade A. All nuts and bolts to be hot dipped galvanized conforming to ASTM A153 or must be coated by the rust proof electrozinc process ASTM B633, Type G.S., or SS Type 18-8SS, ANSI Type 302, 303, or 304.

D. Iron castings must conform to ASTM A126 Class B. The thickness of metal castings, whose standard thickness is less than 0.8-Inch, must not be more than 0.08-Inch less than the standard thickness. The deficiency in thickness of castings, whose standard thickness is 0.8-Inch or more, must not exceed 10% of the standard thickness. The above allowable deficiencies in thickness must not extend over more than one-half of the area of any casting. The diameter of the castings must not vary from the standard dimensions by more than 0.08-Inch.

E. All bronze castings, with the exception of the stem nut, stem screw, and valve seats must conform to ASTM B62 for Leaded Red Brass Copper Alloy UNS No. C83600. The valve seat must conform to ASTM B584 for Leaded Manganese Bronze, Copper Alloy UNS No. C86700. The stem nut and stem screw must conform to ASTM B584 for Silicon Brass, Copper Alloy UNS No. C87600 with the following mechanical properties:

1. Minimum Tensile Strength - 45,000-psi

2. Minimum Yield Strength - 25,000 psi

3. Minimum Elongation - 16% of length

4. Brinell Hardness - 110

F. The stem nut and stem screw must be stamped SI for identification purposes.

G. Wrench nuts made of ductile iron must be marked “D.I.” on the flange portion opposite the arrow indicating the direction of turn to open.

H. Ductile iron castings must comply with compositions and physical properties in accordance with ASTM A536 Grade 65-45-12.

I. The City will furnish neoprene-seating valves if requested by the Contractor. The Contractor’s charges for transporting the neoprene seating valves must be considered incidental to the construction and no additional payment will be allowed.

J. Full face gasket of suitable material, 1/16-inch thick, 8 ½-inches X 13 ½-inches, with eight (8) 7/8-inch diameter holes on an 11 3/4-inch bolt circle must be provided for the hydrant flange gaskets.

K. Steel hydrant chain must comply with Federal Specification RR-C-271D (1), Type II, Class 2, with an approximate weight of 25-pounds per 100 feet, and have a hot galvanized coating. This chain, approximately 26-Inches long, must be connected to hydrant cap hooks and fastened at its center to the hydrant by means of the ½-Inch X 1-Inch cap screw with chain angle and "S" hook of ½-Inch mild steel stock "S" hook and cap hooks which engage the chain, must be securely welded in the closed position or fastened in a suitable manner to hold the hooks securely in a closed position.

L. Where the Plans call for finish and drilling, all such work must accurately comply with the dimensions shown, so that all parts are interchangeable from one hydrant to another. It will be the manufacturer’s responsibility to provide the patterns and gauges necessary to perform the work specified.

M. Where machining tolerances are not indicated on the drawings, the following must be used where applicable:

1. If dimension is in decimals, tolerance is ± 0.005-Inch.

2. If dimension is in inches, tolerance is ± 1/64-Inch.

N. Appropriate lubricant must be applied to threads on hydrant bottom, ½-Inch X 1-Inch cap screw and valve seat before assembly.

O. Operating stem must be of cold rolled steel, ASTM A108 Grade 1018. Stem must be coated, excluding bottom 3-7/8-Inch of the section below shoulder including threads, with a bituminous coating.

P. Rubber Gaskets must comply with ASTM D2000; Type SC-715B, as follows:

1. Shore A Durometer Hardness - 70 $\pm$ 5 ASTM D2240.

2. Tensile Strength - 1500-psi minimum ASTM D412.

3. Compression Set - 35% maximum ASTM D395.

Q. The City reserves the right to make at any time such tests as it may deem proper to determine that the materials used are proper for the work and that the hydrants are of good mechanical construction. The Contractor must give the authorized inspectors of the City free access to all places where hydrants are being made. At the City's request the manufacturer must furnish properly prepared standard test specimens of the materials used and must provide facilities for testing them.

R. Fire Hydrants that do not meet the requirements of this Specification will be rejected and, when so ordered by the City, the Contractor must remove all inferior hydrants not meeting the Specification and replace rejected items within the time limits as specified. The removal and replacement of the hydrants will be considered incidental to the construction and no additional payment will be allowed.

2.3 PAINT

A. All ferrous metal parts of the hydrant, inside and outside, must be thoroughly cleaned before coating. Coatings used on interior surfaces of the hydrant that are in contact with potable water must be suitable for contact with drinking water. Prepare hydrant surfaces and apply paint in accordance with paint manufacturer’s recommendations. Do not paint exposed hydrant nozzle threads or other useable threads.

B. Primer must be red oxide primer; acceptable products are W. C. Richards Metal primer #WRFA-13-127; or Benjamin Moore Universal Metal Primer # M07, or approved equal.

C. Top coat must be alkyd high-gloss enamel; acceptable Manufacturers / Products are Benjamin Moore Impervo #C13320 (Brilliant Red), or Sherwin Williams Industrial Enamel Safety Red #617-4064.

D. Paint for color coding flange must be as follows:

1. White colored pigment; acceptable products are Seymour Stripe #16-652 Spray (White), Rustoleum High Performance Acrylic 5200 System (#5292 Gloss White), or Sherwin Williams PM 200 AES Pure White #5178-99993, or approved equal.

2. Yellow colored pigment; acceptable products are Benjamin Moore Impervo #C133 Alkyd High-Gloss Metal and Wood Enamel (Safety Yellow), or Sherwin Williams Industrial Enamel Safety Yellow #617-4072, #617-8000, or #617-50320, or approved equal.

3. Blue colored pigment: accept products are Seymour Stripe #16-653 Spray (Precaution Blue), or Rustoleum High Performance Acrylic 5200 System (#5225 Safety Blue), or approved equal.

E. Shop Coating of Fire Hydrants.

1. Exterior ferrous surfaces of the hydrant must be painted with a coat of primer to two feet below the top flange.

2. Exterior ferrous surfaces of the hydrant must be given a topcoat of alkyd high-gloss enamel to two feet below the top flange.

3. All exterior ferrous surfaces below the ground line not coated with primer and topcoat must be shop coated with two (2) coats of asphaltic coating, each a minimum of 1 mil thick. The first coat must be allowed to dry thoroughly before applying the second coat.

2.4 HYDRANT DRAIN

A. Hydrant drains must be constructed of 6-Inch diameter, extra strength, perforated clay pipe, conforming to ASTM C700, with mortared bell and spigot type joints.

PART 3 - EXECUTION

3.1 GENERAL

A. Install fire hydrants and hydrant drain with drainage bedding, and connect to hydrant drain outlet as detailed on the drawings.

B. Securely connect fire hydrant to the water main using mechanical joint thrust restraint glands or other restrained joint fittings as shown on the drawings.

C. Pressure test the fire hydrant installation with full line pressure to the fire hydrant without blocking behind the fire hydrant.

D. Hydrant leads must be 8-Inches in diameter, or as otherwise specified or shown on the Plans.

E. Spool pieces are not allowed for the vertical adjustment of hydrants. If a vertical adjustment is required due to the depth of the water main, an offset must be utilized prior to installing the hydrant.

3.2 COLOR CODING HYDRANT FLANGES

A. Contractor must color code the vertical edge of the hydrants top flange, (located approximately 6-Inches from the centerline of the nozzle cap), on all installed hydrants in accordance with the Department's "Color Code for Fire Hydrants".

END OF SECTION 33 12 19

SECTION 33 12 20

WATER MAIN VALVE BASINS & METER VAULTS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes requirements for construction and/or adjustment of water main valve basins and meter vaults using precast concrete or masonry structures.

1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 31 23 10 – Excavation, Trenching and Backfilling.
B. Section 03 20 00 – Concrete Reinforcing.
C. Section 03 30 00 – Cast-In-Place Concrete.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete Reinforcement.
3. ASTM A197 - Standard Specification for Cupola Malleable Iron.
4. ASTM A536 - Standard Specification for Ductile Iron Castings.
5. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
6. ASTM C32 - Standard Specification for Sewer and Manhole Brick.
7. ASTM C55 - Standard Specification for Concrete Building Brick.
8. ASTM C139 - Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
9. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets
10. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
11. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
12. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
13. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants.

B. IDOT Standard Specification for Road and Bridge Construction (SSRBC), latest edition.

C. American Association of State Highway Transportation Officials, Standard Specifications for Highway (AASHTO), latest edition.

1.4 SUBMITTALS

A. Refer to Book I for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.

B. Shop Drawings: When not indicated on the Contract Drawings in sufficient detail or definition, submit detailed drawings of cast-in-place and precast concrete utility structures and related metal work.

C. Product Data: Submit manufacturers' product data for standard manufactured precast concrete sections and structures, for metal gratings and covers, and for other, related miscellaneous metal items.

D. Certification: Submit certification or other acceptable evidence that covers and grates to be provided for roadways and parking areas meet proof-testing requirements for AASHTO H-20 traffic loading.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE STRUCTURES

A. Fabrication standards - Circular precast concrete base and riser sections furnished for manholes, valve basins and other structures must conform to ASTM C478. Non-circular precast concrete monolithic and sectional structures for meter vaults, riser manholes and other structures must conform to ASTM C858.

B. Furnish riser sections in various heights, including an offset tapered section, as detailed on the Drawings, or as directed by the Commissioner.

C. Precast reinforced concrete flat slab tops for manholes must conform to ASTM C857, and be designed to accommodate a minimum AASHTO loading of H-20, unless directed otherwise by the Commissioner.

2.2 JOINT SEALANTS

A. Rubber gaskets must conform to ASTM C443.

B. Preformed butyl rubber flexible rope type gaskets must conform to ASTM C990.

2.3 ADJUSTING RINGS

A. Adjusting rings are to be precast concrete in conformance with ASTM C478.

B. Mating Faces:

1. Smooth

2. Parallel

3. Free from cracks, chips, spalls or casting irregularities interfering with watertight mating to structure top or casting.

4. Provide grooves in faces to contain extrudible preformed gasket material when possible.

2.4 CASTINGS

A. Iron castings are to be ductile iron castings conforming to ASTM A536, Grade 60-40-18, or gray iron conforming to ASTM A48, free from blowholes, shrinkage, cracks and other defects.

B. Allowance for shrinkage must be made in the patterns to meet the specified thickness. Frames and lids are to seat at all points.

C. Malleable castings are to conform to ASTM A197.

D. All castings are to be made accurately to dimensions shown on the plans, and planed, filed, or ground where otherwise necessary to secure flat and true surfaces.

2.5 STEPS

A. Steps are to be polypropylene plastic encased Grade 60 steel reinforcement conforming to ASTM C478.

2.6 CAST-IN-PLACE CONCRETE

A. Concrete in accordance with Section 03 30 00 – Cast-In-Place Concrete.

B. Concrete reinforcing in accordance with Section 03 20 00 – Concrete Reinforcing.

2.7 CONCRETE AND MASONRY BLOCKS AND BRICKS

A. Precast concrete brick must conform to ASTM C55 quality designated Grade N-1.

B. Clay brick must be best quality sewer brick conforming to the qualifications of ASTM C32, except where modified here.

1. Brick must be uniform, sound, hard burned, of compact texture, free from lime and cracks with a clear ringing sound when struck, whole and with edges full and square, and of standard dimensions.

2. Brick, when thoroughly dried and immersed in water for twenty-four (24) hours, must not absorb more than 15% by weight of water.

3. If in any load of brick more than 10% are inferior, the whole load is rejected.

4. If in any load of brick less than 10% are inferior, the brick is accepted provided the Contractor pulls out all inferior bricks, and immediately removes them from the Site of the Work.

2.8 MORTAR

A. Mortar for brickwork is to be composed of one (1) part Portland cement and two (2) parts screened sand.

1. Portland cement must conform to the requirements of Section 1001 of the SSRBC.

2. Sand must be class A quality and gradation FA-9 as specified in Article 1003.02 of the SSRBC.

B. The cement and sand must be proportioned by volume and thoroughly mixed in a tight box.

C. After the initial mixing, water is to be added gradually and the ingredients mixed until the mortar is of proper consistency. The amount of water must be no more than necessary to produce a workable, plastic mortar.

D. Prepare only a sufficient amount of mortar for immediate use and any mortar that has begun to set must not be retempered or used in any way in the Work

2.9 REINFORCING STEEL

A. Reinforcing steel in accordance with Section 03 30 00 – Cast-In-Place Concrete.

PART 3 - EXECUTION

3.1 GENERAL

A. Excavate, backfill and compact in accordance with Section 31 23 10 - Excavation, Trenching and Backfilling.

B. All brick must be thoroughly wetted immediately before being laid.

C. Old brickwork must be thoroughly cleaned and wetted before new work is jointed thereto.

D. No masonry work is to be done when the temperature is below 33º Fahrenheit unless otherwise approved, and then only under conditions for protecting it from frost.

3.2 PRE-CAST STRUCTURE INSTALLATION

A. Carefully place precast sections for all structures on prepared bedding so as to fully and uniformly support the structure and allow pipes to be laid to proper grade.

B. All lift holes on precast sections must be completely filled with mortar, smoothed on both inside and outside surfaces.

C. Seal joints between riser sections with approved mastic sealant or rubber gaskets, or as directed by the Commissioner.

D. Place one adjusting ring (only) on manhole top. Select thickness of adjusting ring to bring completed structure to required elevation.

E. Seal joints between adjusting rings and frames with approved mastic sealant before backfilling structures.

F. Install manhole frame and cover.

3.3 MASONRY STRUCTURE INSTALLATION

A. Install precast concrete or cast in place concrete base as shown on the Drawings.

B. Lay brick courses to the line, straight and parallel, breaking joints with those in adjacent courses.

C. Lay brick radially as headers in a full bed of mortar with joints not exceeding 3/8-Inch in thickness.

D. Fill joints with mortar. Interior joints must be trowel-struck.

E. Fresh masonry must be plastered inside and outside and must be protected from damage of all kinds.

F. New work, unless immediately covered with earth or brick backing, or an approved form of curing compound, must be kept moist until the mortar has hardened.

G. Install manhole frame and cover.

3.4 FINAL ADJUSTMENT OF STRUCTURES

A. After the base course and binder course have been placed, and prior to placing the surface course, the structures must be adjusted to match the final pavement elevation.

B. Remove the binder and base course adjacent to and for a distance not exceeding 12-Inches outside the base of the castings.

C. Adjust the castings to final pavement elevation with adjusting rings set in mortar.

D. Fill the space around the casting with Class SI concrete to the elevation of the surface of the binder course.

3.5 ABANDONMENT OF VALVE BASINS AND OTHER STRUCTURES.

A. Valve basins and other structures being abandoned, the Contractor must remove the existing frame and lid and return it the City as requested by the Commissioner. The remaining parts of the structure are to be removed to a depth of 36-Inches below grade and filled with fine graded aggregate or controlled low strength material (CLSM) flowable fill, as appropriate, or directed by the Commissioner. CLSM flowable material must meet standards specified in Section 31 23 10, “Excavation, Trenching and Backfilling”, paragraph 2.3, C of these specifications.

END OF SECTION 33 12 20

SECTION 33 13 00

HYDROSTATIC TESTING AND DISINFECTING WATER MAINS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes requirements for hydrostatic testing and disinfecting water mains as shown on the drawings and specified here.

1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Section 33 11 13 – Ductile Iron Water Pipe and Fittings.
B. Section 33 12 16 – Water Main Control Valves.

1.3 REFERENCES

A. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances, latest edition.
B. AWWA C651 - Disinfecting Water Mains, latest edition.
C. AWWA C509 - Resilient Seated Gate Valves for Water Supply Service, latest edition.

1.4 SUBMITTALS

A. Prior to starting work, furnish the Commissioner a detailed outline of the proposed sequence of operation. Include the manner of filling and flushing the water main, the method of disposing of the water flushed from the main, the hydrostatic testing procedure, the disinfecting procedure, relevant safety procedures and other relevant procedures to be used. Include the name of the Contractor that will be disinfecting the water main.

B. All submittals will be subject to review by the Water Quality Surveillance Section (WQSS) of the Department.

1.5 QUALITY ASSURANCE

A. Hydrostatic testing of water mains must be performed in accordance with AWWA C600 and the Department’s requirements specified herein. The disinfection of water mains must be performed in accordance with IEPA Regulations, AWWA C651, and the Department's requirements specified herein.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PRESSURE TESTING AND FLUSHING WATER MAINS

A. All flushing and pressure testing of water mains must meet the requirements of AWWA Specification C600.

3.2 TEST SECTIONS

A. New water pipe must be tested in sections isolated from the existing city water system. All existing valves must be tested to determine if they are water tight when in the closed position. If valves are not found to be water tight, they must be repaired or replaced before proceeding with the testing and chlorination procedure.

3.3 INITIAL FILLING

A. Each valved section of pipeline must be slowly filled with water. The test sections may be filled through the isolation valves via the test taps if they are available. Before applying the specified test pressure, all air must be expelled completely from the pipeline section to be tested. When venting air from the pipeline, it is important to limit the pipeline fill rate to avoid excessive surge pressures when the water reaches the air venting opening(s). When the pipeline has been filled, do not permit water to backflow into existing water mains.

3.4 PRELIMINARY FLUSHING

A. All new water mains, extensions, connections, and hydrant branches must be flushed prior to the hydrostatic testing so that water flows clear from all hydrants and test taps. The flushing operation must continue uninterrupted until the water flows clear. Flushing operations may be extended longer when directed by the Commissioner.

3.5 HYDROSTATIC TESTING

A. Setup

Water-pressure testing is the only method allowed for performing hydrostatic tests. Compressed-air testing methods are not permitted. Ensure that all air has been expelled after the preliminary flushing. Use a suitable pump connected to the existing water main system to apply the test pressure. Allow the pipeline to stabilize at the test pressure before conducting the hydrostatic test.

B. Testing

The test must subject the water main to a minimum hydrostatic pressure of 100 psi for a minimum period of two (2) hours. The minimum hydrostatic pressure is to be maintained at the highest point of the pipe in the test section. The test pressure may not vary by more than ±5 psi for the duration of the test. Test pressure is to be maintained within this tolerance by adding makeup water into the pipeline through the pressure test pump. The amount of makeup water added must be accurately measured in gallons (accurate to two decimal places) by suitable methods.

C. Allowable Makeup Water

The amount of makeup water added during the test must not exceed the amount calculated using the following equations:

$$L = \frac{S \times D \times T \times \sqrt{P}}{148000} \qquad \text{Equation 1}$$

L = allowable makeup water, gallons
S = length of pipe tested, feet
D = nominal diameter of pipe tested, inches
T = duration of the test, hours
P = average test pressure, pounds per square inch (gauge)

When testing against closed metal-seated valves, additional makeup water is allowed per valve, as follows:

$$L_V = D \times T \times .0078 \qquad \text{Equation 2}$$

L_v = allowable makeup water per metal-seated valve, gallons
D = nominal diameter of valve, inches
T = duration of the test, hours

For a 1,000' section of pipe tested for 2 hours at 100 psi against one closed metal-seated valve, the allowable makeup water is equal to:

Table 1
Allowable Makeup Water per 1,000 feet of Pipe, gallons
Tested at 100 psi for 2 hours

Nominal Pipe Diameter									
8"	12"	16"	24"	30"	36"	42"	48"	54"	60"
1.21	1.81	2.41	3.62	4.52	5.43	6.33	7.24	8.14	9.04

D. Visual Examination

Any and all exposed pipe, fittings, valves, hydrants, and joints must be examined carefully during the pressure test. Any damaged or defective pipe, fittings, valves, hydrants, or joints that are discovered during or following the pressure test must be repaired or replaced with reliable material. All visible leaks are to be repaired regardless of the allowance used for testing.

E. Acceptance

Hydrostatic testing is to be repeated until all visible leaks are repaired and the amount of makeup water used is below the allowable amount. After all visible leaks have been repaired, acceptance will be determined on the basis of allowable makeup water only. If any test of a new pipeline discloses a small amount of makeup water greater than that specified above, repairs or replacements are to be accomplished in accordance with the contract documents or directed by the Commissioner.

3.6 SECONDARY FLUSHING

A. After each test section has satisfactorily passed the hydrostatic pressure test, a secondary flushing must be performed. The secondary flushing must be performed before the pipeline is disinfected. The Contractor must give a minimum forty-eight (48) hour notice to the Commissioner before performing the secondary flushing procedure.

B. For water mains the test section must be flushed at a minimum velocity of 2.5 feet per second until the water flows clear. Flushing operations may be extended longer when directed by the Commissioner.

3.7 DISINFECTING WATER MAINS

A. After the secondary flushing has been completed and the water flows clear from the pipeline being tested, the water main must be disinfected. The disinfection procedure must be performed by a Contractor qualified to conduct such work. The Water Quality Surveillance Section (WQSS) of the Department of Water Management will observe the disinfection procedure.

3.8 FINAL FLUSHING

After completion of the chlorination process, the chlorination water must be thoroughly flushed from all pipelines. The water main must be flushed until the water flows clear and has representative distribution system chlorine residual as determined by the WQSS of the Department.

3.9 SAMPLING

When the WQSS of the Department has determined that the pipeline is ready to be sampled, the samples are to be collected under the direction of the WQSS. The samples are tested for bacterial content before the pipeline can be approved for service.

3.10 APPROVAL

Final approval of the water main rests with the WQSS of the Department.

3.11 DISPOSAL OF FLUSHING WATER

For all types of flushing, limit flow rates to existing City sewers as specified in Section 01 11 00 – Summary of Work of this specification.

3.12 SAFETY

The Contractor must have sufficient equipment to properly carry out the hydrostatic testing and disinfecting operations and have the necessary safety equipment on hand; including a Chlorine Institute Emergency Kit "A" and self contained breathing apparatus. Failure to provide such equipment will be cause for not allowing the disinfection operation to be performed.

3.13 CONTRACTOR RESPONSIBILITY

The Contractor must have overall responsibility for hydrostatic testing, disinfecting, and sampling. The Contractor must provide all the necessary personnel to: assist in the disinfection operation; perform the final flushing operation; and assist the WQSS of the Department in the water sampling. The Contractor must be responsible for guaranteeing that sufficient and necessary sanitary precautions are taken during construction to ensure approval of the main for service.

3.14 DISINFECTION PROCEDURES WHEN CUTTING INTO OR REPAIRING EXISTING MAINS

Swab pipe and fittings that will not be pressure tested or chlorinated with chlorine solution during installation and use extra precaution to prevent soil and debris from entering the pipe. Incorporate untested pipe into the flushing routine when possible. When connecting new pipe to the existing water system, use operating pressure to visually inspect for leaks. When feasible, perform inspection prior to backfilling. Comply with all standards and requirements of the WQSS of the Department.

END OF SECTION 33 13 00

APPENDIX A

CONSTRUCTION DETAILS

DETAIL NO.	DETAIL NAME	NO. OF PAGES
GENERAL:		
G-1	PROJECT SIGN	1
G-2	TRAFFIC CONTROL NOTES	1
G-4	PLAN LEGEND	2
WATER MAIN:		
D-1	CHICAGO FIRE HYDRANT DETAIL	8
D-2	FIRE HYDRANT SETTING DETAIL	1
D-5	FIRE HYDRANT DRAIN DETAIL	1
D-7	COLOR CODE FOR FIRE HYDRANTS	1
D-8	WATER MAIN TRENCH PHASE DETAILS	1
D-9	WATER MAIN TRENCH INSULATION DETAIL	1
D-10	WATER MAIN POLYETHYLENE WRAP DETAIL	1
D-11	THRUST RESTRAINT CONCRETE THRUST BLOCK DETAILS	1
D-12	THRUST RESTRAINT RESTRAINED JOINT PIPE DETAILS	1
D-13	PRECAST VALVE BASIN	1
D-15	FRAME & LID	1
D-16	TYPICAL 1" & 2" WATER SERVICE	1
D-18	CASING PIPE UNDER RAILROAD TRACK DETAIL	1
D-20	GENERAL NOTES WATER MAIN CONTRACTS	2
D-22	BUMPER GUARD DETAIL	1
D-28	ELECTRICAL CONTINUITY BRACKET FOR TRANSITION COUPLING	1
D-31	SERVICE PIPE INSULATION DETAIL	1
D-50	SEWER CROSSING DETAIL	3
D-51	WATER MAINS CROSSING OVER SEWERS AND HOUSE DRAINS SPECIAL REQUIREMENTS	2
FEEDER MAIN:		
FM-1	INSPECTION MANHOLE	1
FM-2	INSPECTION MANHOLE INSTALLATION REPLACE PIPE	2
FM-4	PITOMETER TAP BASIN PRECAST CONCRETE	1
FM-5	FIRE HYDRANT SETTING 16" & LARGER WATER MAIN	1
FM-12	PIPE REPLACE INSTALLATION	1
FM-20	CONCRETE PIPE TAPPING CONNECTION	5
FM-23	TEST TAP DETAIL [CONCRETE PIPE]	1

APPENDIX A

CONSTRUCTION DETAILS

DETAIL NO.	DETAIL NAME	NO. OF PAGES
RESTORATION:		
R-2	PAVEMENT RESTORATION DETAIL FOR RESIDENTIAL STREETS	1
R-3	PAVEMENT RESTORATION DETAIL FOR ARTERIAL STREETS	1
R-4	PCC PAVEMENT	1
R-5	PCC BASE COURSE WITH HMA BINDER AND SURFACE COURSE	1
R-8	SPEED HUMP	3
R-13	RECONSTRUCTION/ ADJUSTMENT OF MASONRY UTILITY STRUCTURE	1
R-14	PRECAST UTILITY STRUCTURE ADJUSTMENT	1
R-15	TEMPORARY BITUMINOUS RAMP FOR UTILITY STRUCTURES	1
R-18	PAVEMENT MARKING DETAILS	3
R-19	SHORT TERM PAVEMENT MARKING LETTERS AND SYMBOLS	1
R-20	CABLE BRIDGING OF CUT RAILS (WHERE RAILS CANNOT BE RE-USED)	1
SEWER:		
A-4	TYPICAL DRAIN CONNECTIONS FOR EXISTING DRAINS – (V.C.P.)	1
A-21	STANDARD INLET – 2FT. DIA	1
A-23	STANDARD CATCH BASIN – 4FT. DIA	1

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NOTES:

1. TWO SIGNS (ONE ON EACH END OF EACH PIPE PROJECT) MUST BE DISPLAYED FROM THE TIME CONSTRUCTION BEGINS TO THE TIME THAT PAVEMENT IS RESTORED.
2. THE LOCATION OF THE SIGN WILL BE DETERMINED FOR THE RESIDENT ENGINEER.
3. AFTER THE COMPLETION OF THE CONTRACT THE SIGN WILL BE PROPERTY OF THE CITY OF CHICAGO AND MUST BE DELIVERED TO THE APPROPRIATE DISTRICT YARD UNLESS ORDERED TO DISCARD BY THE COMMISSIONER.

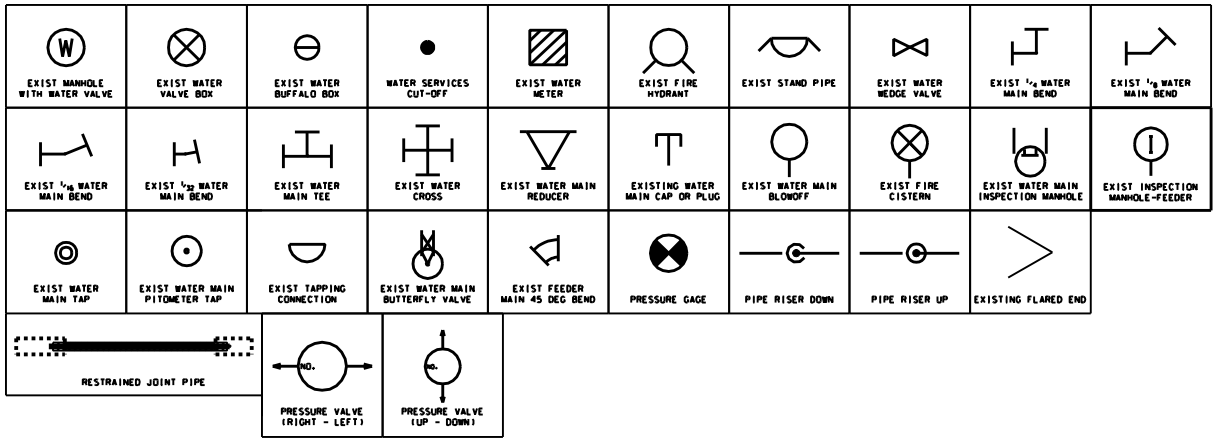
GENERAL NOTES:

1. Whenever possible confine the work site on a two lane street or highway to one traffic lane leaving the opposite lane open to traffic.
2. Whenever possible, park work vehicles on the same side of the street as the job site.
3. Work vehicles may be used as an additional barricade with the flasher light lit but not as a substitute for any work area protection which may be called for.
4. Under certain field conditions such as hills, crossroads, curves, driveways, etc. the spacing of work area protection must be adjusted as necessary.
5. All employees working on the job site along highly traveled roads must wear high visibility vests as requested by the OSHA Act.
6. Flaggers must wear high visibility vests when directing traffic.
7. Flaggers must use the proper traffic control sign when directing traffic.
8. When two flaggers are necessary, they must be in direct communication with each other at all times either by sight or radio communication.
9. When there is no work in progress and the flagger is not required, the "FLAGGER SYMBOL" sign must be removed.
10. Remove all signs or traffic control devices that do not apply to existing conditions i.e. if no work is being performed, the warning signs must be either taken down or covered.
11. When openings in or near the sidewalk are necessary, barricades must be properly placed so that anyone passing by would not inadvertently fall into the excavation. Safety fence may also be appropriate.
12. All excavations that present a hazard or must be left open overnight must be properly barricaded for the protection of the public.
13. The sides of barricades facing traffic must have retroreflective rail faces.
14. All traffic controls shall meet the requirements of CDOT.

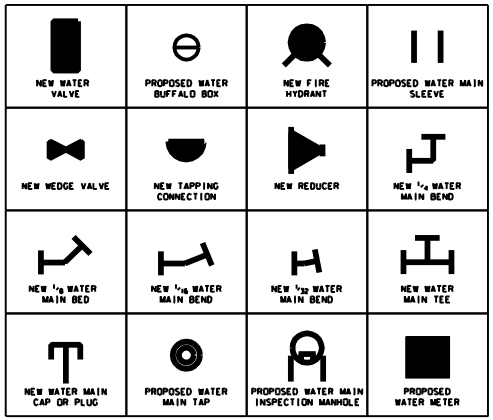
REV:06.07

LEGEND - SYMBOLS

EXISTING WATER SYMBOLS



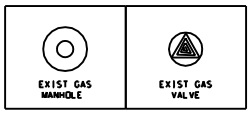
PROPOSED WATER SYMBOLS



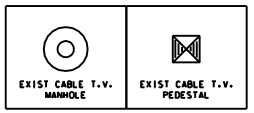
SEWER SYMBOLS



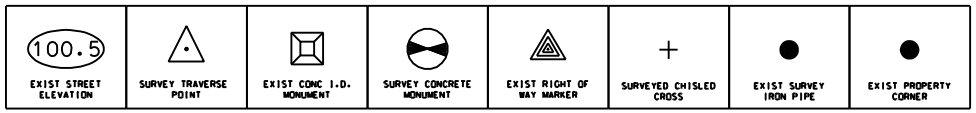
GAS SYMBOLS



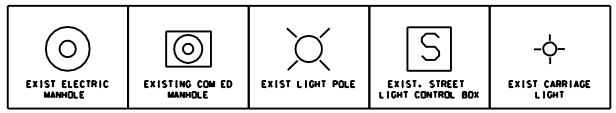
CABLE T.V. SYMBOLS



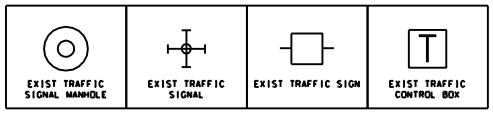
SURVEY SYMBOLS



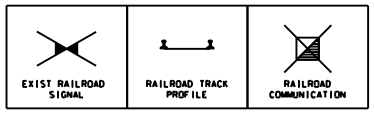
ELECTRICAL SYMBOLS



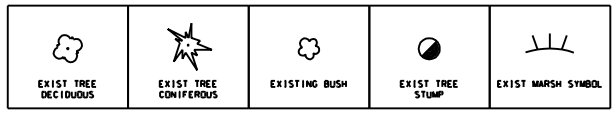
TRAFFIC SYMBOLS



RAILROAD SYMBOLS



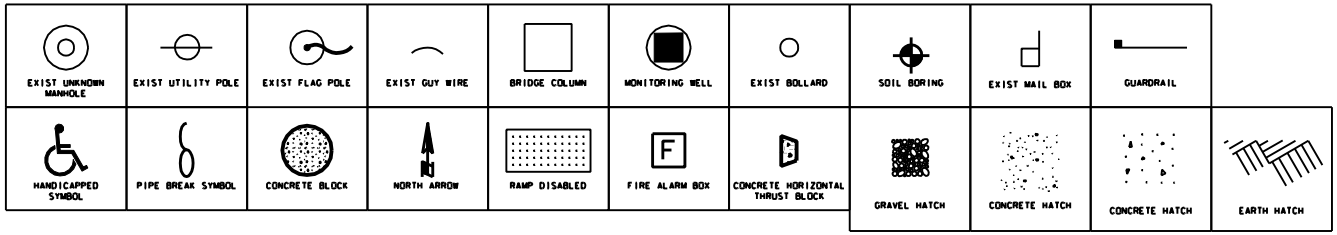
VEGETATION SYMBOLS



TELEPHONE SYMBOLS



MISCELLANEOUS SYMBOLS



G-4

SHT. 1 OF 2

REV:06.07

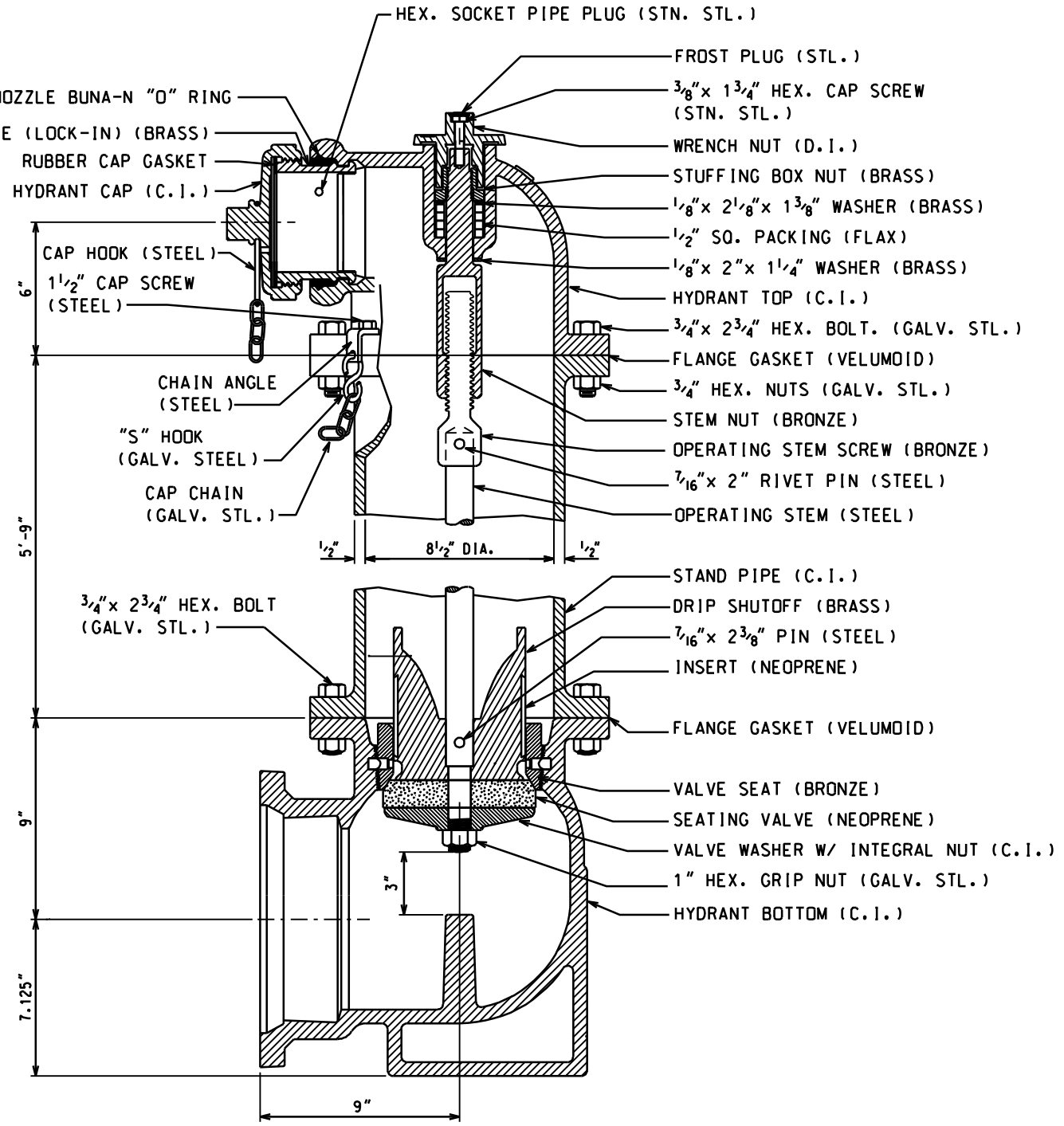
LEGEND - LINE STYLES

SYMBOL	DESCRIPTION
	Existing-Water Main
	Existing-Water Services
	Proposed-Water Main
	Proposed-New Water Services WM to B-Box
	Proposed-New Water Services B-Box to Property
	Proposed-Water Main (By Others)
	Abandoned-Water Main
	Existing ROW
	Existing ROW (Vacated)
	Existing ROW (Elevated)
	Existing-Easement
	Proposed-ROW
	Existing-City Limits Boundary Line
CPD	Existing-Chicago Park District Line
CTE CTE	Existing-City Electric
COM ED	Existing-ComEd
CBL	Existing-Cable TV
TEL	Existing-Telephone
SEWER	Existing-Sewer
	Proposed-Sewer
	Proposed-Sewer Lateral
	Existing-Sediment Force Main
	Proposed-Sediment Force Main
10" SEWER	Abandoned-Sewer
DEAD GAS	Abandoned-Gas
GAS	Existing-Gas

SYMBOL	DESCRIPTION
	Existing-Curb
	Existing-Sidewalk
	Existing-Ditches-Creeks-Edge of Water
	Existing-Edge of Pavement
	Existing-Embankments-Dead Ends-Retaining Walls
X X X	Existing-Fence
CTA	Existing-CTA Buried Electric Cables
	Existing-Railroads
BURIED TRACKS (DIMENSIONS UNKNOWN)	Existing-Buried Street Car Tracks
	Existing-Steam and Cooling Pipes
CTP	Existing-City Press Electrical
	Existing-Hedge Line
	Existing-Woods Tree Line
	Proposed-Curb
	Proposed-Sidewalk
	Proposed-Ditches-Creeks-Edge of Water
	Proposed-Pavement

G-4

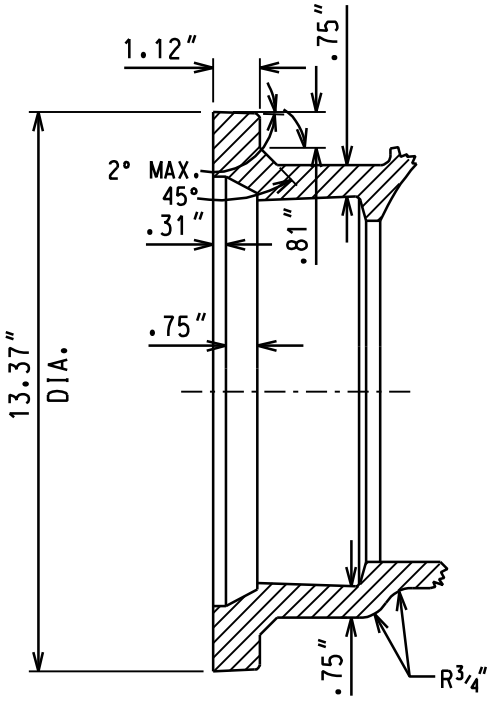
SHT. 2 OF 2



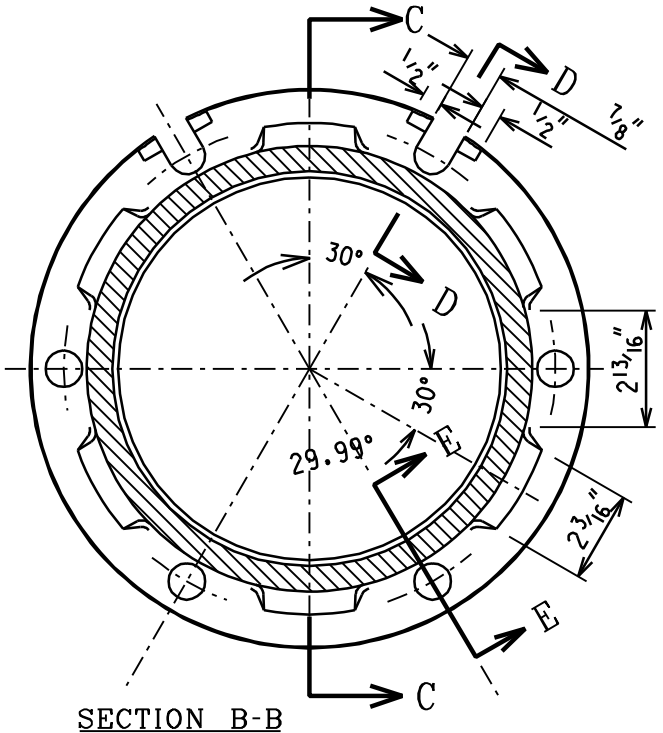
CROSS-SECTIONAL VIEW

NOTE:

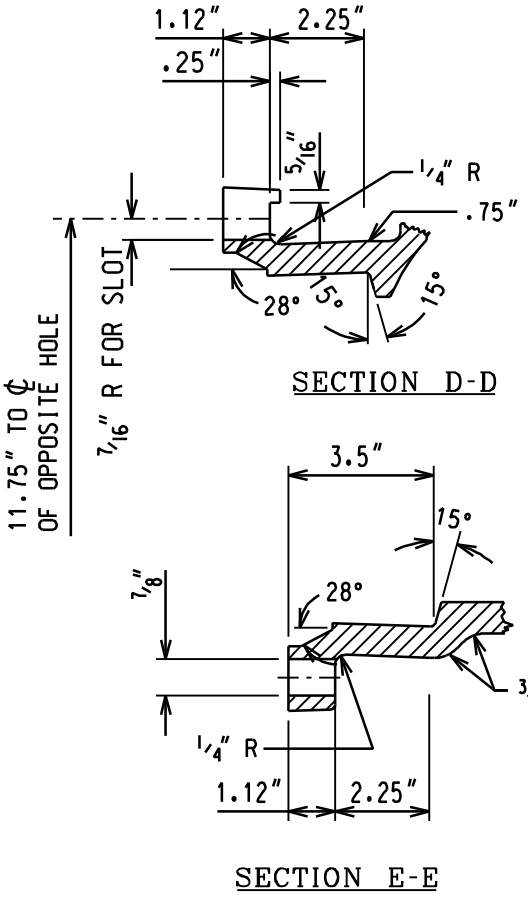
1. TOP CASTING IS TURNED 45° FROM TRUE POSITION IN SECTIONAL VIEW.



SECTION C-C

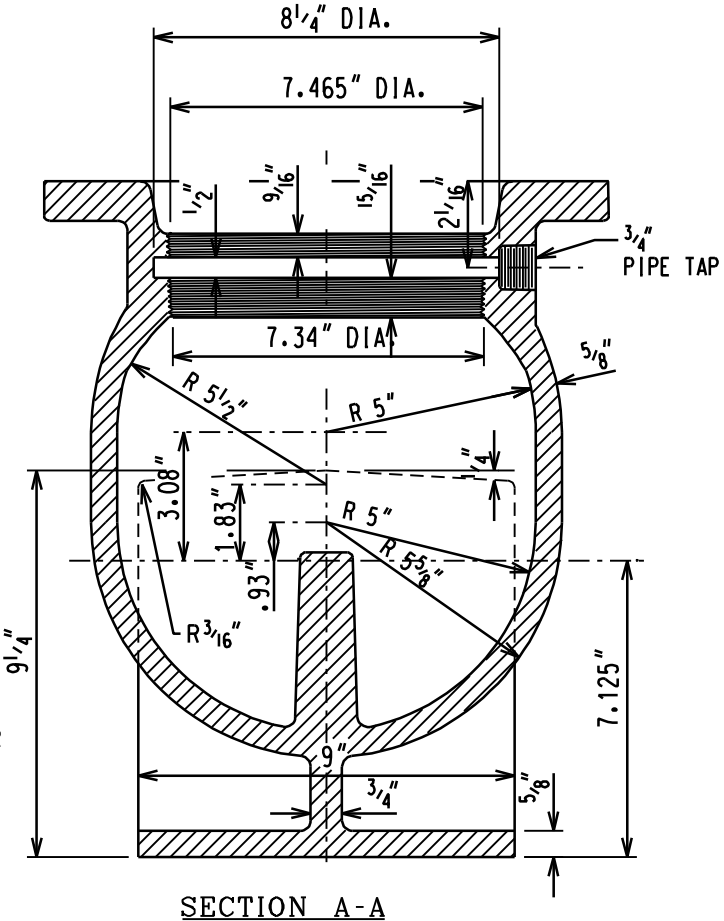


SECTION B-B



SECTION D-D

SECTION E-E



SECTION A-A

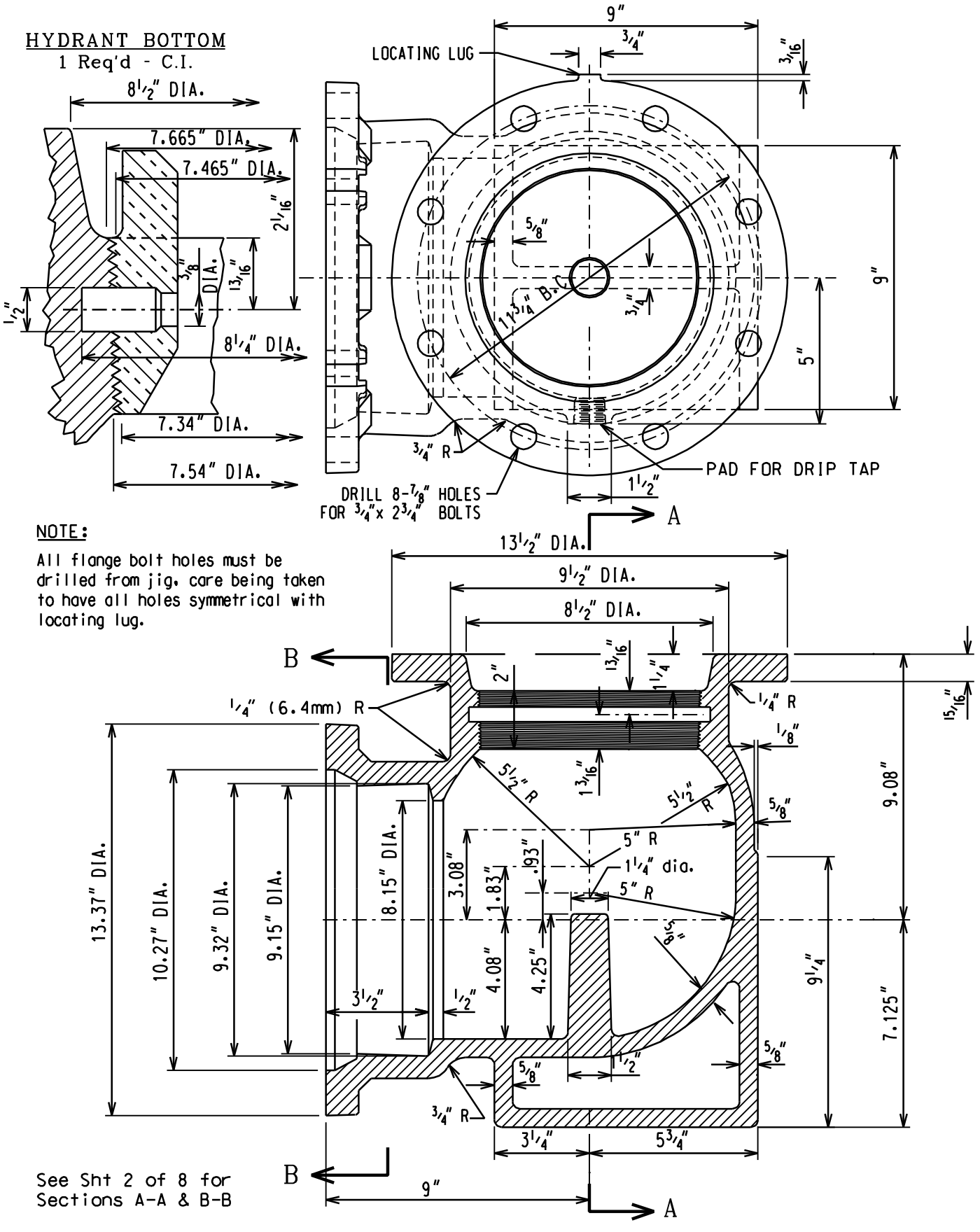
HYDRANT BOTTOM

REV:04.07

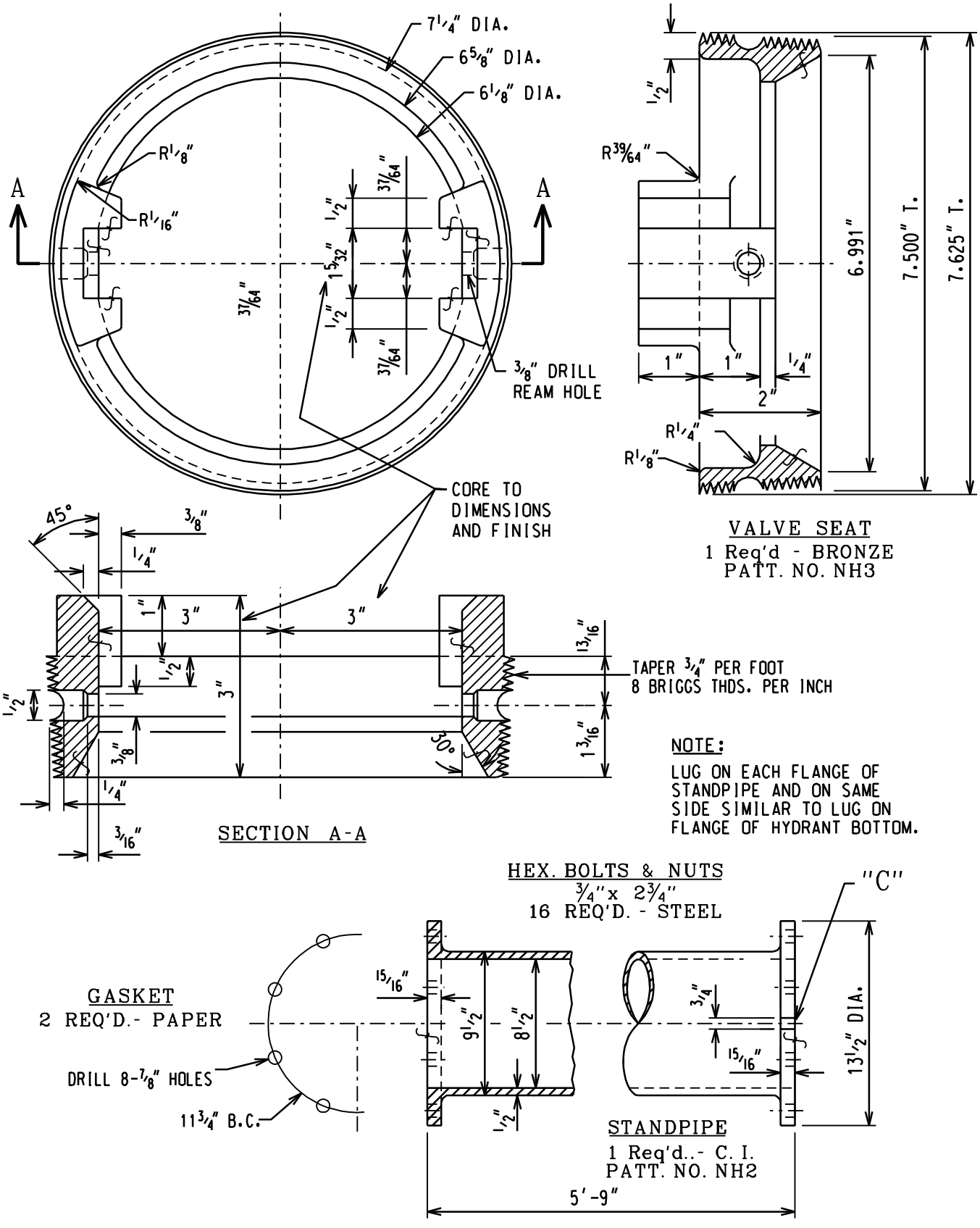
CHICAGO FIRE HYDRANT DETAIL

D-1

SHT. 2 OF 8



HYDRANT BOTTOM

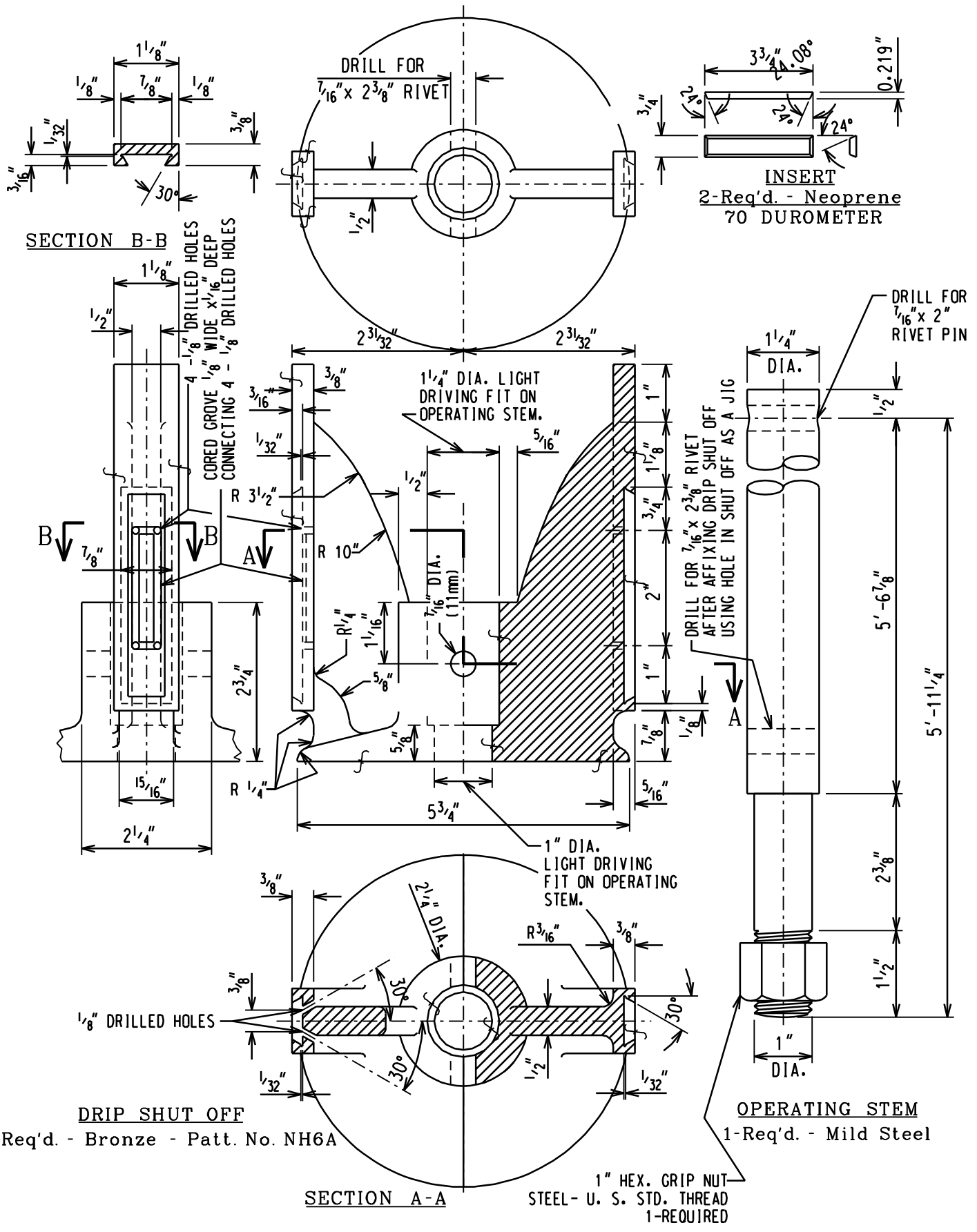


VALVE SEAT, STANDPIPE & GASKET

REV:04.07

CHICAGO FIRE HYDRANT DETAIL

D-1

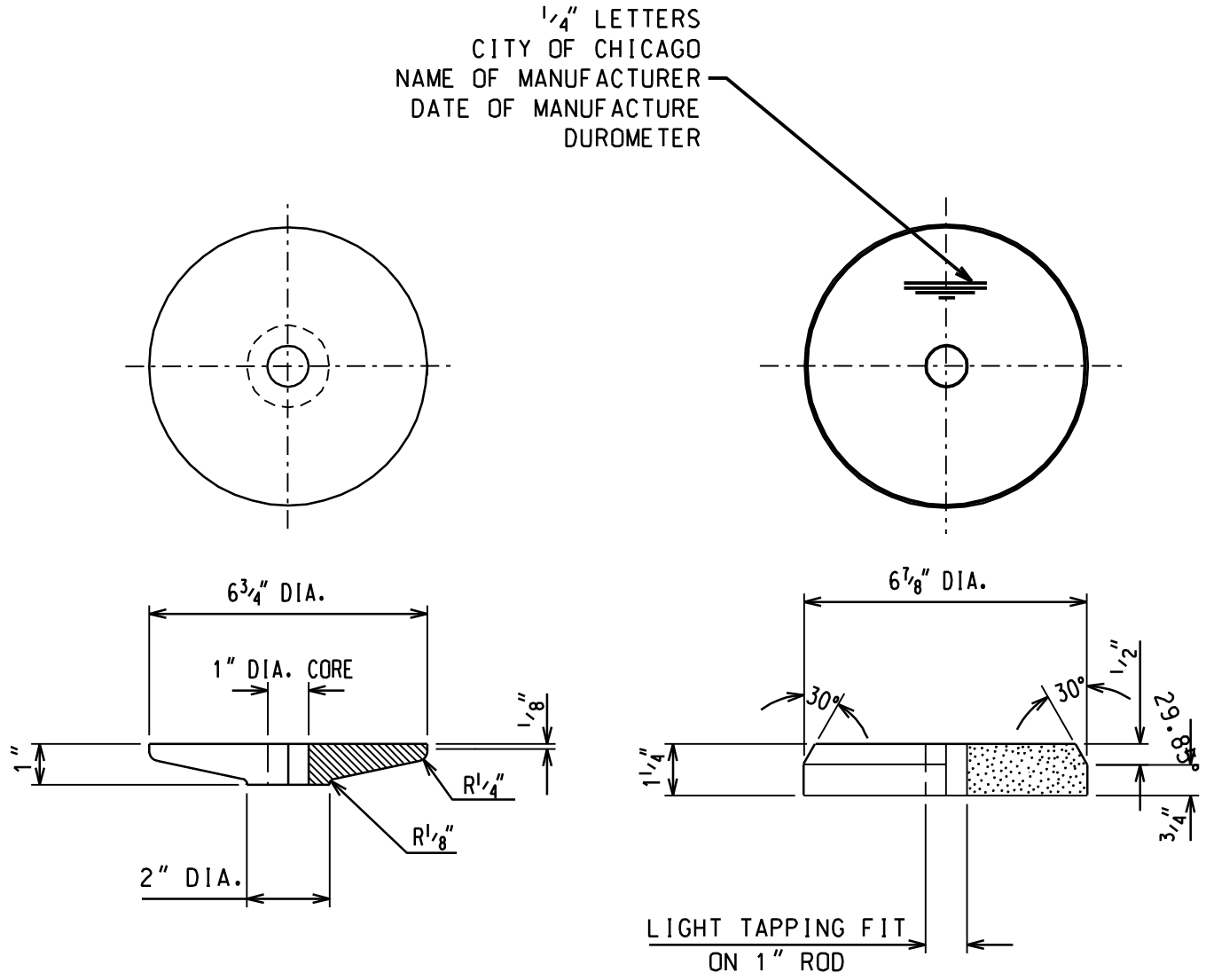


DRIP SHUT-OFF & OPERATING STEM

REV:04.07

CHICAGO FIRE HYDRANT DETAIL

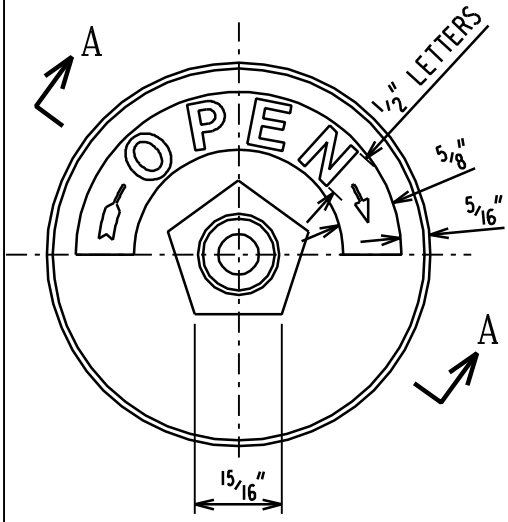
D-1



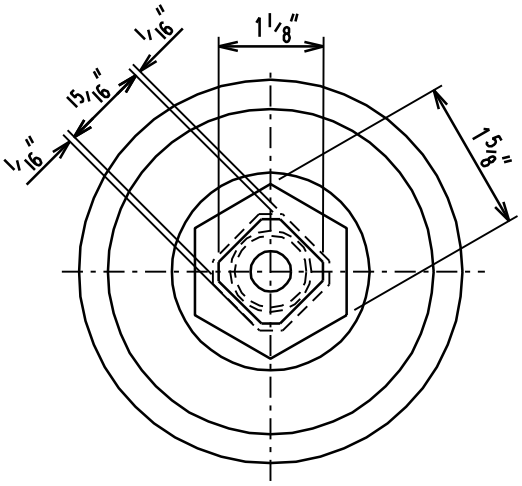
VALVE WASHER-CAST IRON
PATTERN NO. NH 10 - 1 REQUIRED

SEATING VALVE - NEOPRENE
1 - REQUIRED
80 DUROMETER

VALVE WASHER & SEATING VALVE



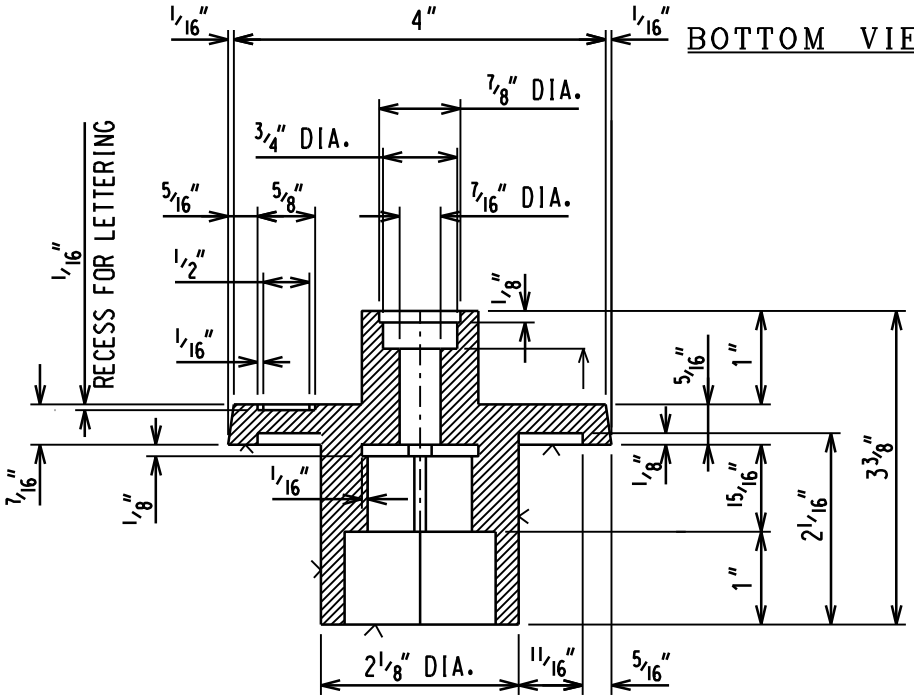
TOP VIEW



BOTTOM VIEW

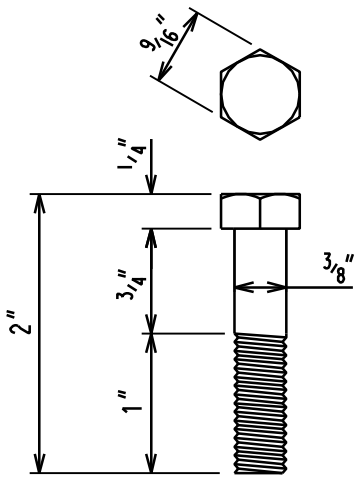
NOTE

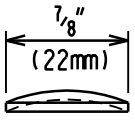
LETTERS SHALL BE 1/2" HIGH GOTHIC. RAISED 1/16" FROM A 1/16" RECESS AS SHOWN IN SECTION A-A



SECTION A-A

SPECIAL WRENCH NUT - DUCTILE IRON
PATTERN NO. NH7B - 1 REQUIRED



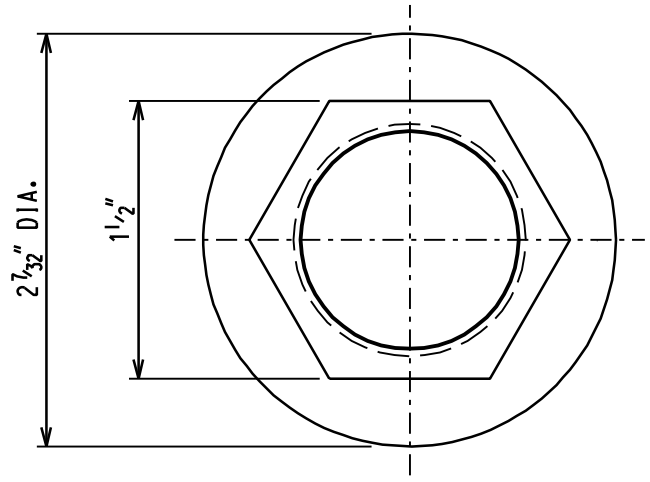


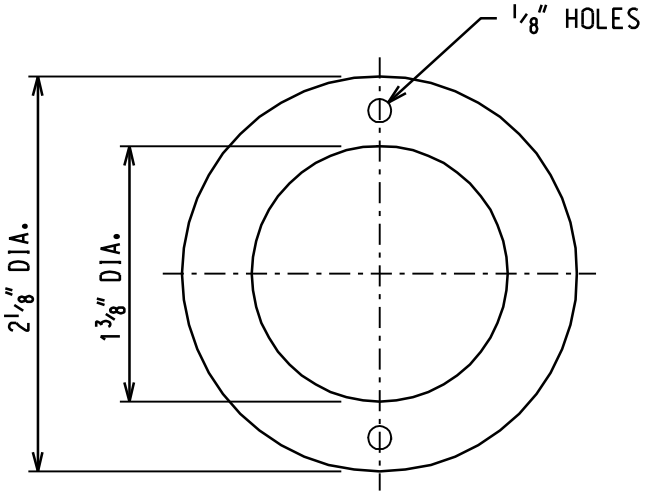
CAP SCREW-STAINLESS STL.
HEX. HEAD TYPE 300 SERIES

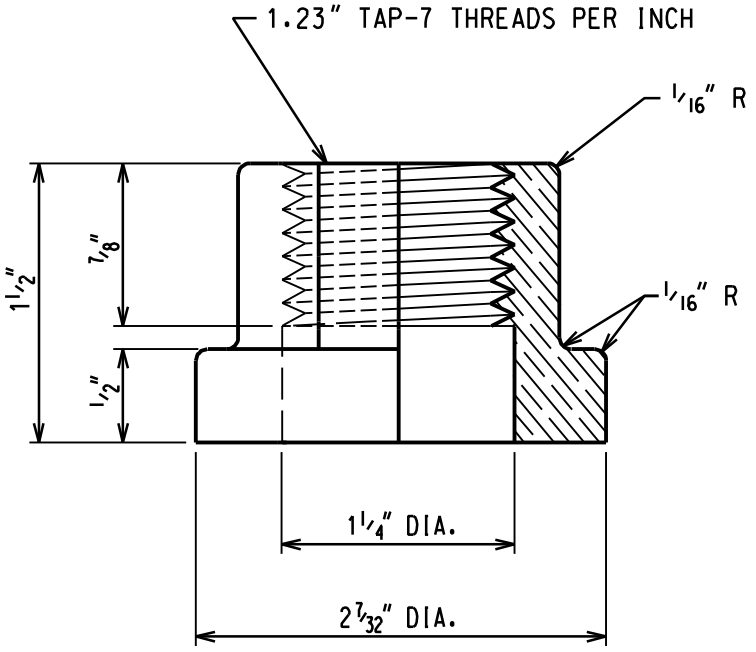
1-Req'd.

FROST PLUG - STAINLESS STEEL
7/8" STANDARD - REQ.

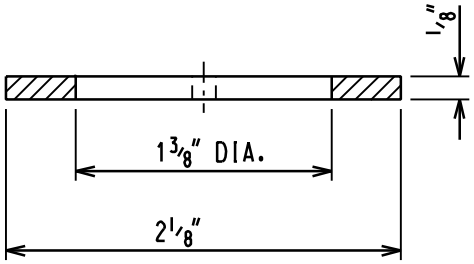
SPECIALTY WRENCH NUT, CAP SCREW & FROST PLUG DETAILS





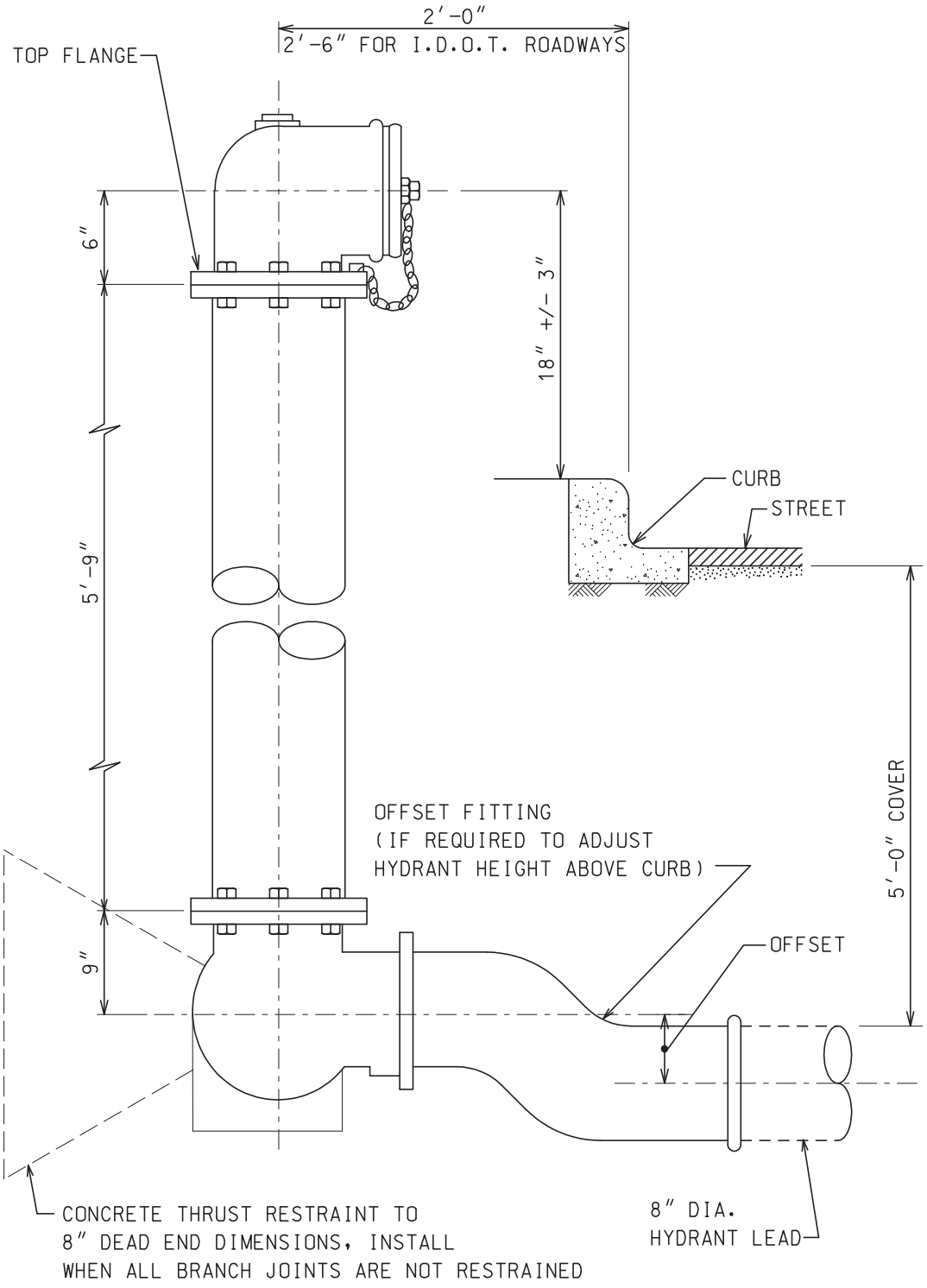


STUFFING BOX NUT - Bronze
PATTERN NO. NH 8 - 1 Required



WASHER - Brass
1 Required

STUFFING BOX NUT & WASHER DETAILS



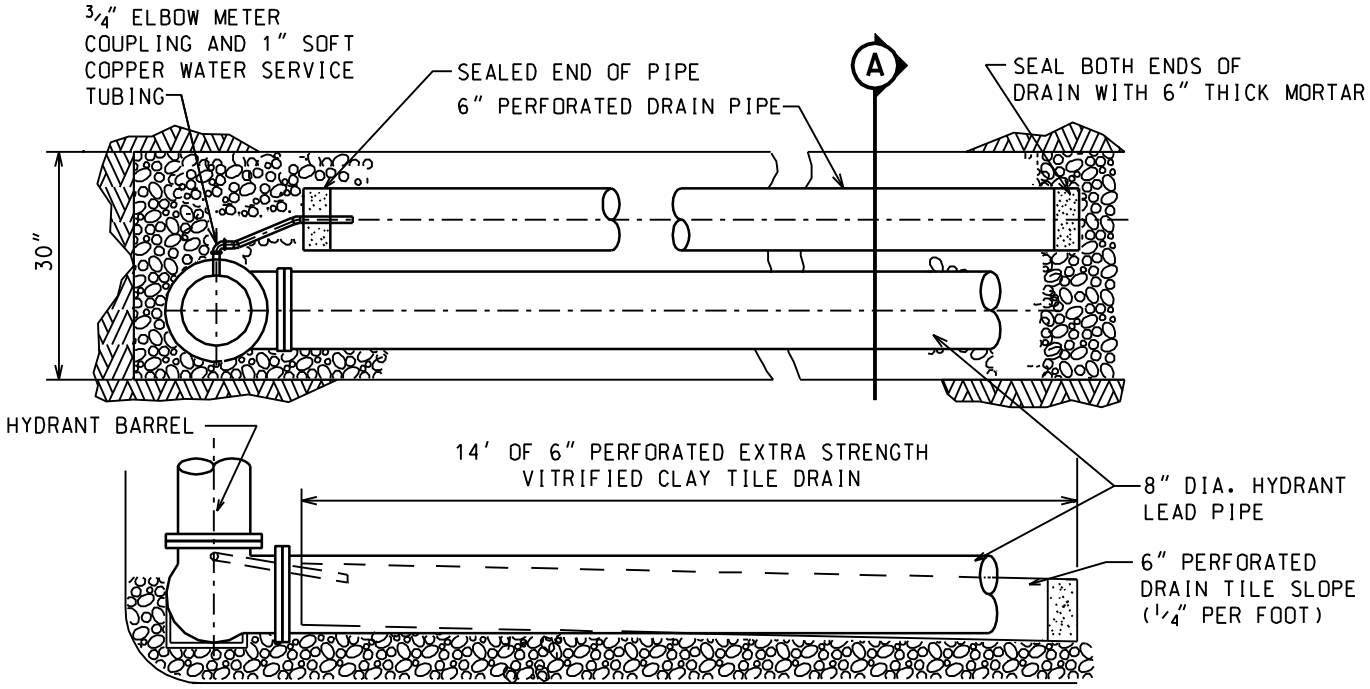
NOTE:

1. SEE FIRE HYDRANT DRAIN DETAILS.
2. ALL BURIED DUCTILE IRON HYDRANT COMPONENTS MUST BE WRAPPED IN POLYETHYLENE ENCASEMENT.
3. SEE DETAIL D-5 FOR FIRE HYDRANT DRAIN ASSEMBLY
4. THE TOP AND FACE OF THE CURB ARE TO BE PAINTED 'SAFETY YELLOW' FOR 15 FEET EACH SIDE OF THE FIRE HYDRANT, EXCEPT WHERE THE 15 FOOT DIMENSION INTERSECTS A CROSSWALK, DRIVEWAY OR SIMILAR FEATURE.

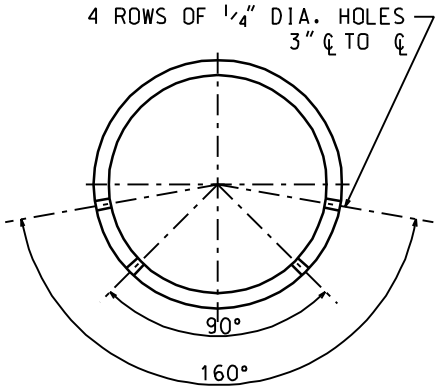
REV:06.10

FIRE HYDRANT SETTING DETAIL

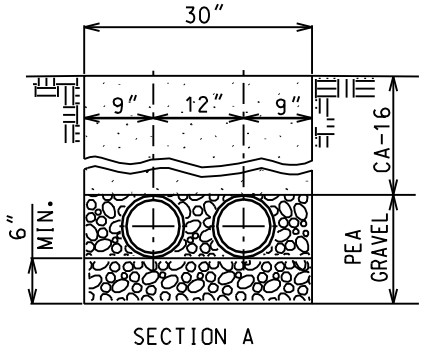
D-2



LAYING CONDITION



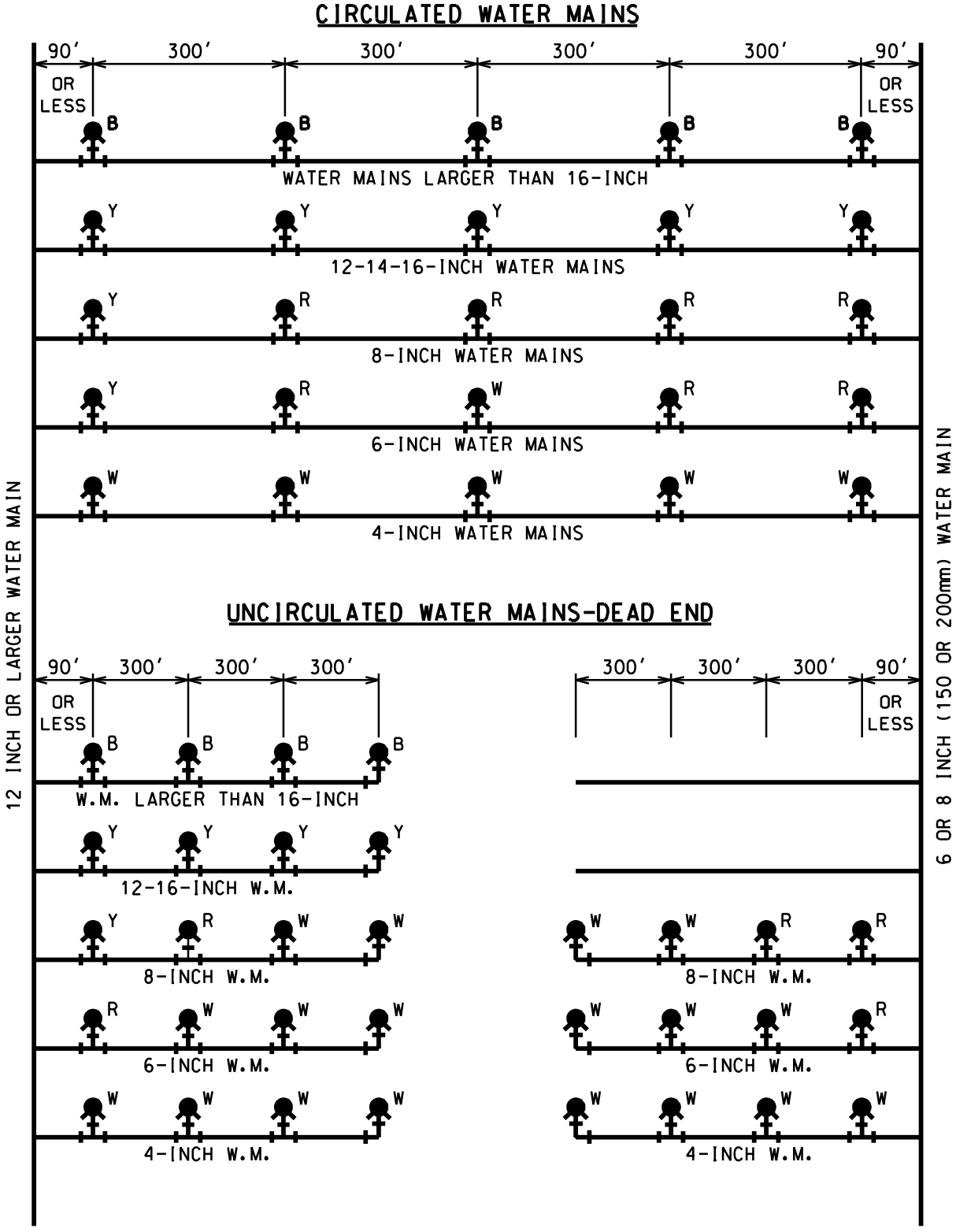
DETAIL "A"
DRAIN TILE DRAIN HOLES



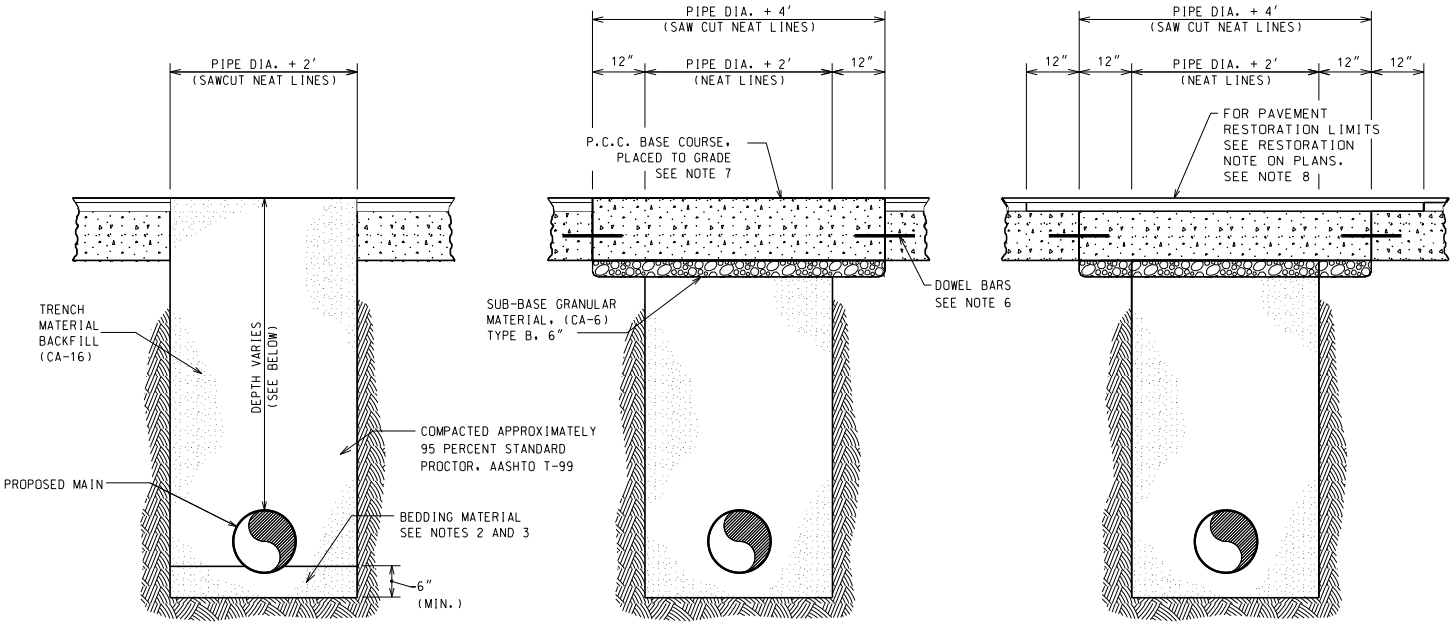
TILE PIPE & HYDRANT BRANCH
EMBEDDED IN PEA GRAVEL

NOTES:

1. WATER TABLE MUST BE BELOW BOTTOM OF TRENCH.
2. LAY DRAIN PIPE IN WATER MAIN TRENCH IF HYDRANT LEAD PIPE IS NOT LONG ENOUGH TO ACHIEVE 14' DRAIN PIPE LENGTH.
3. PLACE DRAIN PIPES SO HOLES ARE FACING DOWN, SEE DETAIL A.
4. COPPER WATER SERVICE TUBING MUST BE ENCASED IN POLYETHYLENE WRAP.



B-BLUE FLANGE Y-YELLOW FLANGE R-RED FLANGE W-WHITE FLANGE
ALL PUBLIC FIRE HYDRANTS ARE TO BE PAINTED RED EXCEPT FOR THE TOP FLANGES WHICH MUST BE COLOR CODED.



ROADWAY TRENCH - PHASE 1

ROADWAY TRENCH - PHASE 2

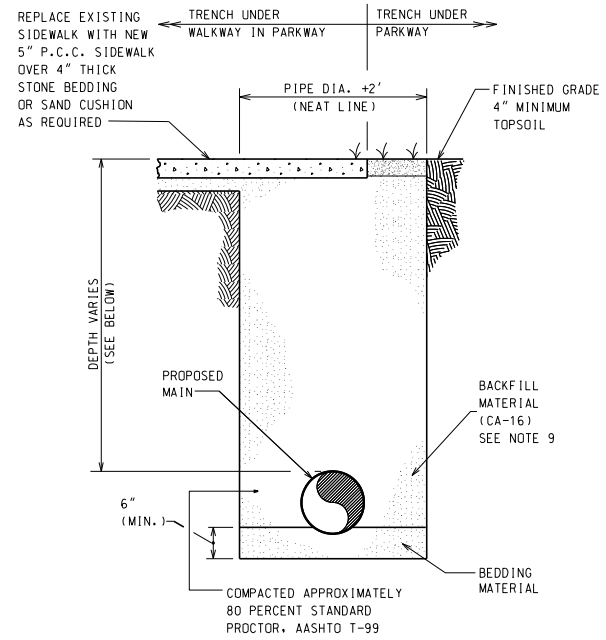
ROADWAY TRENCH - PHASE 3

PIPE DEPTH REQUIREMENTS	
MINIMUM DEPTH OF COVER FOR WATER MAINS	
SIZE OF PIPE	DEPTH OF COVER
3/4" TO 3"	5'-6" ± 3"
4"	5'-6" ± 3"
6"	5'-6" ± 3"
8"	5'-3" ± 3"
12"	5'-0" ± 2"
16"	5'-0" ± 2"
24"	4'-6" ± 2"
30" TO 42"	3'-6" MIN.(SEE PLAN)
48" & LARGER	3' MIN.(SEE PLAN)

PHASE 1: BACKFILL CA-16 TO GRADE FOLLOWING THE INSTALLATION OF PROPSED WATER MAIN.

PHASE 2: P.C.C. BASE COURSE TO GRADE FOLLOWING THE APPROVAL OF PROPOSED MAIN AND SUCCESSFUL COMPLETION OF SERVICE TRANSFERS AND CONNECTIONS.

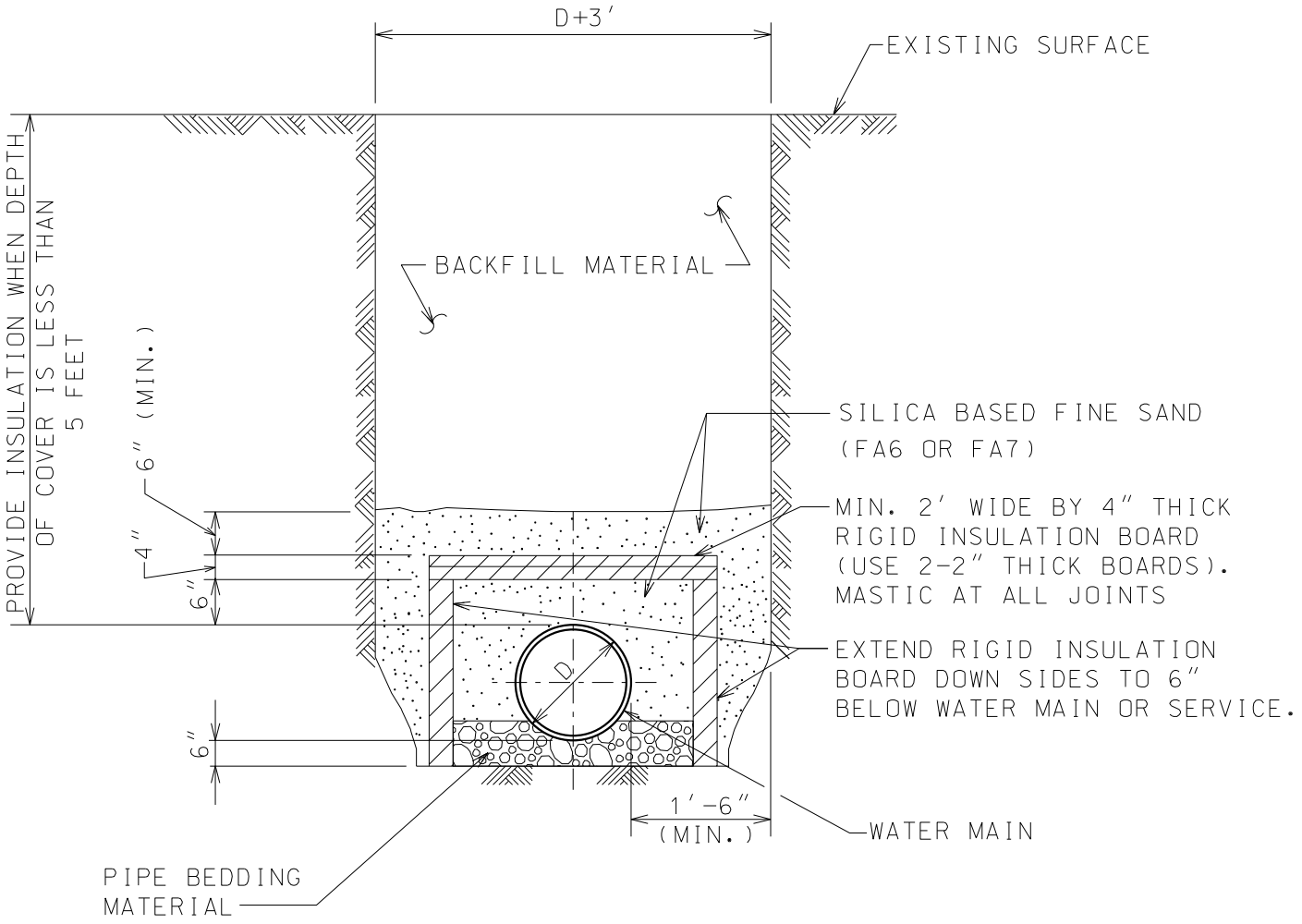
PHASE 3: FINAL PAVEMENT RESTORATION. LIMITS AS INDICATED ON PLANS.



PARKWAY TRENCH

GENERAL NOTES:

1. PROVIDE PIPE BEDDING TO A DEPTH OF $^{1}/_{8}$ OF PIPE DIAMETER OR 6" MINIMUM OF COMPACTED GRANULAR MATERIAL, GRAVEL, OR CRUSHED STONE.
2. USE CA-16 BEDDING MATERIAL FOR PIPE SIZES UP TO 16-INCH DIAMETER.
3. USE CA-11 BEDDING MATERIAL FOR PIPE SIZES LARGER THAN 16-INCH DIAMETER.
4. ALL EXCAVATIONS MUST BE PROPERLY SHORED, SHEETED AND BRACED TO PROVIDE SAFE WORKING CONDITIONS, ALL IN COMPLIANCE WITH THE U.S. DEPARTMENT OF LABOR SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION STIPULATED UNDER THE OCCUPATIONAL SAFETY AND HEALTH ACT, (O.S.H.A.).
5. PLATE ALL UNATTENDED EXCAVATIONS IN PAVEMENT AREAS AND SECURE PLATES TO PAVEMENT AND PROVIDE BARRIERS IN PARKWAY AREAS.
6. DOWEL BARS SHALL BE #5 EPOXY COATED BARS, 18" LONG DRILLED, WITH 9" EMBEDDMENT AND GROUTED AT 30" CENTERS. DOWEL BARS MAY BE OMITTED ON CDOT STREETS WHERE CLSM USED AS TRENCH BACKFILL.
7. FOLLOWING THE APPROVAL OF PROPOSED MAIN AND SUCCESSFUL COMPLETION OF SERVICE TRANSFERS AND CONNECTIONS, PLACE CONCRETE BASE COURSE FLUSH TO GRADE. THE ADDITIONAL THICKNESS IS TO BE REMOVED DURING PAVEMENT RESTORATION WORK. FINAL CONCRETE BASE THICKNESS MUST BE PER C.D.O.T. AND I.D.O.T. REQUIREMENTS. WHEN THE THICKNESS OF THE EXISTING ROADWAY BASE MATERIAL IS LESS THAN THE MINIMUM THICKNESS INDICATED IN THE PLANS, THE BOTTOM OF BASE MATERIAL WILL EXTEND BELOW THE BOTTOM OF THE BASE MATERIAL OF THE EXISTING PAVEMENT.
8. FINAL PAVEMENT RESTORATION SHALL BE COMPLETED AS INDICATED IN THE RESTORATION NOTE ON THE PLANS AND IN COMPLIANCE WITH C.D.O.T. AND STANDARDS. THE C.D.O.T. STREET PAVEMENT RESTORATION DETAIL HAS BEEN INCLUDED IN THESE DETAILS FOR REFERENCE.
9. EXCAVATED MATERIAL MAY BE USED IN PLACE OF (CA-16) IN PARKWAY TRENCHES. THE MATERIAL MUST BE PULVERIZED AND APPROVED BY THE COMMISSIONER.



NOTES:

1. RIGID INSULATION BOARD TO BE CLOSED CELL, EXTRUDED POLYSTYRENE FOAM MEETING ASTM 578, TYPE VI, 40 PSI COMPRESSING STRENGTH (ASTM D1621) 0.1% MAX. WATER ABSORPTION (ASTM C272).

2. BACKFILL MATERIAL AROUND RIGID INSULATION BOARD SHALL BE SILICA BASED FINE SAND (FA6 OR FA7), FREE FROM ROOTS, ORGANIC MATTER, LEAVES OR OTHER INJURIOUS MATERIALS.

3. OVERLAP ALL RIGID INSULATION BOARD JOINTS.

4. INSTALL RIGID INSULATION BOARD AS INDICATED ON PLANS OR AS APPROVED BY COMMISSIONER.

WATER MAIN TRENCH INSULATION DETAIL

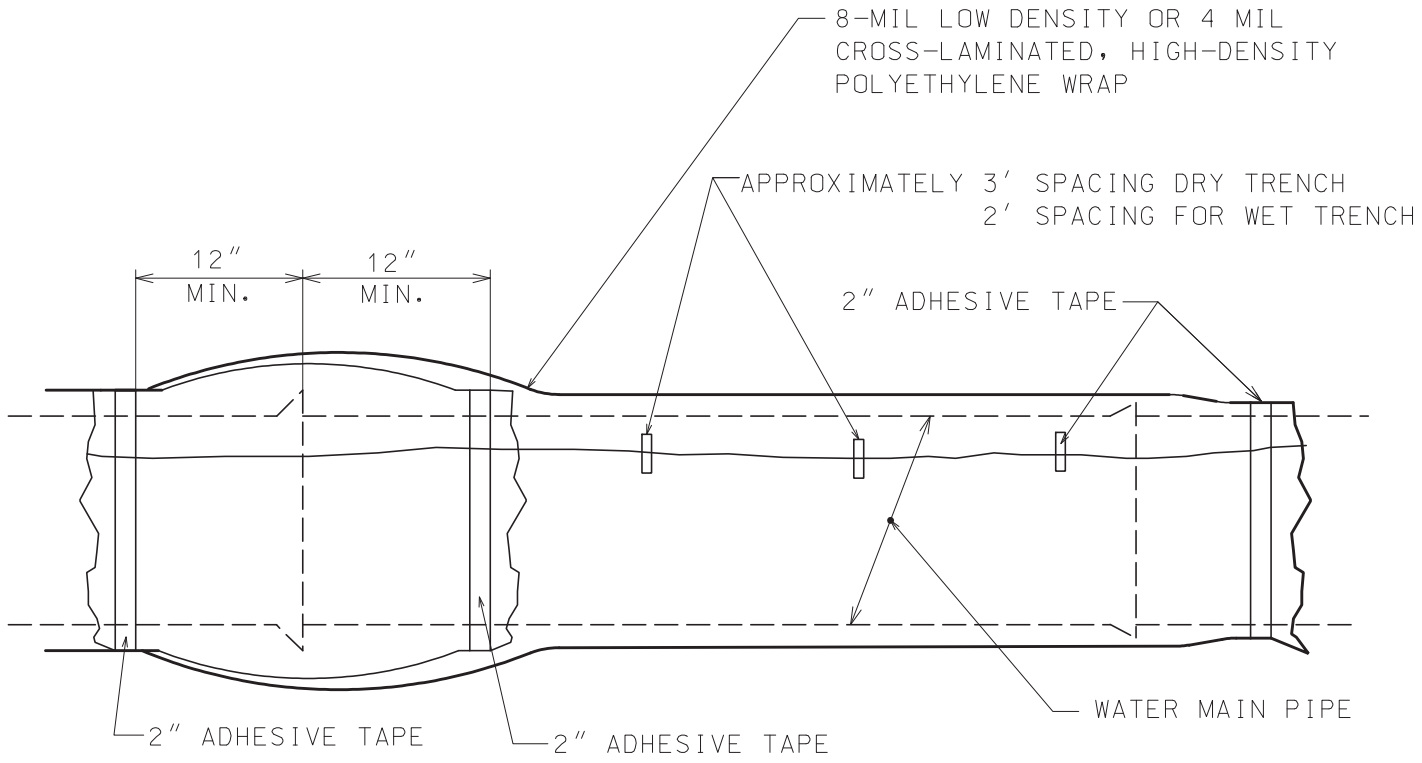


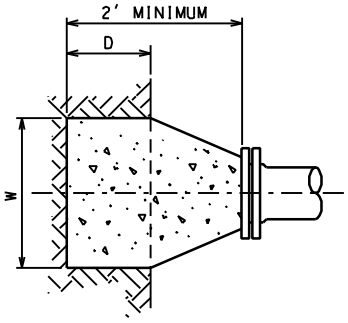
CHART "A" POLYWRAP FLAT TUBE WIDTHS		
PIPE DIAMETER (IN.)	D.I.P. WITH PUSH-ON JOINTS (IN.)	D.I.P. WITH MECHANICAL JOINTS (IN.)
4	14	16
6	17	20
8	21	24
12	29	30
16	37	37
24	53	53

NOTES:

1. USE ONE LENGTH OF POLYETHYLENE TUBE WRAP FOR EACH LENGTH OF PIPE, OVERLAPPED AT PIPE JOINTS AND FOLD EXCESS OVER TOP OF TUBE FOR SLACK REDUCTION.

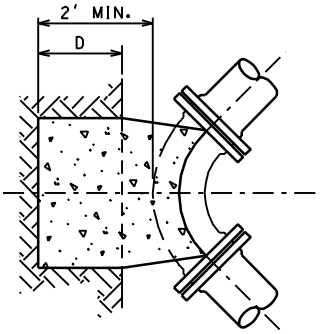
2. USE CHART "A" TO SELECT SIZE OF WRAP.

WATER MAIN
POLYETHYLENE WRAP DETAIL



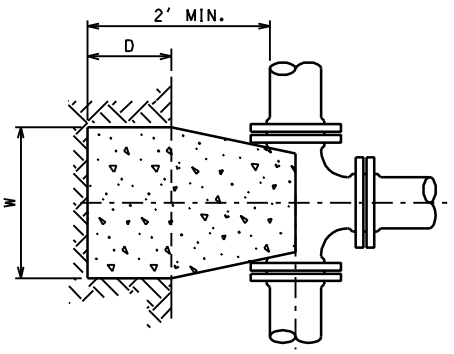
PLAN VIEW

DEAD END THRUST BLOCK



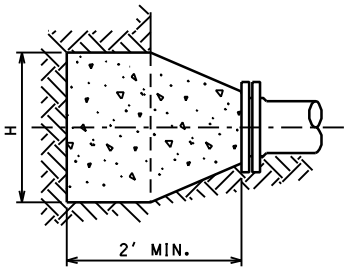
PLAN VIEW

BEND THRUST BLOCK



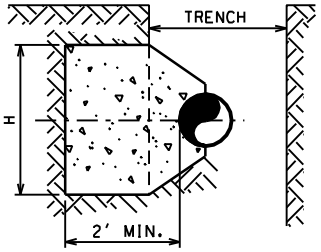
PLAN VIEW

TEE THRUST BLOCK



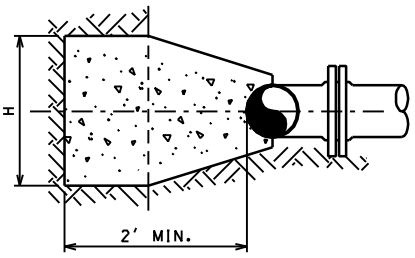
PROFILE

DEAD END THRUST BLOCK



PROFILE

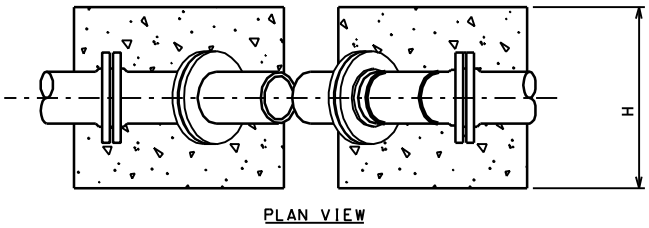
BEND THRUST BLOCK



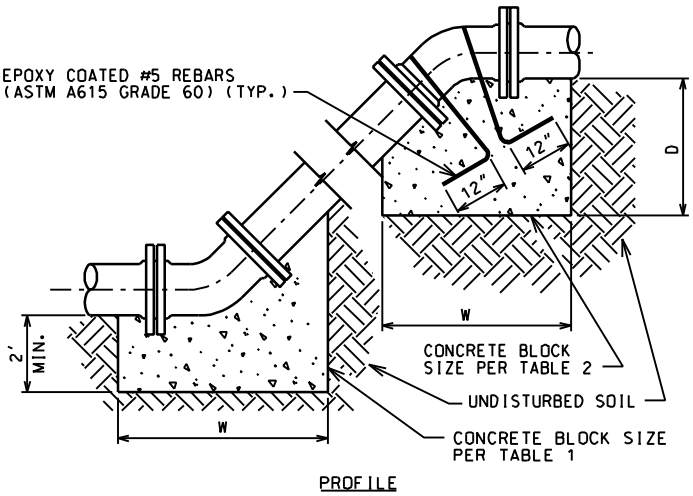
PROFILE

TEE THRUST BLOCK

HORIZONTAL THRUST BLOCK DETAILS



PLAN VIEW



PROFILE

VERTICAL THRUST BLOCK DETAILS

TABLE 1

PIPE SIZE	DEAD END & TEE				HORIZONTAL 1/4 BEND				HORIZONTAL 1/8 BEND			
INCH DIA.	D	H	W	CY	D	H	W	CY	D	H	W	CY
16	1	5.5	4.5	2	1	6.5	5	2.5	1	4.5	4	1.5
12	1	3.5	3.5	1	1	4	4	1.5	1	3	3	.75
8	.5	2.5	2.5	.5	.5	3	3	.5	.5	2	2	.3

PIPE SIZE	HORIZONTAL 1/16 BEND				HORIZONTAL 1/32 BEND			
INCH DIA.	D	H	W	CY	D	H	W	CY
16	1	3.5	3.5	1	1	2.5	2.5	.6
12	1	2.5	2.5	.5	1	2	2	.4
8	.5	1.5	1.5	.25	.5	1.5	1.5	.25

TABLE 2

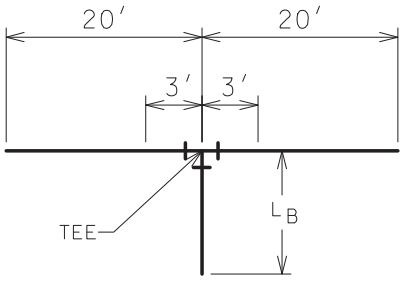
PIPE SIZE	VERTICAL 1/8 BEND				VERTICAL 1/8 BEND BOTTOM			
INCH DIA.	D	H	W	CY	D	H	W	CY
16	7	6	6	11	2	4.5	4	2.25
12	5	6	5	7	2	3	3	1
8	4.5	4	4	3.5	2	2	2	.5

D IS THE DIMENSION INTO UNDISTURBED GROUND IN FEET
H IS HEIGHT OF THRUST BLOCK IN FEET
W IS WIDTH OF THRUST BLOCK IN FEET
ALL DIMENSIONS ARE MINIMUM.
THRUST BLOCKS IN LOOSE FILL OR SAND AREAS ARE NOT INCLUDED IN THESE TABLES AND WILL REQUIRE ADDITIONAL ANALYSIS.

NOTES:

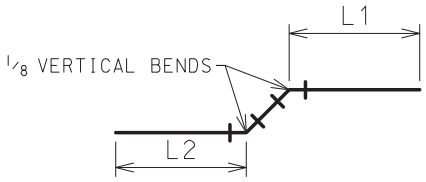
1. FULL CONCRETE THRUST BLOCKS AS SHOWN ARE REQUIRED WHEN THRUST RESTRAINT IS NOT PROVIDED BY OTHER MEANS SUCH AS RESTRAINED JOINT PIPE.
2. WHEN THRUST RESTRAINT GLANDS ARE INSTALLED FOR THE CONNECTIONS, CONCRETE THRUST BLOCKS SHALL BE PROVIDED UP TO THE THE DOTTED LINE AS SHOWN.
3. ALL BOLTS, NUTS, THRUST RESTRAINT GLANDS AND FITTINGS SHALL BE WRAPPED WITH POLYETHYLENE TUBING TO PREVENT CORROSION AND CONCRETE ADHESION.
4. CONCRETE FOR THRUST BLOCKS MUST NOT CONTAIN FLY ASH.

THRUST RESTRAINT
CONCRETE THRUST BLOCK DETAILS



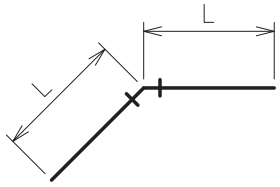
TEE SIZE	L_B
8″ x 8″ :(8″, 12″, 16″ OR 24″) x 12″	0
16″ x 16″	42′
36″ x 24″	277′

HORIZONTAL TEES - LENGTH OF RESTRAINED JOINTS



PIPE SIZE	L1	L2
8″	26′	26′
12″	37′	11′
16″	67′	20′
24″	67′	20′

1/8 VERTICAL BENDS - LENGTH OF RESTRAINED JOINTS



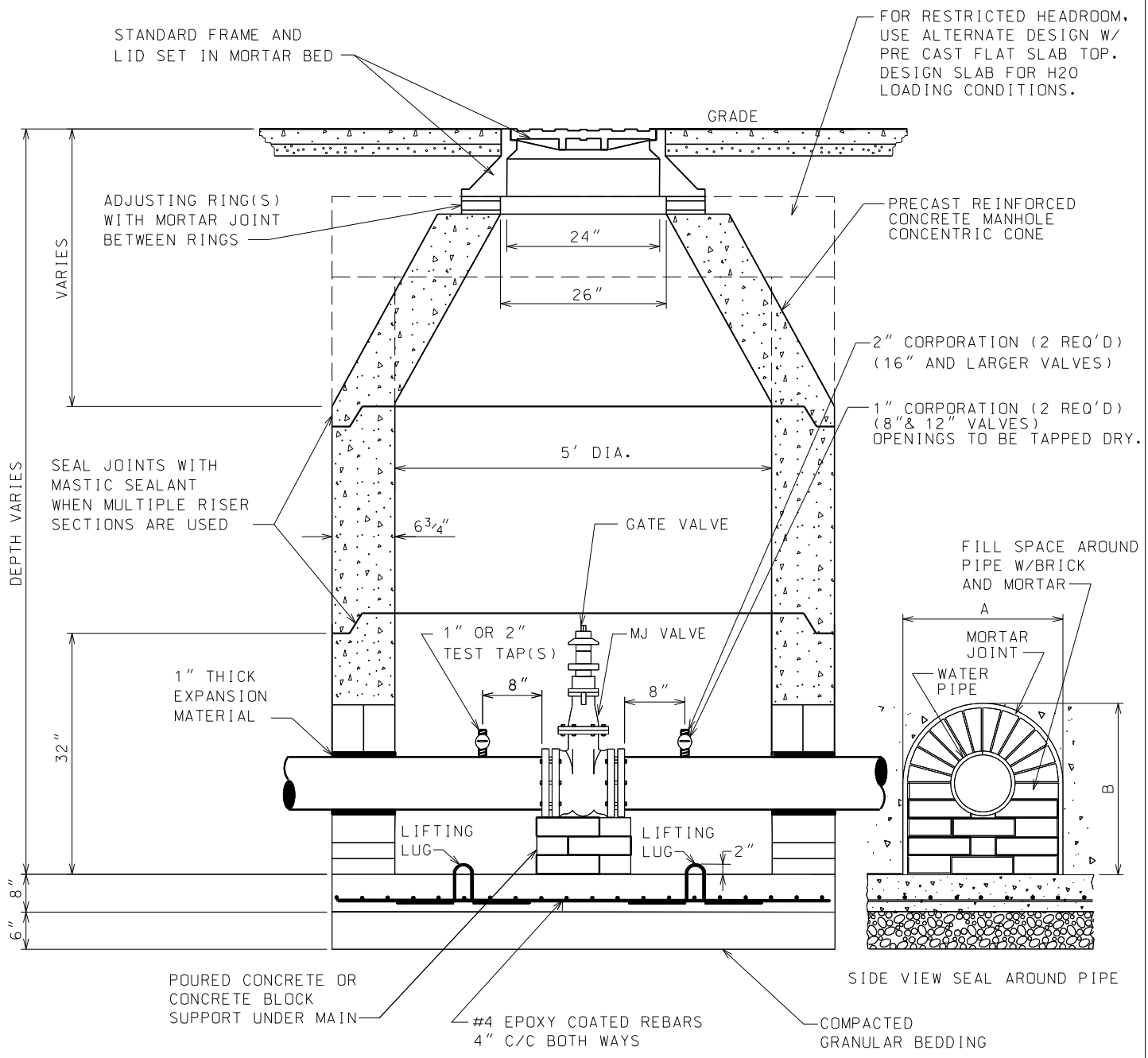
PIPE SIZE	DISTANCE OF RESTRAINED JOINTS REQUIRED EITHER SIDE OF BENDS L — BEND SIZES 1/32	1/16	1/8	1/4
8″	3′	6′	12′	29′
12″	4′	8′	17′	41′
16″	7′	15′	30′	73′
24″	7′	15′	30′	73′

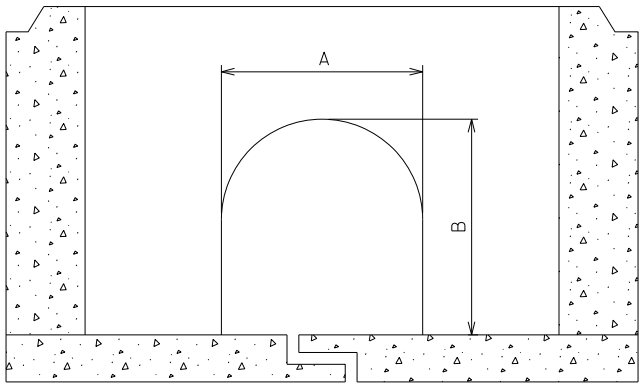
HORIZONTAL BENDS - LENGTH OF RESTRAINED JOINTS

NOTE:
1. MINIMUM LENGTHS OF PIPE REQUIRED TO RESTRAIN FITTINGS SHOWN.

2. LENGTHS BASED ON POLY-WRAPPED PIPE.

THRUST RESTRAINT
RESTRAINED JOINT PIPE DETAILS





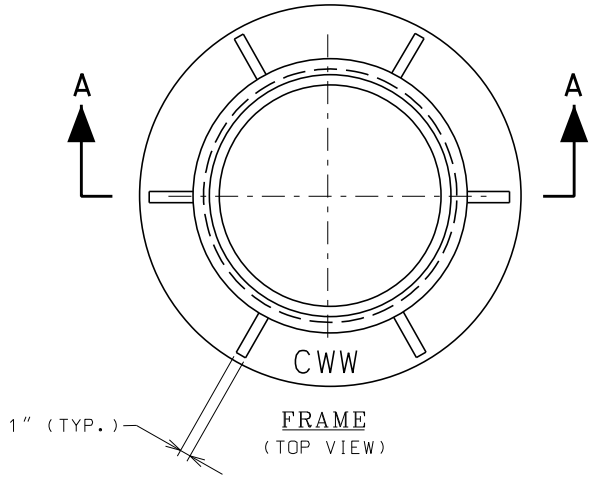
OPTIONAL SPLIT BOTTOM

NOMINAL PIPE SIZES	OPENING DIMENSIONS	
	A	B
8"	11.0"	12.5"
12"	15.5"	16.5"
16"	19.5"	21.0"

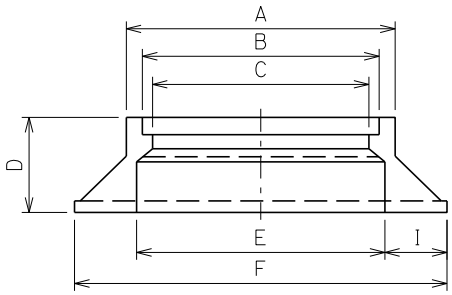
PRECAST VALVE BASIN
FOR PIPES UP TO 16" DIA.

REV:09.15

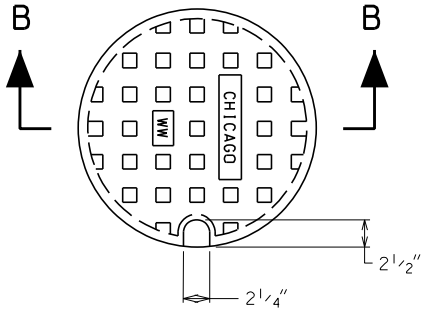
D-13



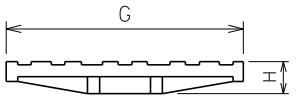
FRAME
(TOP VIEW)



SECTION A-A



LID
(TOP VIEW)



SECTION B-B

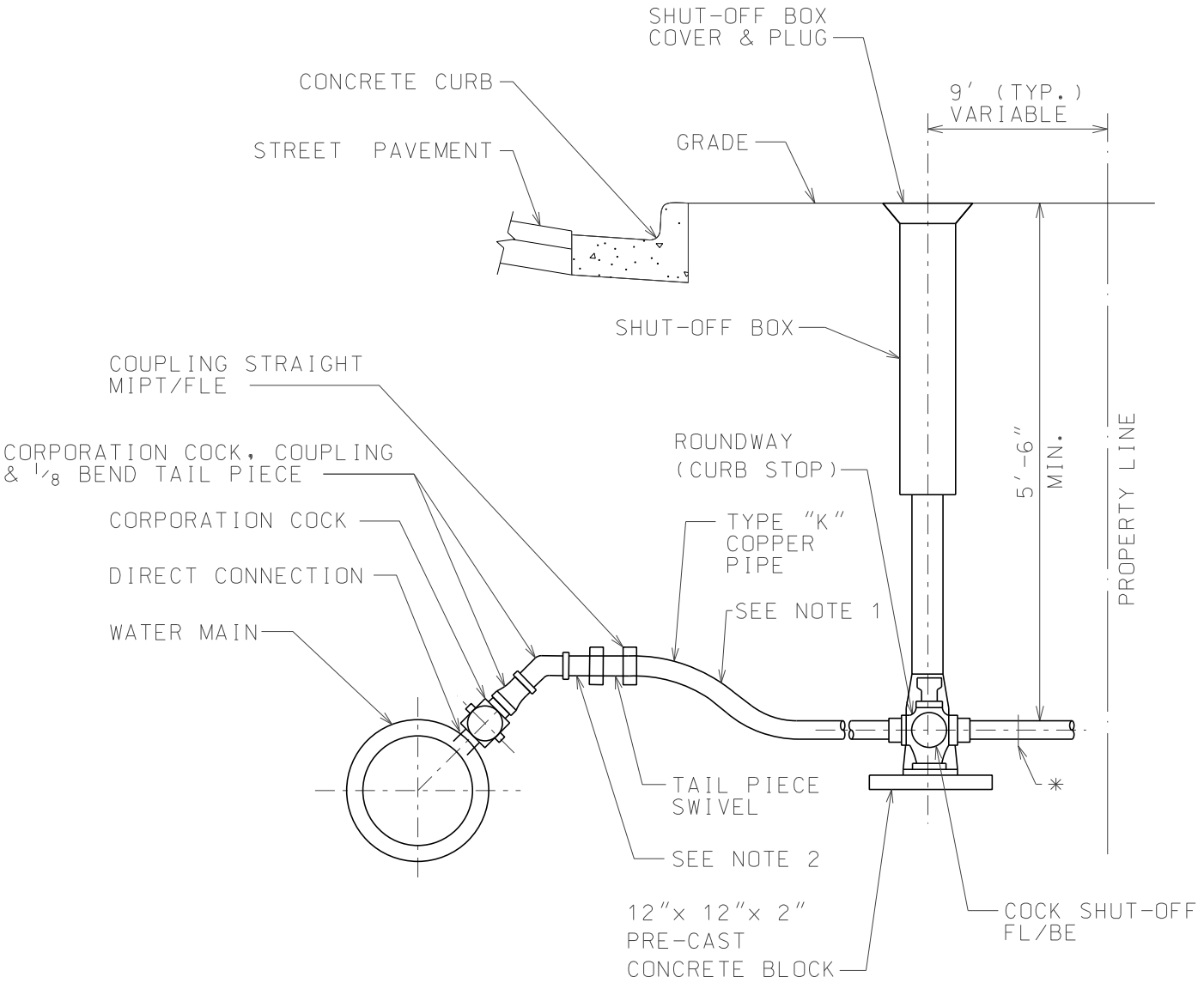
NOTES:

ALL FRAMES AND LIDS SHALL BE OF HEAVY DUTY TYPE DESIGN AND MEET AASHTO M105 AND M306 REQUIREMENTS FOR A 40,000 LB PROOF LOAD.

LETTERING FOR CHICAGO W.W. ON THE LID SHALL BE 2" SHARP FACE GOTHIC LETTERS, 3/16" WIDE AND RAISED 1/8" FROM 1/8" RECESS AS MEASURED FROM THE TOP SURFACE OF THE LID.

LETTERING FOR C.W.W. ON THE FRAME SHALL BE LOCATED ON THE TOP SURFACE OF THE HORIZONTAL FLANGE AND SHALL BE 1" SHARP FACE GOTHIC, 3/16" WIDE AND RAISED 1/8" AS MEASURED FROM THE FLANGE SURFACE. LOCATION OF LETTERING SHALL BE AS INDICATED ON DRAWING.

FRAME AND LID DIMENSIONS		
	FRAME AND LID TYPES	
	STANDARD	36" SPECIAL F&L
DIMENSION	INCHES	INCHES
A	24	-
B	22 7/8 - 23	36
C	21	34
D	9	8 1/2
E	24 1/2 - 24 13/16	36
F	34	45
G	22 3/4	36
H	3	1 1/2
I	4 5/8 - 4 3/4	4 1/2

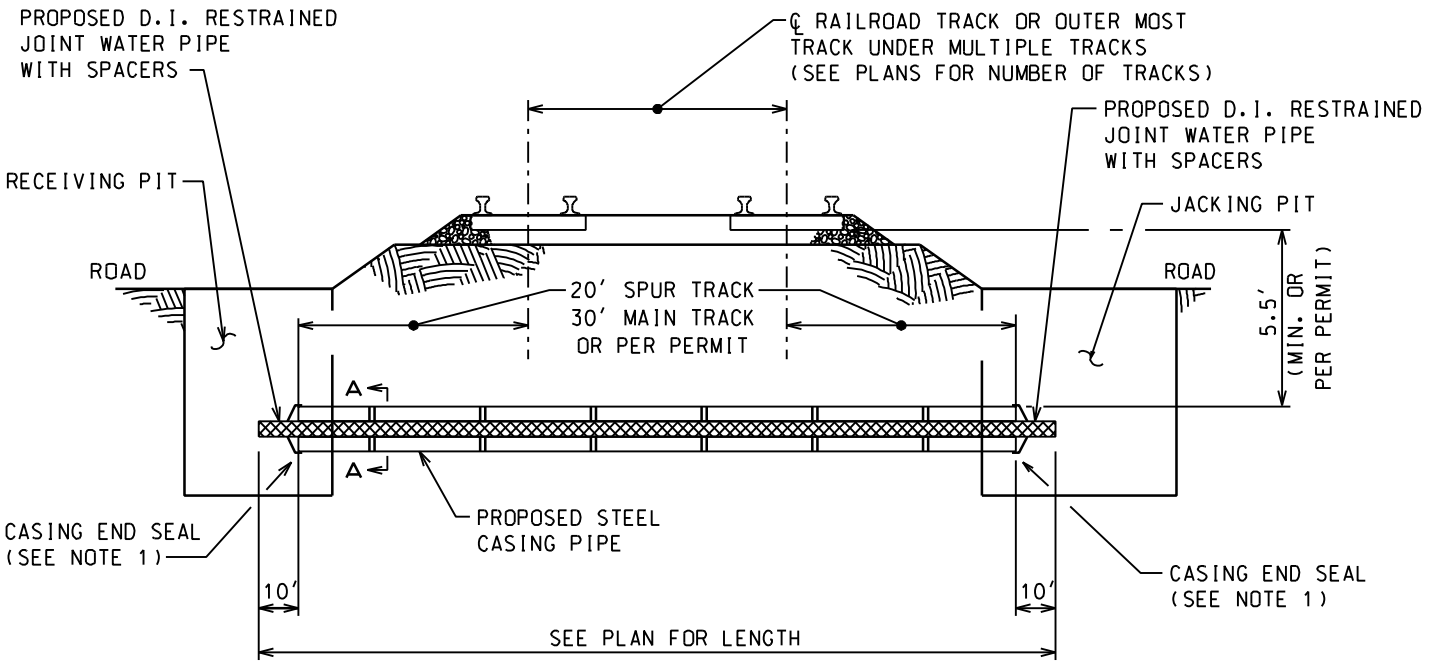


CORPORATION COCK		SHUT-OFF BOX
SIZE	WEIGHT	WEIGHT
IN.	LB.	LB.
1.0	3.00	7.25
1.5	10.00	7.25
2.0	16.50	7.25

NOTES:

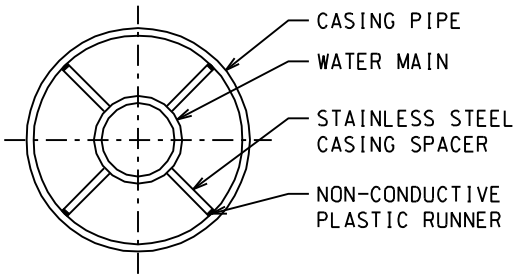
1. WHEN CONNECTING NEW COPPER SERVICE TO EXISTING LEAD SERVICE PROVIDE: LEAD PAX COUPLING FIP/FL
2. THE FIRST THREE (3) FEET OF SERVICE CONNECTION TO WATER MAIN MUST BE ENCASED IN POLYETHYLENE WRAP

TYPICAL 1" TO 2" WATER SERVICE



PROFILE

N.T.S.



SECTION A-A

NOTES:

1. END SEAL - BRICK AND MORTAR OR SELF CURING RUBBER SEAL.
2. LENGTH OF CASING PIPES UNDER METRA TRACKS SHALL BE EXTENDED TO METRA R.O.W. LINES AND JACKING AND RECEIVING PITS ARE NOT TO BE LOCATED WITHIN TRACK R.O.W.

THIS DETAIL IS PROVIDED FOR REFERENCE PURPOSES ONLY

CASING PIPE UNDER RAILROAD TRACK DETAIL D-18

GENERAL NOTES

1. LOCATION OF UTILITIES AND PROPERTY LINES ARE FROM THE BEST INFORMATION AVAILABLE. EXACT LOCATION AND COMPLETENESS ARE NOT GUARANTEED.

2. THE CONTRACTOR MUST VERIFY THE LOCATION OF UNDERGROUND UTILITIES WITH THE UTILITY OWNERS PRIOR TO DOING ANY WORK IN THE VICINITY. THE CONTRACTOR MUST COMPLY WITH REQUIREMENTS OF UTILITY OWNERS REGARDING NOTICE OF WORK AND PROTECTION OF UTILITIES. THE CONTRACTOR MUST COMPLY WITH THE CITY OF CHICAGO, DEPARTMENT OF TRANSPORTATION DAMAGE PREVENTION PROTOCOL CITY INFRASTRUCTURE DEPARTMENTS. ALL UTILITIES MUST BE NOTIFIED AT LEAST 48 HOURS BEFORE CONSTRUCTION. (CALL DIGGER 312-744-7000).

3. TEST PITS MUST BE EXCAVATED IN ADVANCE OF PIPELINE CONSTRUCTION IN ORDER TO CONFIRM DEPTH AND LOCATION OF EXISTING UTILITIES AND WHEN DIRECTED BY THE DEPARTMENT MANAGER. NO ADDITIONAL PAYMENT WILL BE MADE FOR TEST PIT EXCAVATION.

4. IF ANY PUBLIC OR PRIVATE UTILITIES CROSS THE WATER MAIN TRENCH AND MUST REMAIN IN PLACE, THE CONTRACTOR MUST PROTECT SAID UTILITY IN CONFORMANCE WITH THE SPECIFICATIONS OR AS DIRECTED BY THE COMMISSIONER.

5. PROVIDE EROSION CONTROL IN ACCORDANCE WITH THE SPECIFICATIONS.

6. FITTINGS AND THEIR LOCATIONS INDICATED ON THE DRAWINGS ARE TENTATIVE. THE CONTRACTOR MUST COMPLETE THE INSTALLATION WITH THE NECESSARY FITTINGS DICTATED BY FIELD CONDITIONS.

7. WORK INDICATED ON THE PLANS AND NOT REFERENCED TO A BID ITEM IS CONSIDERED INCIDENTAL TO THE WORK TO WHICH IT APPLIES AND NO ADDITIONAL COMPENSATION WILL BE ALLOWED.

8. WATER MAIN AND FITTINGS LOCATIONS SHOWN ON THE DRAWINGS FOR THE NEW WATER MAINS AND APPURTENANCES MAY BE CHANGED BY THE COMMISSIONER DUE TO FIELD CONDITIONS. NO ADDITIONAL COMPENSATION WILL BE ALLOWED FOR SUCH CHANGES, UNLESS PREVIOUSLY APPROVED BY THE COMMISSIONER.

9. THE CONTRACTOR MUST PROVIDE THRUST RESTRAINTS IN ACCORDANCE WITH THE SPECIFICATIONS. THE CONTRACTOR MUST FURNISH AND INSTALL MECHANICAL JOINT THRUST RESTRAINT GLANDS AT ALL FITTINGS AND MECHANICAL JOINTS.

10. THE CONTRACTOR MUST VERIFY THE OPERATION OF EVERY VALVE NECESSARY FOR THE REQUIRED WATER MAIN SHUT DOWN FOR EACH PIPE SECTION. FOR VALVES OR WATER MAINS UNDER 16-INCHES IN DIAMETER, THE WORK MUST BE DONE UNDER THE DIRECT SUPERVISION OF A DEPARTMENT REPRESENTATIVE PRIOR TO THE START OF THE JOB. A 24 HOUR ADVANCE NOTICE MUST BE GIVEN TO ALL CONSUMERS EFFECTED AND THE BUREAU OF OPERATIONS AND DISTRIBUTION. THE OPERATION OF ALL VALVES 16-INCHES IN DIAMETER AND LARGER MUST BE PERFORMED BY CITY FORCES PURSUANT TO A 72 HOUR ADVANCE NOTIFICATION TO THE DEPARTMENT. ANY VALVE FOUND NOT OPERABLE WILL BE REPAIRED OR REPLACED BY THE DEPARTMENT UNLESS DIRECTED OTHERWISE BY THE COMMISSIONER.

11. PRIOR TO NEW CONSTRUCTION CONTRACTOR MUST PERFORM UNI-DIRECTIONAL FLUSHING OF THE SOURCE WATER MAIN TO REMOVE PIPE SEDIMENT AND FLUSH UNTIL CLEAR. THIS IS FOR EXISTING PIPING ONLY. FLUSHING IS DONE WHEN EXISTING LINE VALVES ARE CHECKED FOR PROPER OPERATION PER NOTE 10.

12. IN INSTANCES WHERE CHLORINATION IS TO BE DONE AGAINST ANY EXISTING VALVE, AT THE TIME THAT THE EXISTING WATER MAIN IS BREACHED FOR FINAL CONNECTION, THE CONTRACTOR IS TO VERIFY THAT THE EXISTING VALVES ARE IN GOOD OPERATING CONDITION AND DO NOT LEAK. ANY LEAKING VALVE SHOULD BE BROUGHT TO THE COMMISSIONER'S ATTENTION AND BE REPAIRED OR REPLACED BY THE COMMISSIONER PRIOR TO MAKING PIPE CONNECTIONS TO THE EXISTING WATER MAIN. THE VALVE SHOULD REMAIN IN THE CLOSED POSITION UNTIL THE NEW WATER MAIN IS APPROVED FOR SERVICE.

GENERAL NOTES (CONTINUED)

13. ALL OPENINGS IN EXISTING WATER MAINS MUST BE PLUGGED OR CAPPED WITH DUCTILE IRON FITTINGS UNTIL THE MAIN IS ABANDONED.

14. ALL VALVE BASINS MUST BE CONSTRUCTED OF PRE-CAST REINFORCED CONCRETE UNLESS DIRECTED OTHERWISE BY THE COMMISSIONER.

15. NOTES INDICATING S.N.L., E.W.L., ETC., MEAN SOUTH OF THE NORTH PROPERTY LINE, EAST OF THE WEST PROPERTY LINE, ETC. AND ARE MEASURED FROM THE NEAREST STREET.

16. IF A STANDARD MECHANICAL JOINT SLEEVE DOES NOT FIT TO MAKE CONNECTION OF THE NEW PIPE TO THE EXISTING PIPE, A TRANSITION SLEEVE MUST BE USED. NO GRINDING OF THE EXISTING PIPE IS PERMITTED.

17. BURIED STREET CAR TRACKS ARE SHOWN FOR INFORMATIONAL PURPOSES ONLY. EXACT LOCATIONS AND DIMENSIONS ARE UNKNOWN UNLESS NOTED OTHERWISE. CAUTION SHOULD BE EXERCISED WHEN EXCAVATING IN THE STREETS CONTAINING BURIED STREET CAR TRACKS. BURIED TRACKS AND CABLES MAY BE USED FOR ELECTRICAL GROUNDING BY THE CHICAGO TRANSIT AUTHORITY OR MEMBERS OF THE CHICAGO AREA JOINT ELECTROLYSIS COMMITTEE STANDARDS. ELECTRICAL CONDUCTIVITY MUST BE MAINTAINED.

18. HOUSE DRAINS ARE NOT SHOWN ON THE DRAWINGS. THE CONTRACTOR MUST LOCATE ALL HOUSE DRAINS WITHIN THE AREA OF EXCAVATION AND MAKE ADJUSTMENTS AND/OR REPAIRS PER DETAILS D-50 AND D-51.

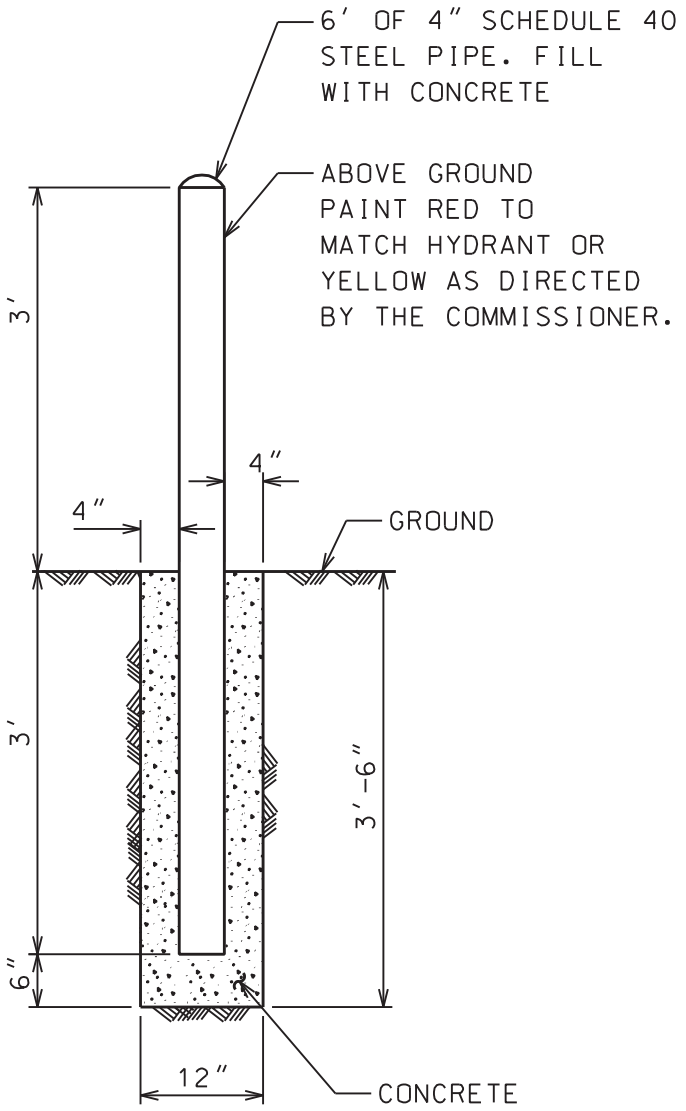
19. THE DEPARTMENT WILL PROVIDE THE NECESSARY I.E.P.A. WATER MAIN CONSTRUCTION PERMITS FOR THIS CONTRACT.

20. WORK WITHIN STATE ROUTES ARE NOTED ON THE DRAWINGS AND WILL REQUIRE I.D.O.T., REGION 1, UTILITY PERMITS. THE CONTRACTOR IS RESPONSIBLE FOR SECURING ALL PERMITS, INITIATED BY THE DEPARTMENT AND OBTAINING PERFORMANCE BONDS. ALL WORK MUST BE IN ACCORDANCE WITH I.D.O.T. PERMIT REQUIREMENTS. QUESTIONS SHOULD BE DIRECTED TO: I.D.O.T REGION ONE UTILITIES COORDINATOR AT (847) 705-4258.

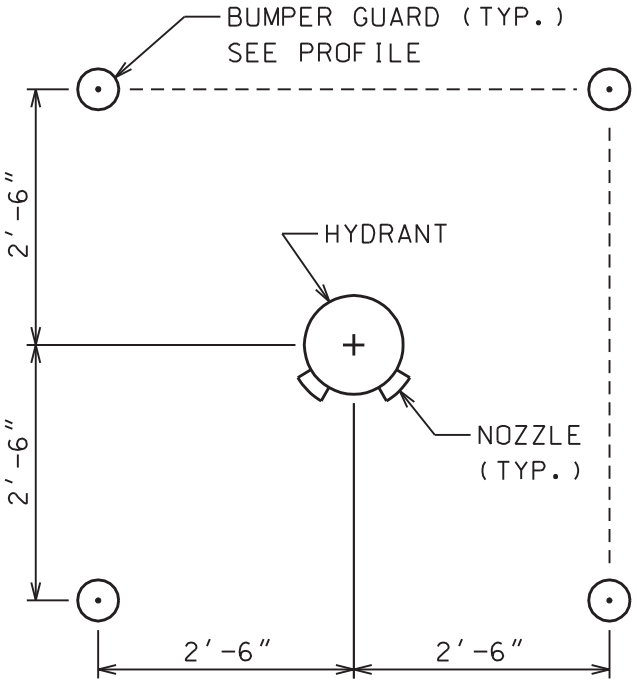
21. ABANDON EXISTING WATER MAINS IN ACCORDANCE WITH THE SPECIFICATIONS.

22. SWAB PIPE AND FITTINGS THAT WILL NOT BE PRESSURE TESTED OR CHLORINATED WITH CHLORINE SOLUTION DURING INSTALLATION AND USE EXTRA PRECAUTION TO PREVENT SOIL AND DEBRIS FROM ENTERING THE PIPE. INCORPORATE UNTESTED PIPE INTO THE FLUSHING ROUTINE WHEN POSSIBLE. WHEN CONNECTING NEW PIPE TO THE EXISTING WATER SYSTEM, USE OPERATING PRESSURE TO VISUALLY INSPECT FOR LEAKS. WHEN FEASIBLE, PERFORM INSPECTION PRIOR TO BACKFILLING. COMPLY WITH ALL STANDARDS AND REQUIREMENTS OF THE BUREAU OF WATER QUALITY (312) 744-8190.

23. DE-CHLORINATION OF HEAVILY CHLORINATED WATER IS REQUIRED. THE CONTRACTOR OR SUBCONTRACTED CHLORINATOR SHALL DE-CHLORINATE AS LISTED FOR "INFORMATIONAL PURPOSES ONLY" IN APPENDIX C OF THE ANSI/AWWA STANDARD C651-05, JUNE 1, 2005. THE CHLORINE LEVEL MUST BE BROUGHT TO POTABLE WATER LEVELS.



PROFILE

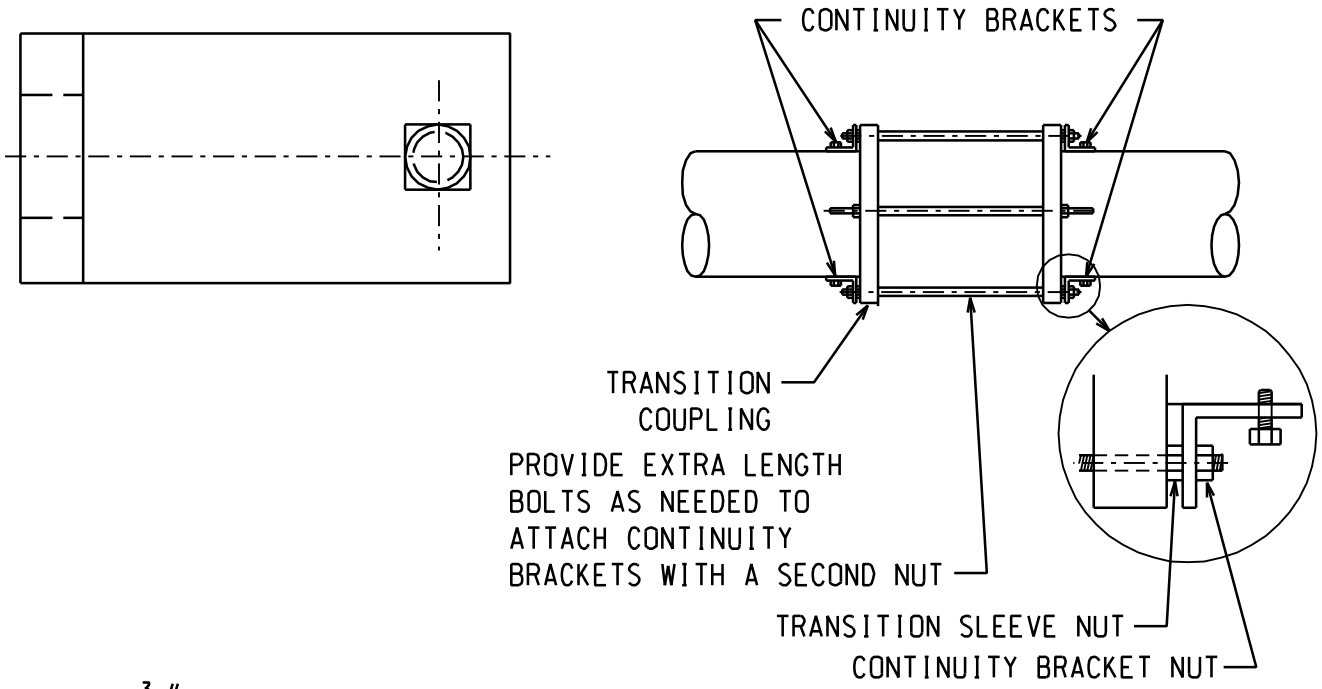


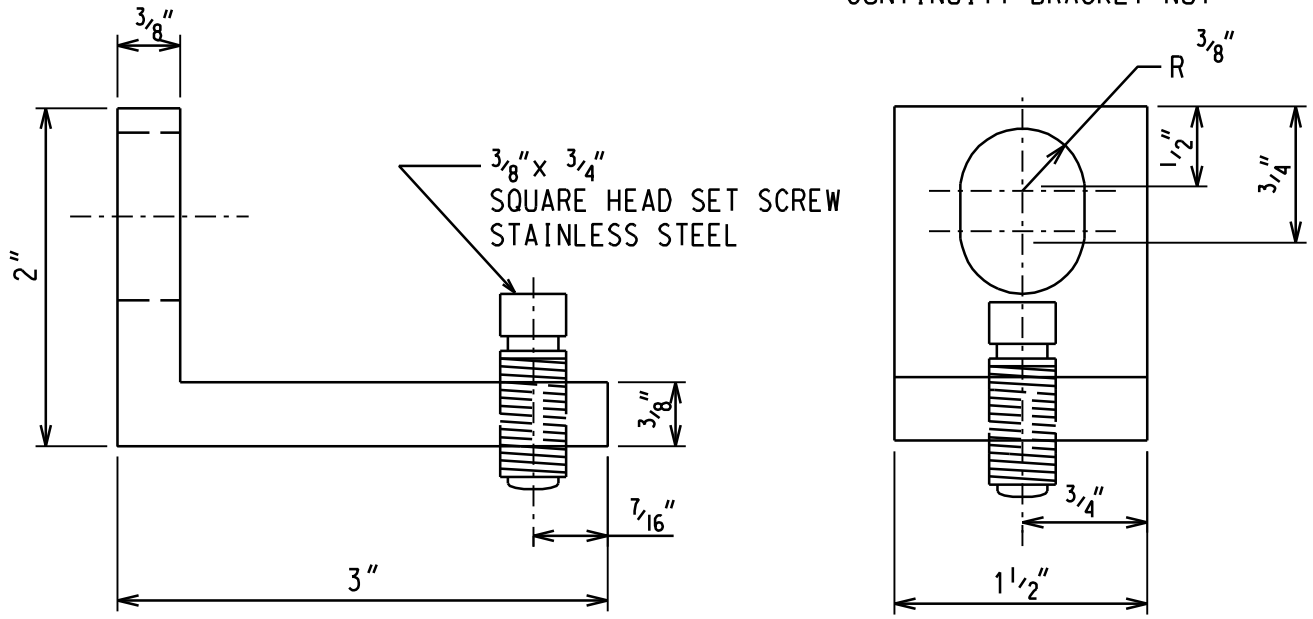
PLAN

REV:10.11

BUMPER GUARD DETAIL

D-22





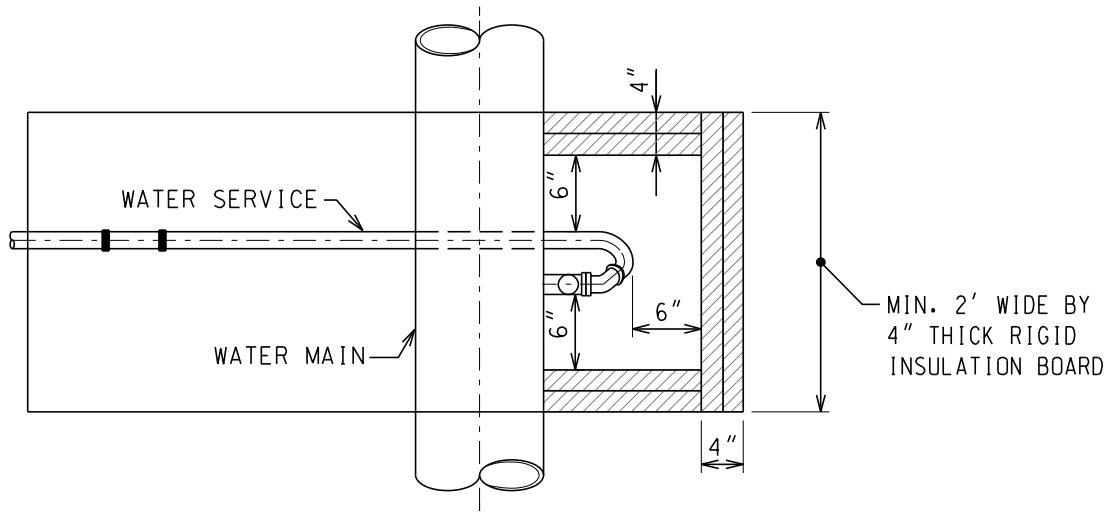
INSTALLATION NOTE:

AFTER THE TRANSITION SLEEVE IS TIGHTENED AND THE WATER MAIN PRESSURE TESTED, INSTALL MINIMUM OF FOUR (4) ELECTRICAL CONTINUITY BRACKETS. A MINIMUM OF TWO (2) ARE TO BE INSTALLED ON EACH END OF THE TRANSITION SLEEVE TO PROVIDE ELECTRICAL CONTINUITY FOR PIPE THAWING. EQUALLY SPACE BRACKETS AROUND PIPE (IE. 9& 3 O'CLOCK POSITION).

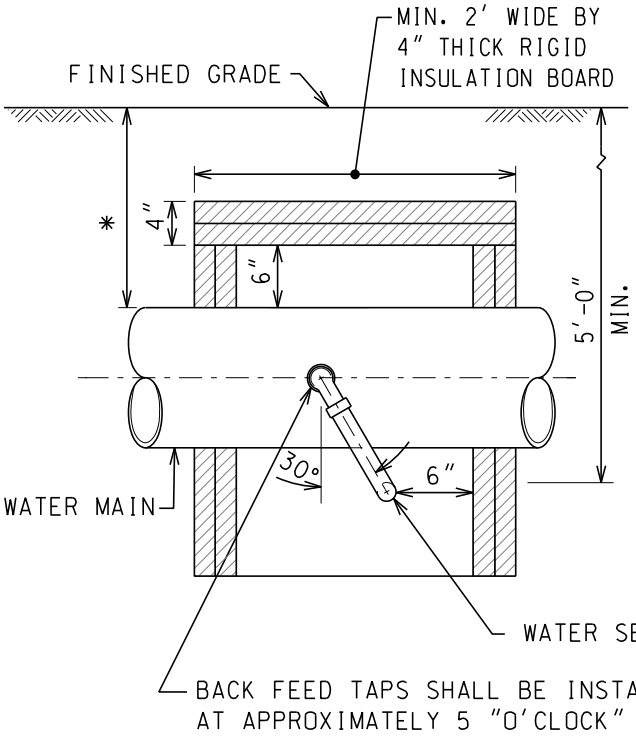
FOR 16-INCH DIAMETER CAST IRON PIPE INCREASE THE NUMBER OF ELECTRICAL CONTINUITY BRACKETS TO THREE (3) ON EACH END.

FOR 24-INCH DIAMETER AND LARGER CAST IRON PIPE CONTACT THE D.W.M., BUREAU OF ENGINEERING SERVICES.

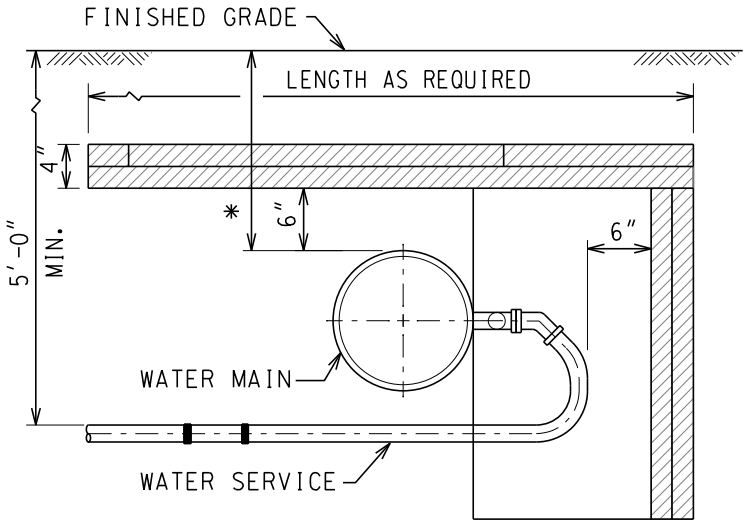
ELECTRICAL CONTINUITY BRACKET FOR TRANSITION COUPLING



TOP VIEW



FRONT VIEW



SIDE VIEW

*DEPTH AS DIRECTED BY COMMISSIONER.

NOTES:

1. BACKFILL MATERIAL AROUND RIGID INSULATION BOARD SHALL BE SILICA BASED FINE SAND (FA6 OR FA7), FREE FROM ROOTS, ORGANIC MATTER, LEAVES OR OTHER INJURIOUS MATERIALS.

2. OVERLAP ALL RIGID INSULATION BOARD JOINTS.

3. RIGID INSULATION BOARD TO BE CLOSED CELL, EXTRUDED POLYSTYRENE FOAM MEETING ASTM 578, TYPE VI, 40 PSI COMPRESSING STRENGTH (ASTM D1621) 0.1% MAX. WATER ABSORPTION (ASTM C272).

4. INSTALL RIGID INSULATION BOARD AS INDICATED ON PLANS OR AS APPROVED BY COMMISSIONER.

SERVICE PIPE INSULATION DETAILS

SEWER CROSSING DETAILS AND NOTES

GENERAL NOTES

SEE DETAIL D-51 FOR ADDITIONAL INFORMATION AND REQUIREMENTS FOR SEWER CROSSINGS.

'SEWER-WATER MAIN CLEARANCE' IS THE VERTICAL DISTANCE MEASURED BETWEEN THE OUTER EDGES OF THE SEWER AND THE WATER MAIN.

THE "PROP. COVER AT SEWER" IS THE DEPTH OF COVER THE PROPOSED WATER MAIN NEEDS TO MEET SEWER SEPARATION REQUIREMENTS. THIS IS A CALCULATED DEPTH AND MAY NEED TO BE ADJUSTED DUE TO FIELD CONDITIONS. ANY ADJUSTMENTS MUST STILL PROVIDE THE SPECIFIED SEWER-WATER MAIN CLEARANCE.

BENDS ARE SHOWN IN THE DETAILS TO MAKE VERTICAL ADJUSTMENTS.
USE $^{1}/_{8}$ -BENDS UNLESS FIELD CONDITIONS NECESSITATE A DIFFERENT ANGLE.
WHEN LESS THAN $10^{1}/_{2}$ INCHES OF VERTICAL ADJUSTMENT IS REQUIRED FOR A SEWER CROSSING, BREAK PIPE JOINTS RATHER THAN INSTALL BENDS.
INSTALL WATER MAIN AT STANDARD DEPTH WHENEVER POSSIBLE.

WHEN VERTICAL BENDS ARE USED, RESTRAIN ALL PIPE JOINTS BETWEEN THE OUTERMOST BENDS.

INSTALL INSULATION WHEN 16" AND SMALLER WATER PIPE (SEE D-8) HAS LESS THAN 5 FEET OF COVER AND WHEN LARGER PIPE HAS LESS THAN $3^{1}/_{2}$ FEET OF COVER.
SEE DETAIL D-9 FOR INSTALLATION OF WATER MAIN TRENCH INSULATION.

CASING NOTES

UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS,
INSTALL CASINGS OVER SEWERS BY OPEN CUT METHOD (SEE SECTION 31.23.10);
INSTALL CASINGS UNDER SEWERS BY THE JACK & BORE METHOD (SEE SECTION 33.05.21).

CARRIER PIPE	PVC CASING SIZE See * Below	STEEL CASING SIZE See Section 33.05.21
1" TYPE K COPPER	2"	NA
$1^{1}/_{2}$" TYPE K COPPER	$2^{1}/_{2}$"	NA
2" TYPE K COPPER	3"	NA
4" DUCTILE IRON	12"	NA
6" DUCTILE IRON	14"	20"
8" DUCTILE IRON	14"	20"
12" DUCTILE IRON	24"	24"

* USE PVC PIPE CONFORMING TO ASTM D1785 (PVC 1120 or PVC 1220).
  FOR COPPER PIPE, USE SCHEDULE 40 PVC PIPE;
  FOR DUCTILE IRON PIPE, USE SCHEDULE 80 PVC PIPE.

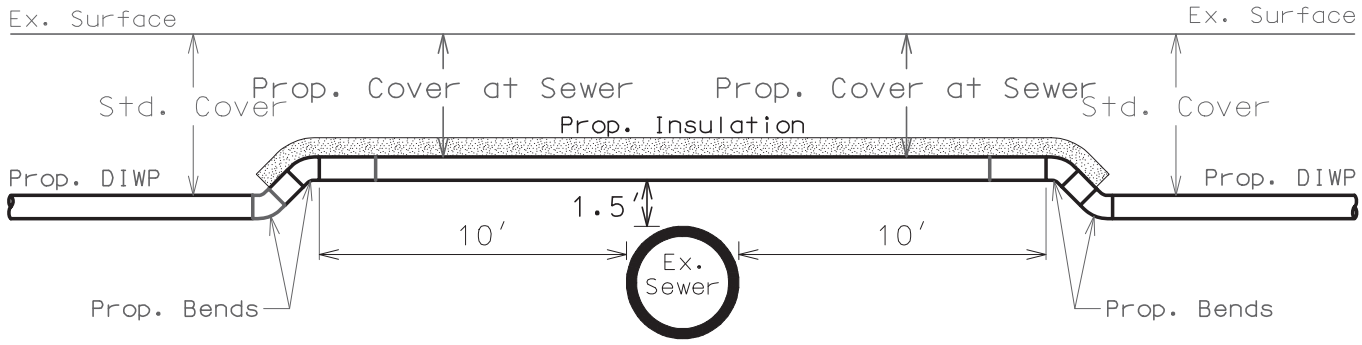
FOR COPPER PIPE, NO JOINTS ARE ALLOWED IN THE CASING.
THE COPPER PIPE MAY REST DIRECTLY ON THE INSIDE BOTTOM OF THE CASING.

FOR DI PIPE, CENTER A FULL LENGTH OF PIPE IN THE CASING.
RESTRAIN ALL DI JOINTS WITHIN THE CASING.
NO CASING SPACERS ARE REQUIRED;
REST THE TWO PIPE BELLS ASSOCIATED WITH
THE FULL LENGTH OF PIPE CENTERED IN THE CASING
DIRECTLY ON THE INSIDE BOTTOM OF THE CASING.
INSTALL AN EXTRA LAYER OF POLYWRAP ON EACH BELL IN THE CASING.

AFTER PLACEMENT OF THE CARRIER PIPE THROUGH THE CASING,
SEAL THE ENDS OF THE CASING WITH BRICK AND MORTAR, RUBBER END-SEAL,
OR OTHER APPROPRIATE METHOD TO PROVIDE A LEAK-TIGHT SEAL.

SEWER CROSSING DETAIL A.0

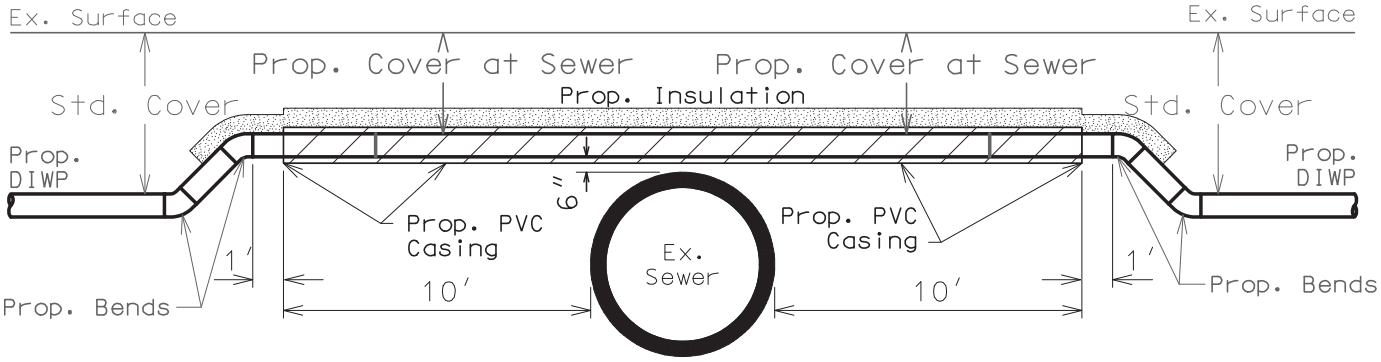
Water Main 1.5′ Above Sewer



Profile View Along Water Main Centerline

SEWER CROSSING DETAIL A.1

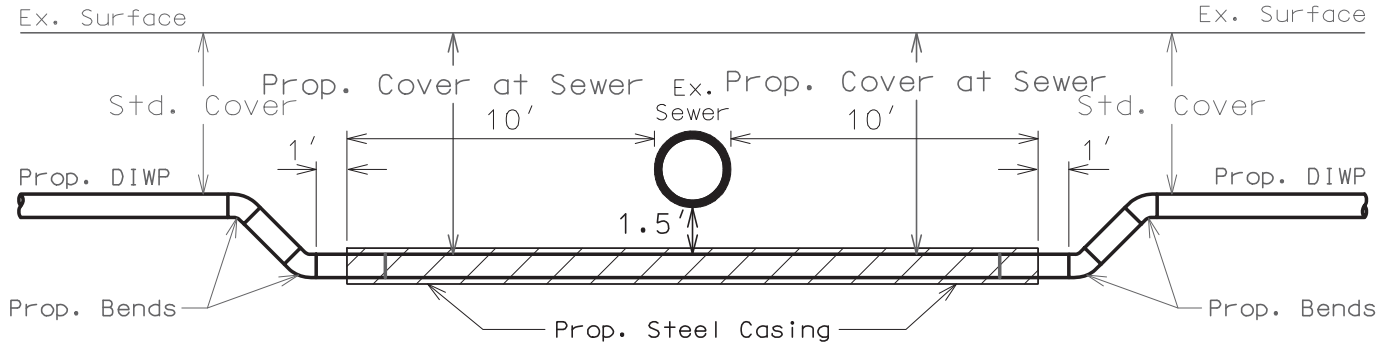
Water Main 6″ Above Sewer – Case Water Main



Profile View Along Water Main Centerline

SEWER CROSSING DETAIL B.1

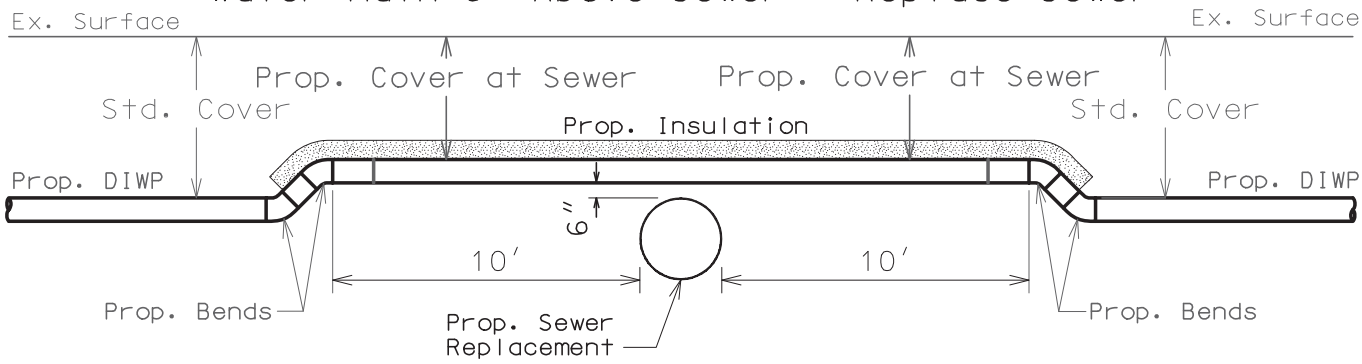
Water Main 1.5′ Below Sewer – Case Water Main



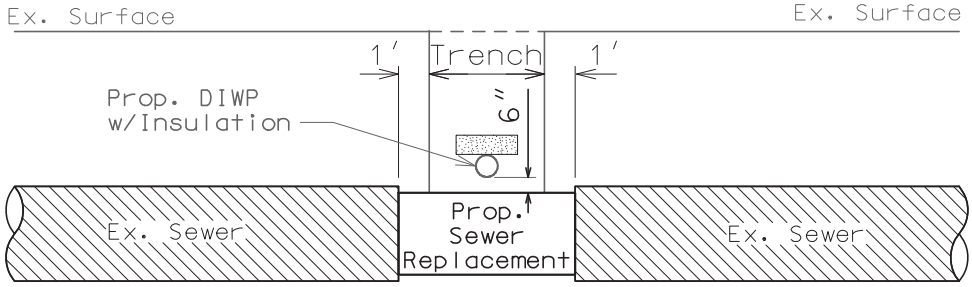
Profile View Along Water Main Centerline

SEWER CROSSING DETAIL A.2

Water Main 6" Above Sewer - Replace Sewer



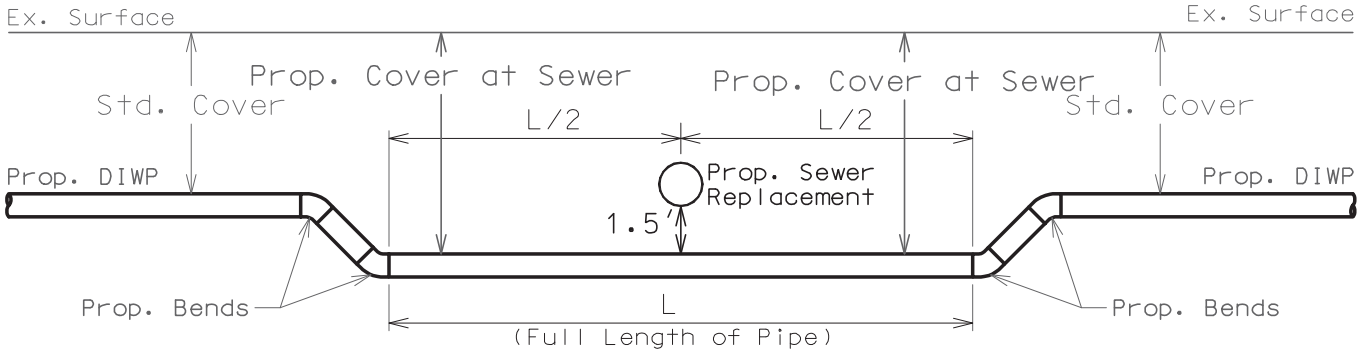
Profile View Along Water Main Centerline



Profile View Along Sewer Centerline

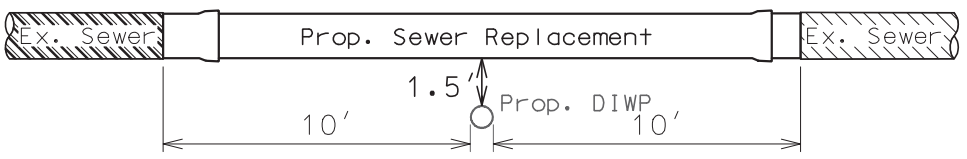
SEWER CROSSING DETAIL B.2

Water Main 1.5' Below Sewer - Replace Sewer



Profile View Along Water Main Centerline





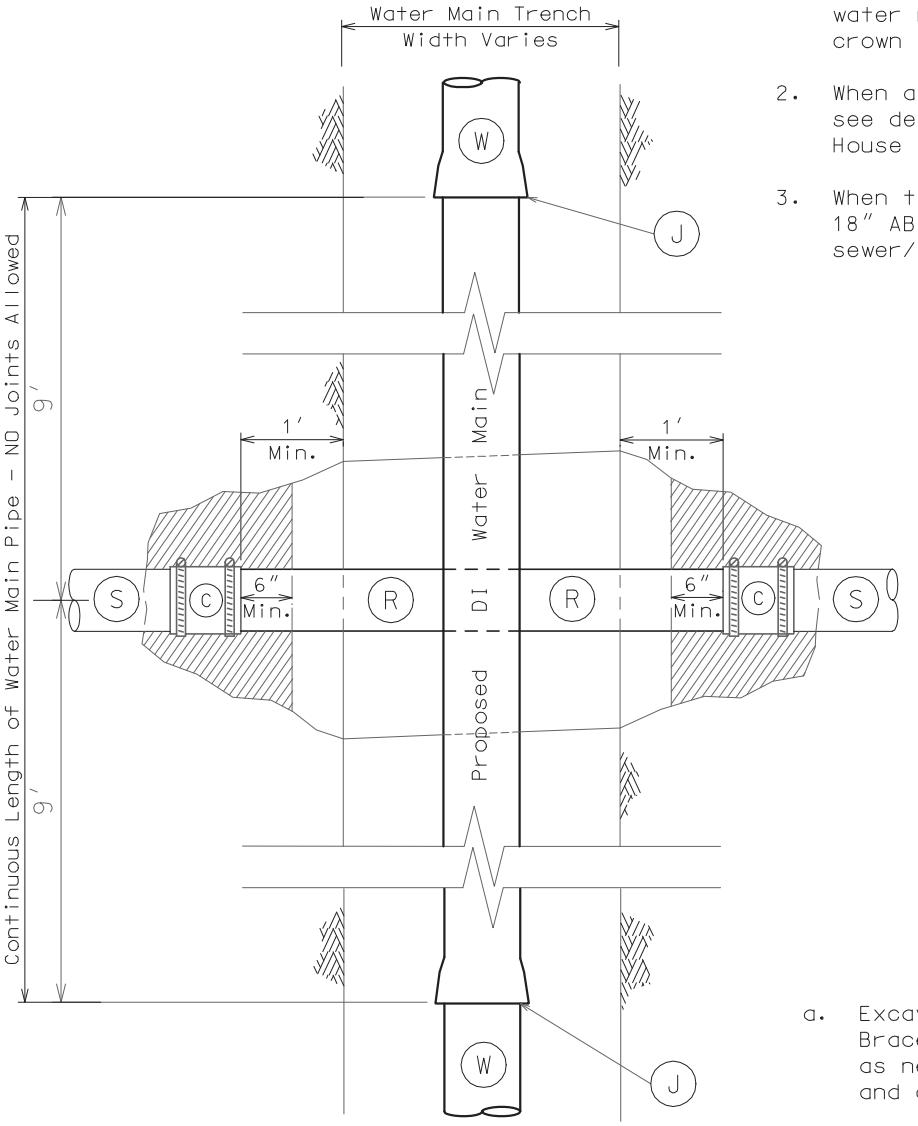
Profile View Along Sewer Centerline

SEWER CROSSING DETAIL

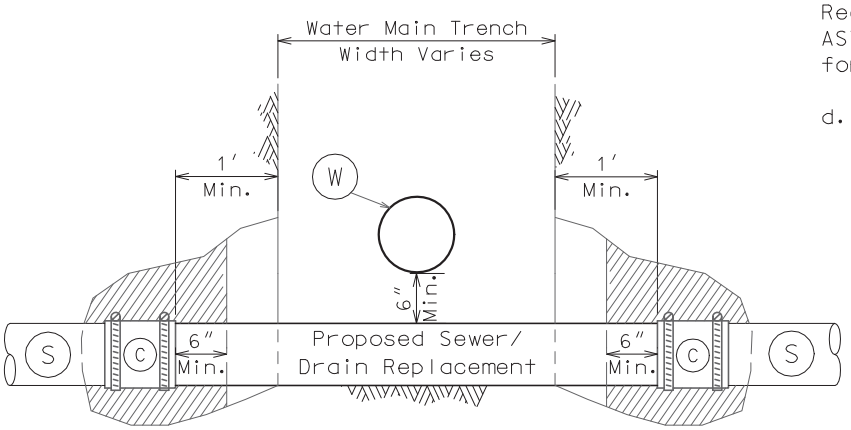
REV:07.12

D-50

SHT. 3 OF 3



PLAN
No Scale



PROFILE THROUGH SEWER/DRAIN
No Scale

GENERAL NOTES

1. Replace the sewer/drain when the invert of the water main is LESS than 18" ABOVE the crown of the sewer/drain.
2. When a water main crosses UNDER a sewer/drain, see detail "Water Mains Crossing Under Sewers & House Drains."
3. When the invert of the water main is MORE than 18" ABOVE the crown of the sewer/drain, no sewer/drain replacement is required.

KEY TO SYMBOLS

- (W) Proposed DI Water Main
- (J) Proposed DI Water Main Joint (Continuous Pipe Between Joints)
- (S) Existing Sewer or House Drain
- (R) Proposed Sewer/Drain Replacement
- (C) Proposed ASTM C1173 Flexible Transition Coupling for Sewer Piping
- Proposed Bentonite Seal
- Undisturbed Soil

SEWER/DRAIN REPLACEMENT NOTES

a. Excavate as needed to replace sewer/drain. Brace and shore trenches and excavations as needed to provide safe working conditions and comply with applicable requirements.

b. Cut existing sewer/drain to remove section to be replaced; breaking or cracking is not allowed.

c. Replace the sewer/drain with a continuous length of ductile iron pipe, the same size as the sewer/drain, cut to fit. Reconnect the sewer/drain with ASTM C1173 Flexible Transition Couplings for Sewer Pipe.

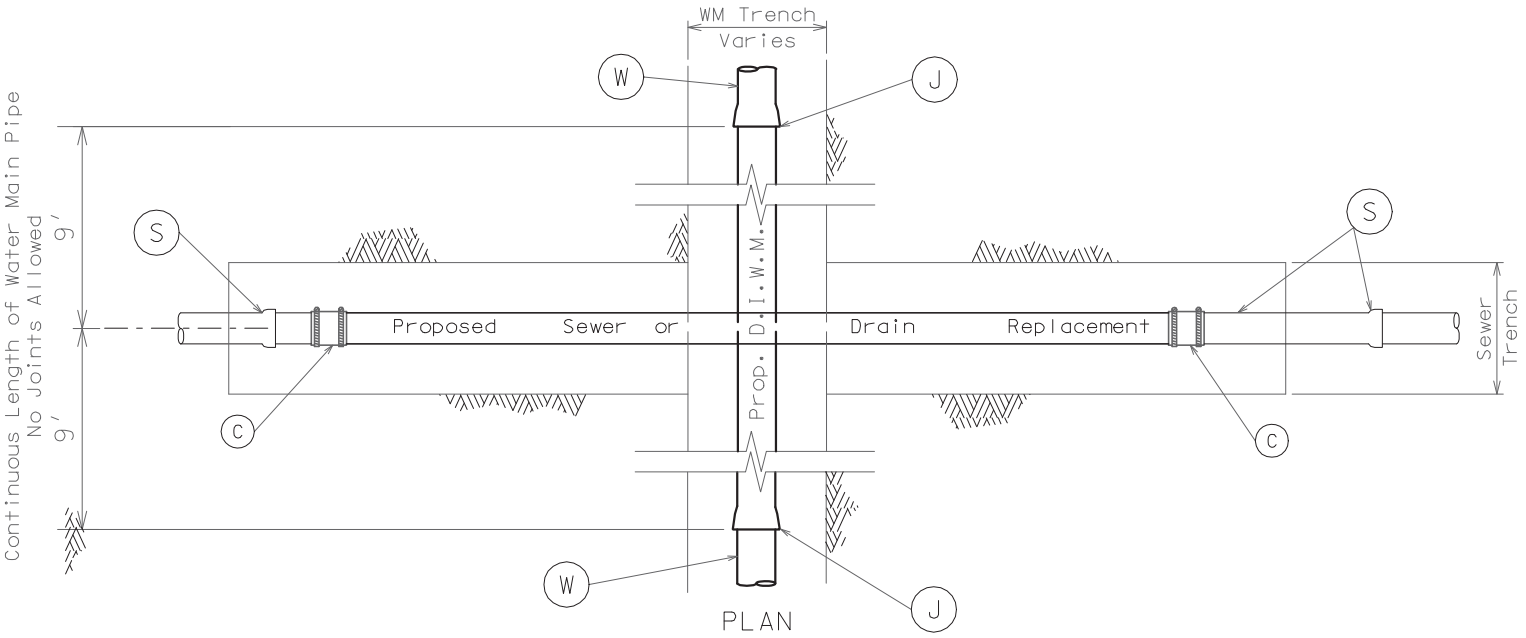
d. Encase the couplings in medium bentonite chips ($^{1}/_{4}$" – $^{3}/_{8}$") mixed with enough clean water to form a stiff clay. Pack the excavations surrounding the couplings to seal off leaks.

e. Center a length of water main pipe (18' typically) over the sewer/drain crossing.

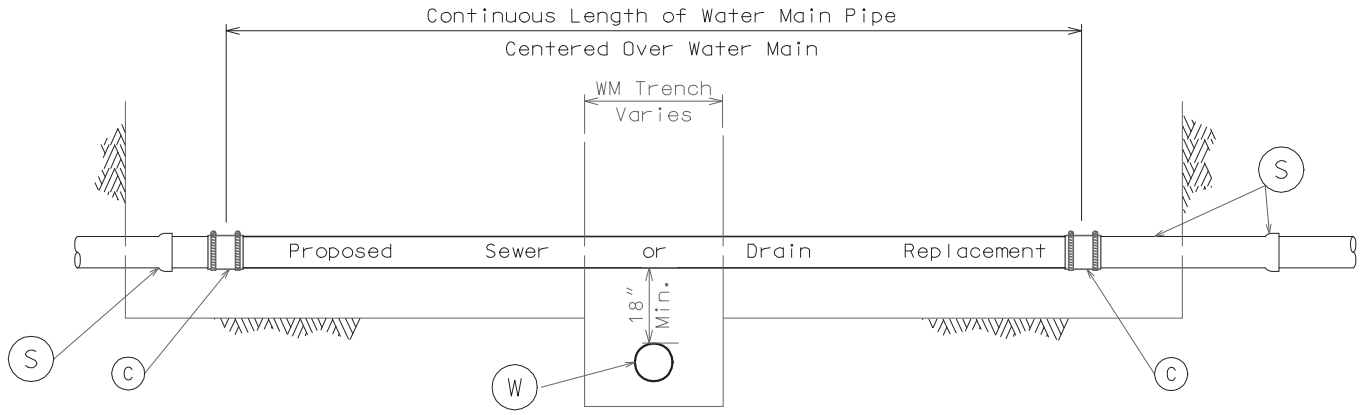
f. Except where bentonite seals are shown, backfill using typical standards.

g. Comply with IL EPA requirements (modified and approved by IL EPA November 13, 2007).

WATER MAINS CROSSING OVER SEWERS & HOUSE DRAINS



PLAN
No Scale



PROFILE THROUGH SEWER/DRAIN
No Scale

GENERAL NOTES

1. Replace the sewer/drain in all cases when a water main crosses UNDER the sewer/drain.
2. When a water main crosses OVER a sewer/drain, see detail "Water Mains Crossing Over Sewers & House Drains."

KEY TO SYMBOLS

- (W) Proposed DI Water Main
- (J) Proposed DI Water Main Joint (Continuous Pipe Between Joints)
- (S) Existing Sewer or House Drain
- (R) Proposed Sewer/Drain Replacement
- (C) Proposed ASTM C1173 Flexible Transition Coupling for Sewer Piping
- Undisturbed Soil

SEWER/DRAIN REPLACEMENT NOTES

a. Minimum clearance between the crown of the water main and the invert of the sewer/drain is 18".

b. Excavate as needed to replace sewer/drain. Brace and shore trenches and excavations as needed to provide safe working conditions and comply with applicable requirements.

c. Cut existing sewer/drain to remove section to be replaced; breaking or cracking is not allowed.

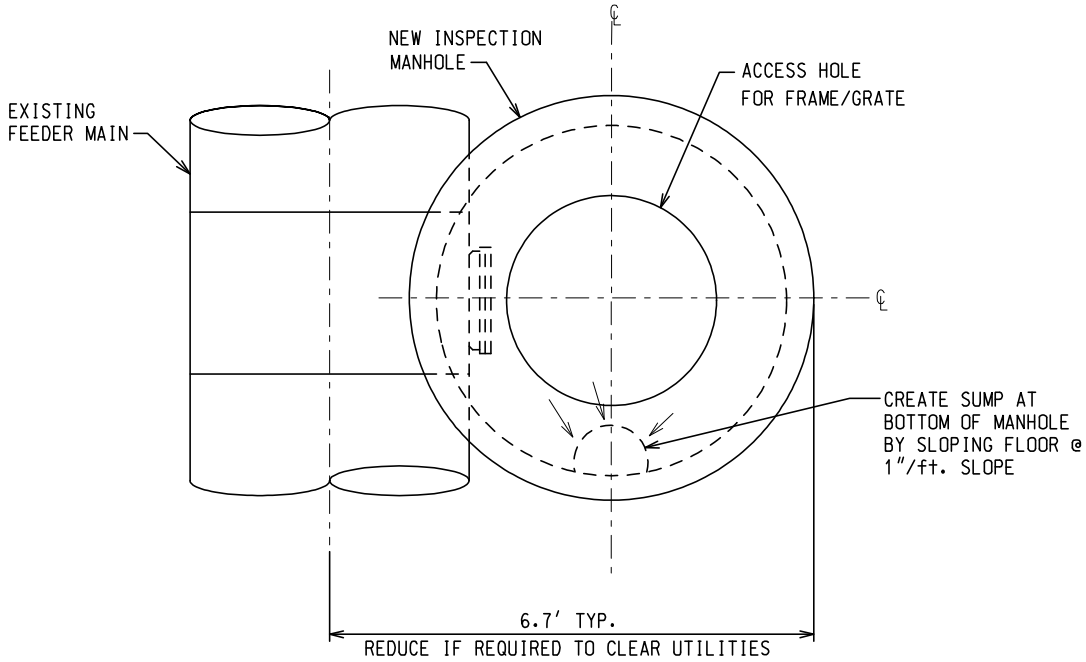
d. Replace the sewer/drain with a continuous length of ductile iron pipe, the same size as the sewer/drain, cut to fit. Reconnect the sewer/drain with ASTM C1173 Flexible Transition Couplings for Sewer Pipe.

e. Center a length of water main pipe (18' typically) under the sewer/drain crossing.

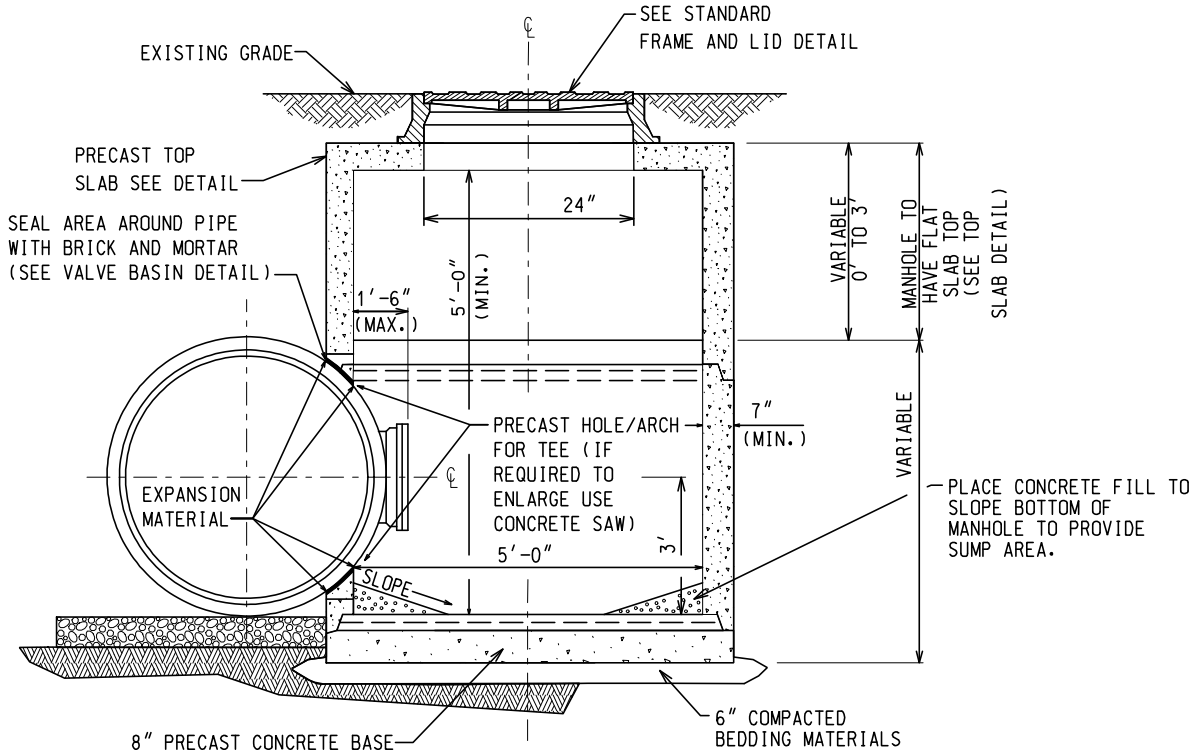
f. Backfill using typical standards.

g. Comply with IL EPA requirements.

WATER MAINS CROSSING UNDER SEWERS & HOUSE DRAINS

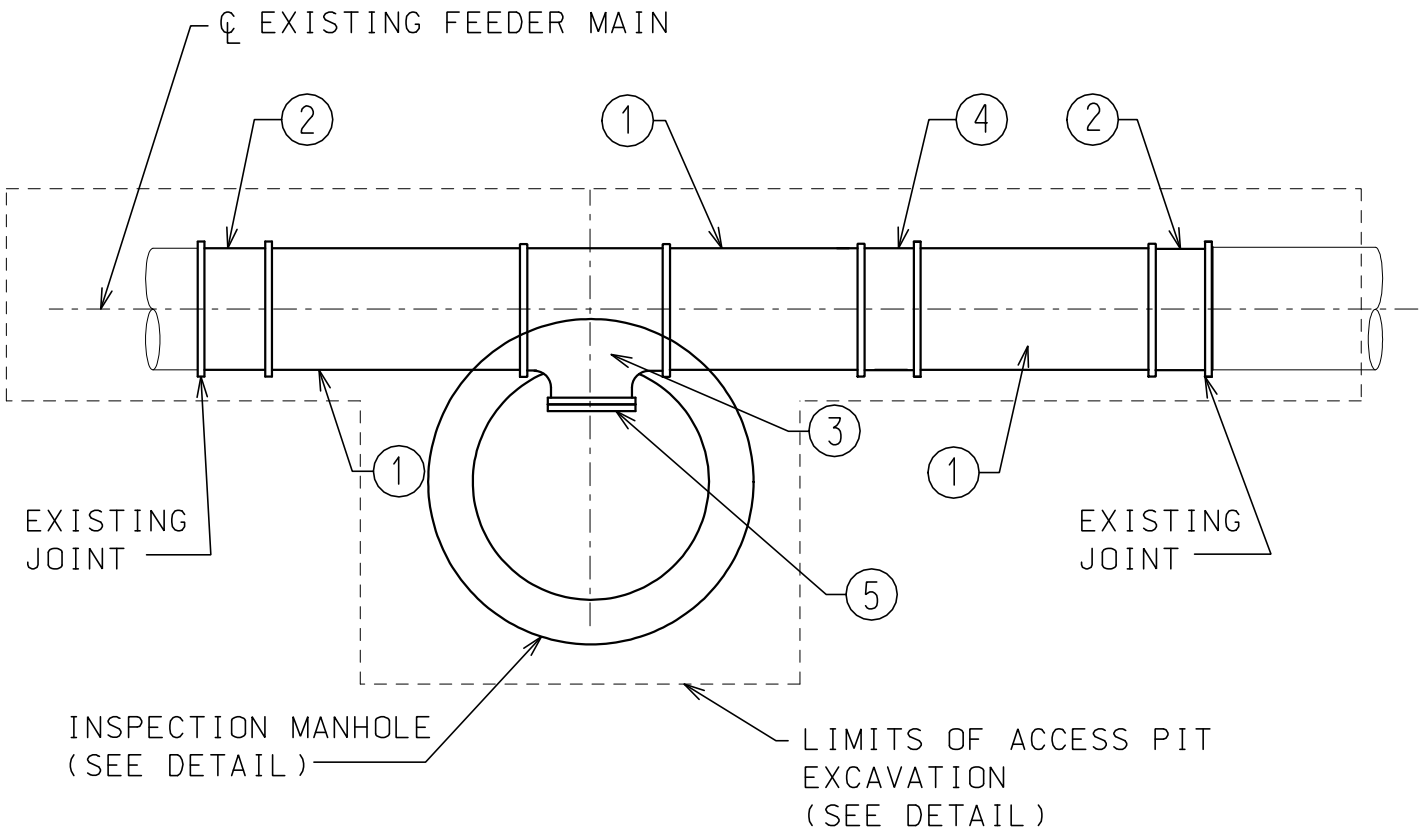


PLAN



SECTIONAL VIEW

NOTE:
ALL OPENINGS IN BASIN SHALL BE SEALED WITH "NO SHRINK" GROUT.

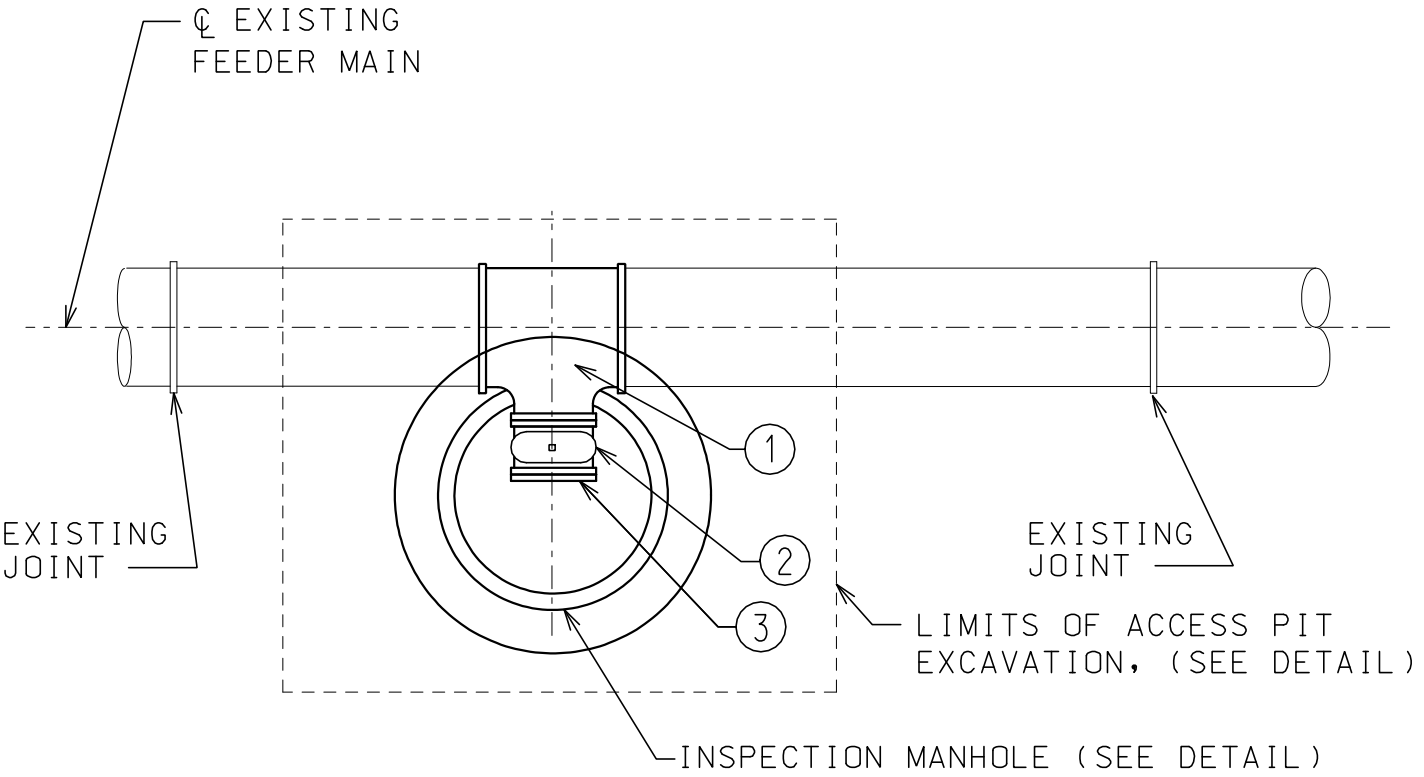


NOTES

1. DUCTILE IRON WATER MAIN
2. ADAPTER P.C.C.P. TO DUCTILE IRON
3. 24" BRANCH DUCTILE IRON 3BMJ TEE
4. MJ SLEEVE
5. 24" MJ PLUG AND GASKET
6. MEGALUGS AT ALL MJ JOINTS

THIS DETAIL IS PROVIDED FOR
REFERENCE PURPOSES ONLY

INSPECTION MANHOLE INSTALLATION
REPLACE PIPE



NOTES

1. TAPPING SADDLE WITH 24" FLANGE
   ENCASE BURIED METAL PARTS IN CONCRETE.
   CONCRETE MUST NOT CONTAIN FLY ASH.

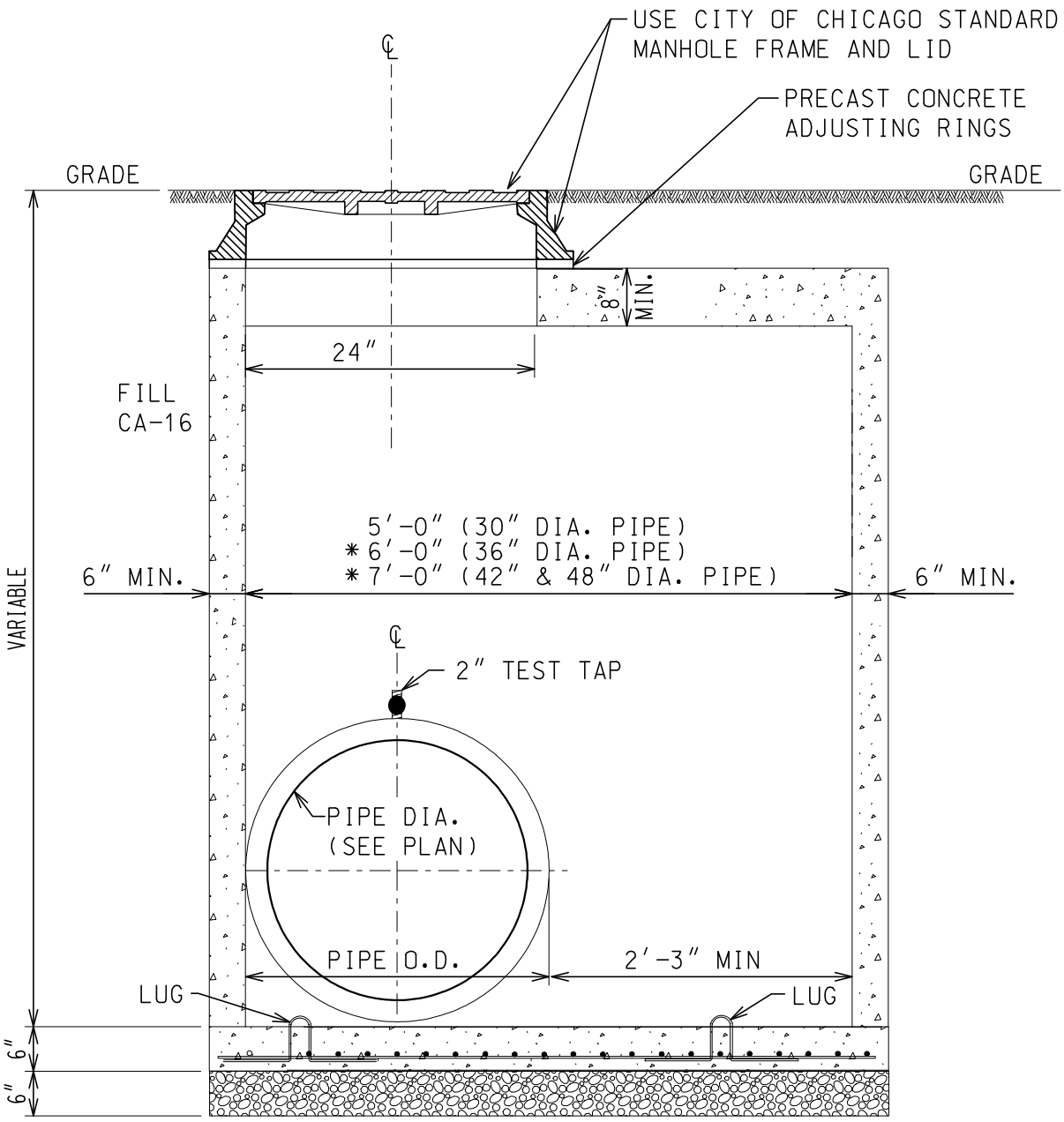
2. TAPPING VALVE

3. 24" BLIND FLANGE AND GASKET.

TYPICAL FOR INSTALLATION ADJACENT TO BUTTERFLY VALVES OVER 24" DIAMETER, UNLESS OTHERWISE NOTED ON THE DRAWINGS OR DIRECTED BY THE COMMISSIONER.

THIS DETAIL IS PROVIDED FOR
REFERENCE PURPOSES ONLY

INSPECTION MANHOLE
INSTALLATION ALTERNATIVE A - PIPE TAP



SECTIONAL VIEW

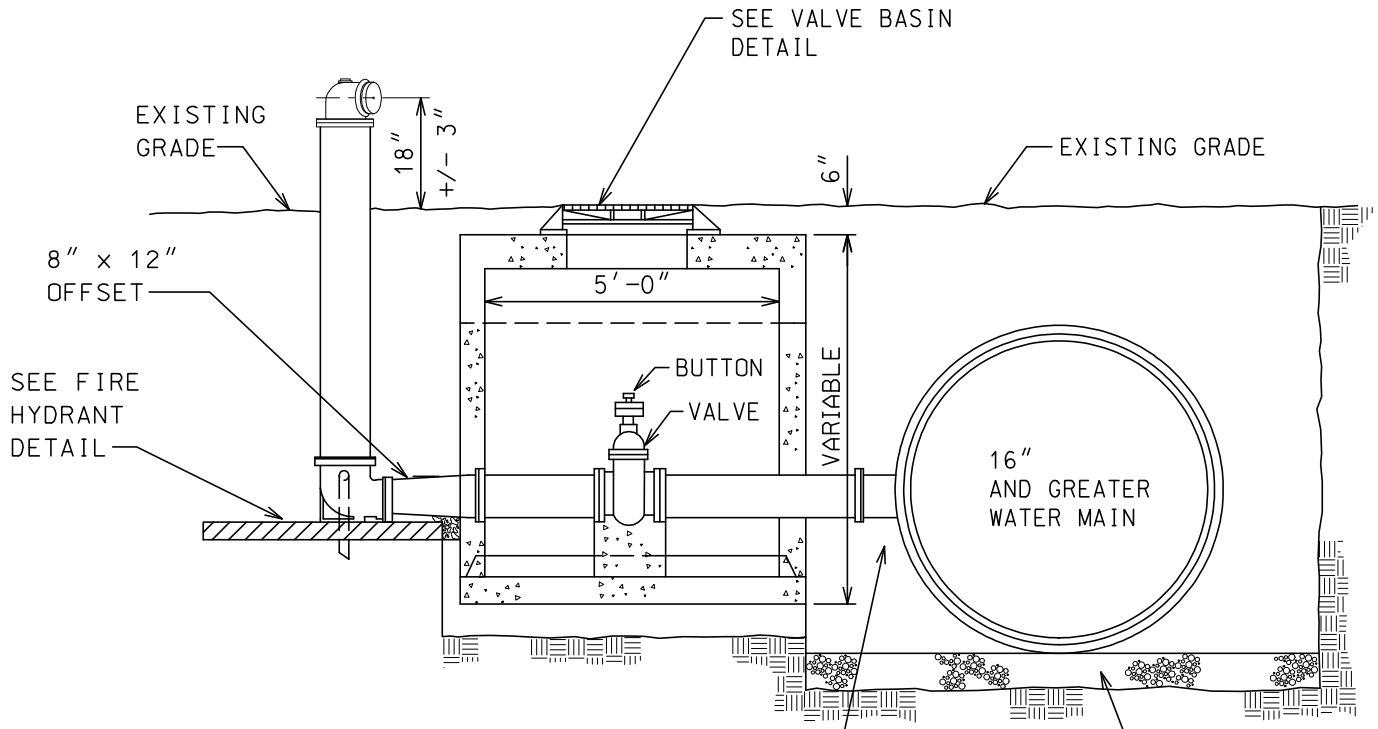
SCALE: N.T.S.

NOTE:

1. PROVIDE 6″ THICK COMPACTED CA-16 BEDDING
2. USE PRECAST CONCRETE BASE OR PROVIDE 6″ THICK IDOT CLASS 'SI' CONCRETE BASE POURED IN PLACE WITH #4 EPOXY COATED REBARS 4″ C/C BOTH WAYS.
3. PROVIDE FOUR #4 REBAR LUGS FOR HANDLING. CUT THE LUGS AFTER PLACING THE SLAB IN POSITION.
4. PRECAST CONCRETE TOP SLAB TO BE USED WHERE HEAD ROOM IS REQUIRED.
5. THE LOCATION OF MANHOLE TO BE DETERMINED ON INDIVIDUAL BASIS.

*6. OPENING ON TOP SLAB TO BE CENTERED OVER TEST TAP.

PITOMETER TAP BASIN
PRECAST CONCRETE

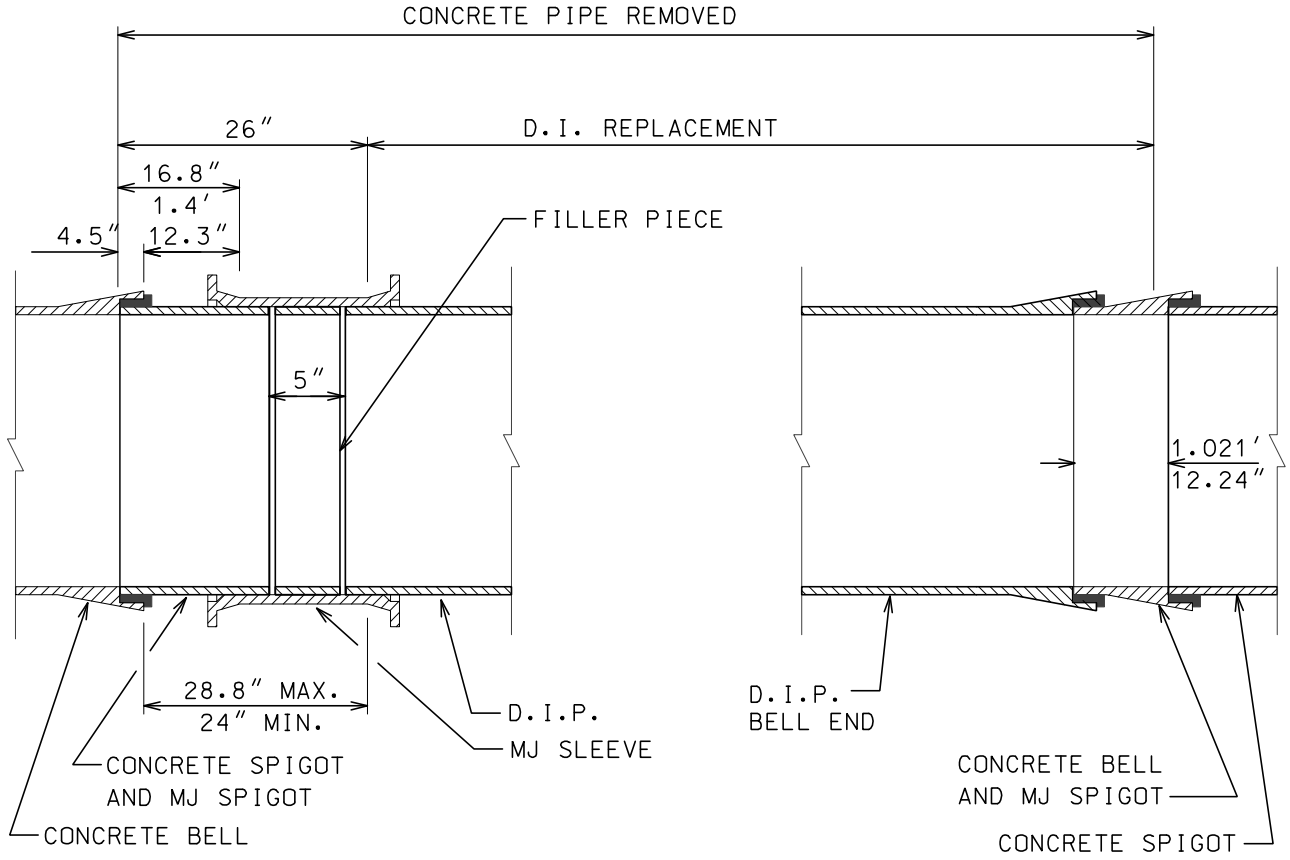


NOTE:
INSTALL THRUST RESTRAINT GLAND ON ALL MECHANICAL JOINTS.

FIRE HYDRANT SETTING
16″ & LARGER WATER MAIN

REV:04.09

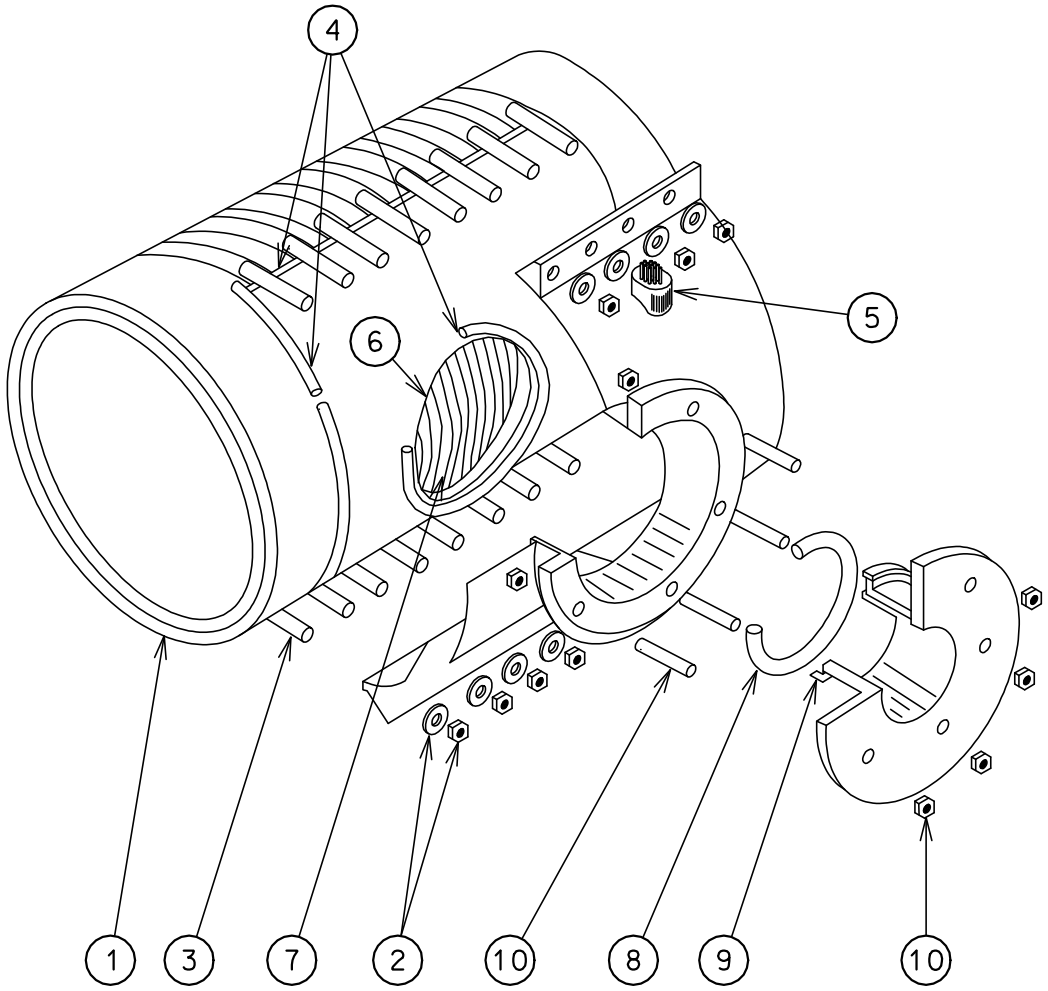
FM-5



(TYP. P.C.C.P. BELL
TO D.I. SPIGOT)

(TYP. D.I. BELL
TO P.C.C.P. SPIGOT)

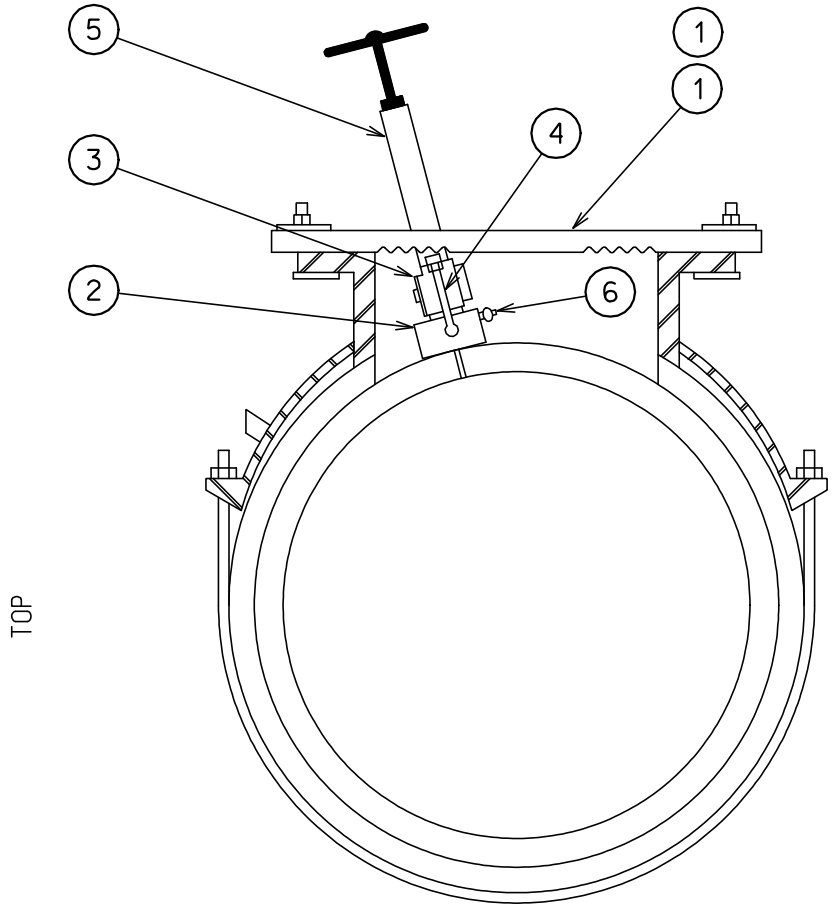
THIS DETAIL IS PROVIDED FOR
REFERENCE PURPOSES ONLY



SKETCH A

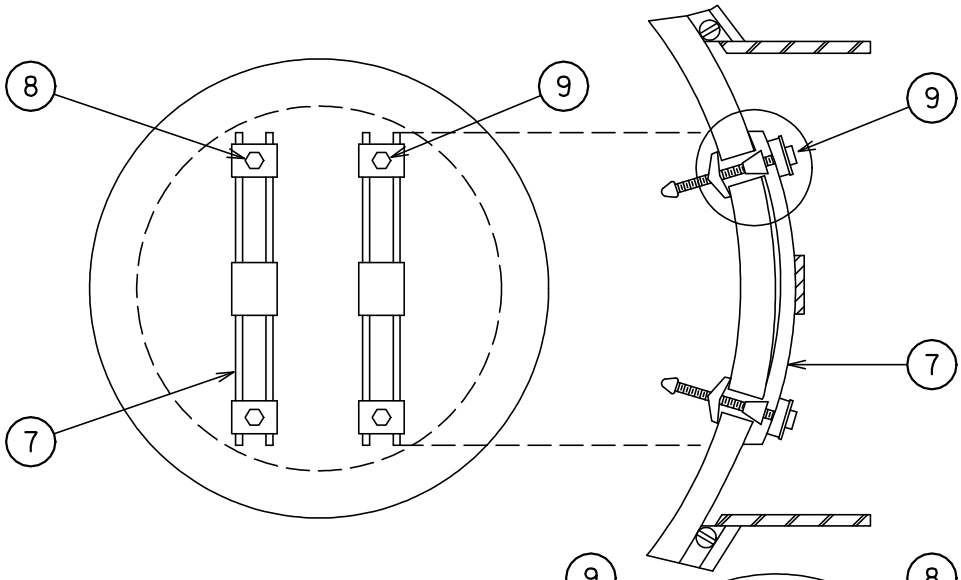
1. CONCRETE CYLINDER PIPE
2. NUTS AND BOLTS
3. U-BOLT STRAPS
4. RUBBER GASKETS
5. GROUT OPENING
6. OPENING
7. PRESTRESSING WIRES
8. RUBBER GLAND GASKET
9. GLAND
10. STUDS AND NUTS

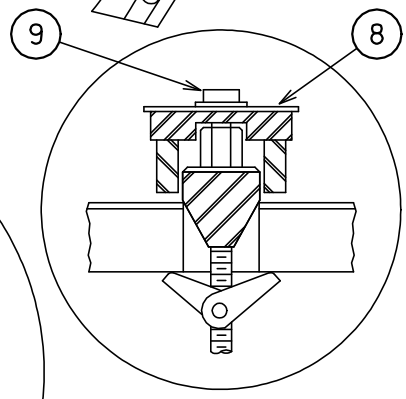
NOTE: INSTALL BLIND FLANGE VALVE AS REQUIRED



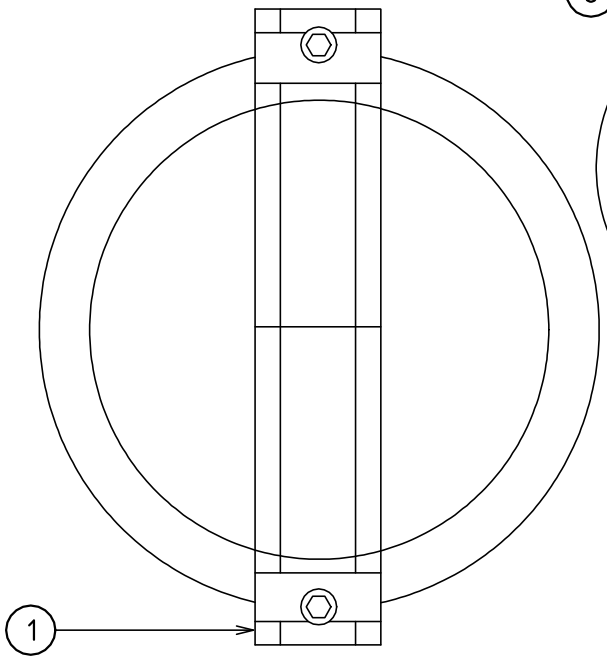
SKETCH B

1. FRAME
2. GLAND
3. CORPORATION STOP
4. JACKING BOLT
5. TOGGLE INSERTING MACHINE
6. SEAL CHECK COCK



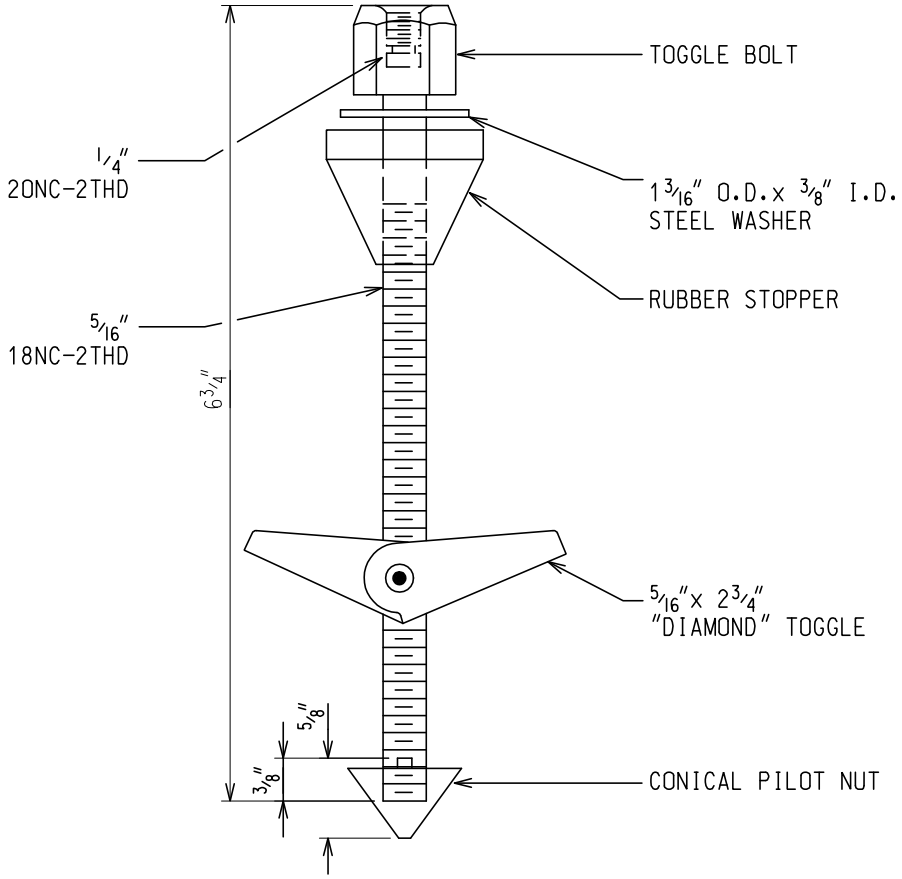


DETAIL VIEW

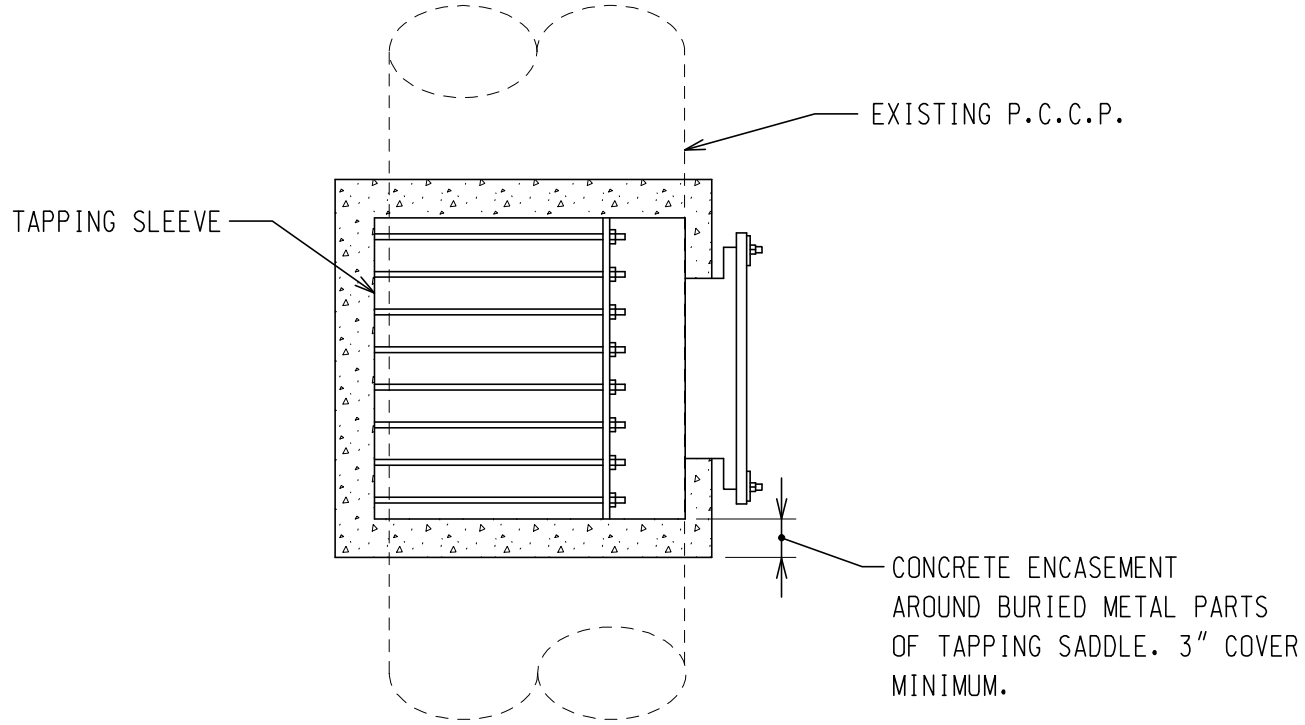


SKETCH C

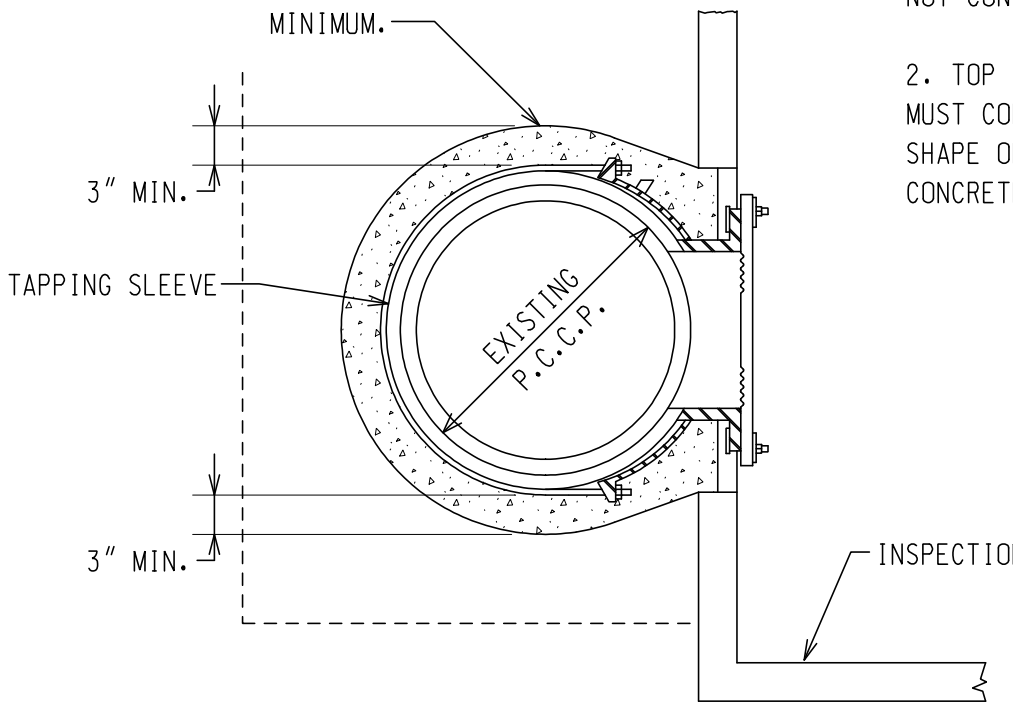
1 FRAME
7 RIBS
8 CLAMP PLATE
9 SCREWS


TOGGLE BOLT
1/4"
20NC-2THD
1 3/16" O.D.x 3/8" I.D.
STEEL WASHER
RUBBER STOPPER
5/16"
18NC-2THD
6 3/4"
5/16"X 2 3/4"
"DIAMOND" TOGGLE
5/8"
3/8"
CONICAL PILOT NUT

SKETCH D



PLAN



SECTION

NOTES:

1. CONCRETE ENCASEMENT MUST NOT CONTAIN FLY ASH.

2. TOP OF ENCASEMENT CONCRETE MUST CONFORM TO THE ROUND SHAPE OF PIPE. DO NOT FINISH CONCRETE FLAT OVER TOP OF PIPE.

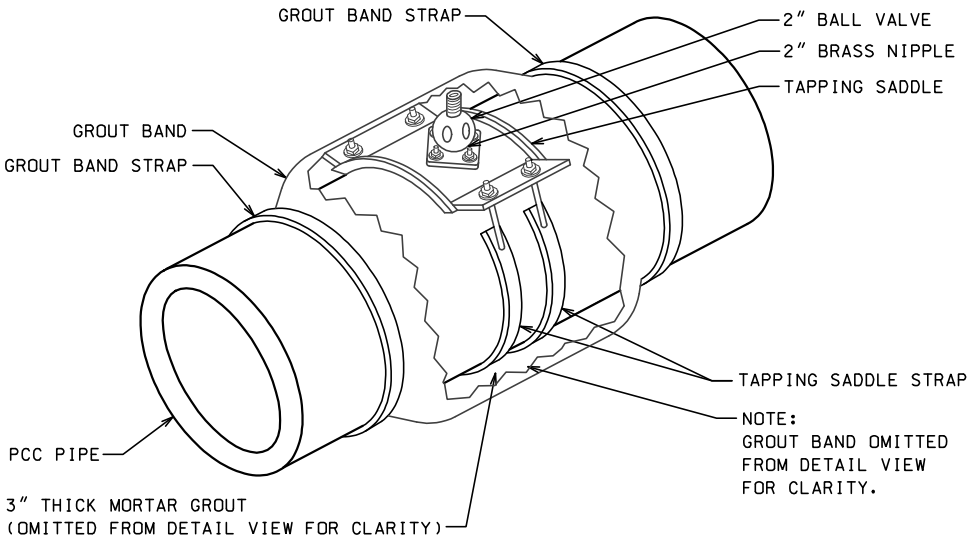
REV:04.07

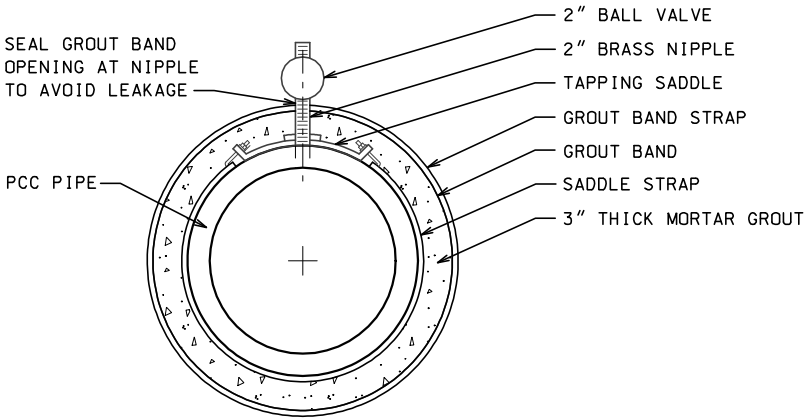
CONCRETE ENCASEMENT OF TAPPING SLEEVE

FM-20

REV:06.10

TEST TAP DETAIL





SECTION AT TAP CONNECTION

NOTES:

1. PIPE SURFACE RECEIVING A CEMENT MORTAR COATING MUST BE THOROUGHLY CLEAN AND WETTED WITH WATER JUST PRIOR TO PLACING THE CEMENT MORTAR.

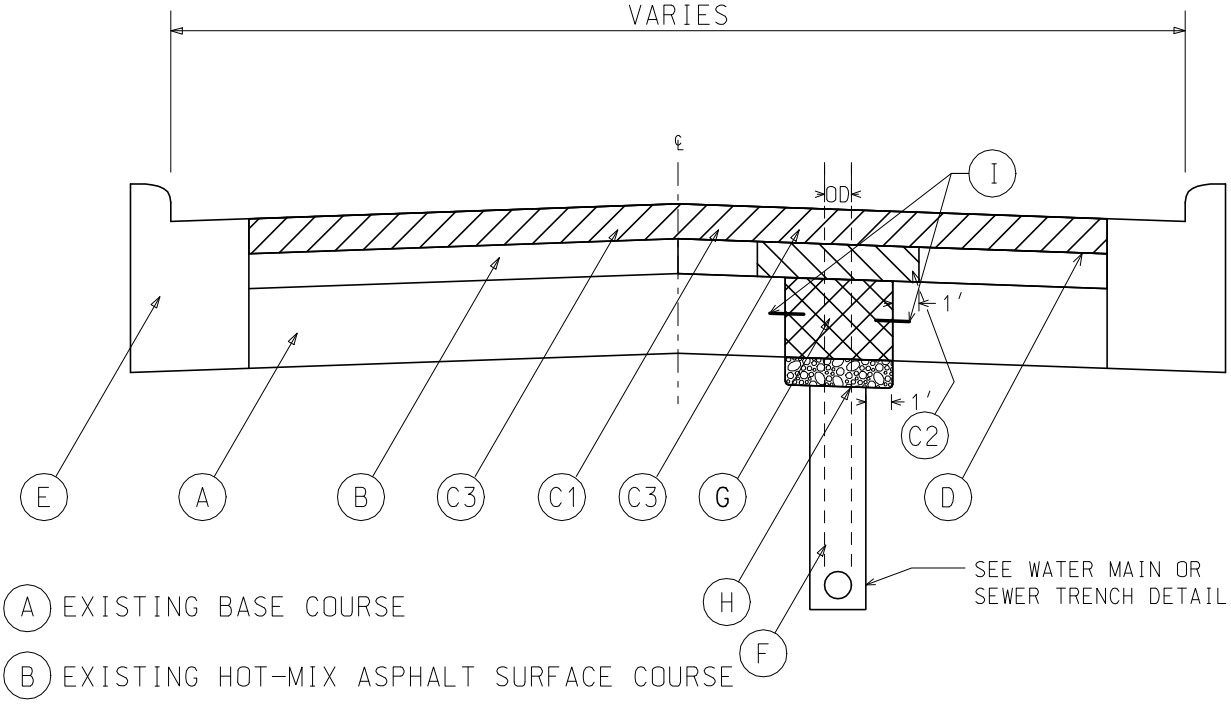
2. PLACE A GROUT BAND AROUND THE PIPE AND TAPPING SADDLE STRAPS. PROVIDE SUFFICIENT LENGTH OF BAND TO ESSENTIALLY ENCIRCLE THE PIPE AND SECURE THE BAND IN SUCH A MANNER THAT MORTAR GROUT WILL BE CONTAINED WITH LITTLE OR NO LEAKAGE.

3. COMPLETELY FILL THE BAND WITH MORTAR IN ONE OPERATION BY FILLING FROM ONE SIDE UNTIL THE MORTAR RISES ON THE OPPOSITE SIDE, AND THEN ROD OR AGITATE ON BOTH SIDES OF THE PIPE ALTERNATELY TO SETTLE THE MORTAR. DO NOT AGITATE THE MORTAR FOR AT LEAST 15 MINUTES TO ALLOW EXCESS WATER TO SEEP THROUGH THE GROUT BAND AND TO ALLOW THE MORTAR TO STIFFEN. AFTER THIS PERIOD ADD MORE MORTAR, AS NECESSARY, TO COVER THE SADDLE AND STRAPS COMPLETELY.

4. THE GAP AT THE TOP OF THE GROUT BAND MUST BE PROTECTED FROM PENETRATION OF BACKFILL INTO THE MORTAR EITHER BY ALLOWING THE MORTAR TO STIFFEN, OR BY CAPPING WITH A STIFF MORTAR MIX, OR BY COVERING WITH A STRUCTURALLY PROTECTIVE MATERIAL. THE BAND MUST NOT BE REMOVED FROM THE JOINT.

5. THE MORTAR USED AT JOINTS MUST CONSIST OF ONE PART PORTLAND CEMENT TO NO MORE THAN 3 PARTS CLEAN SAND MIXED WITH WATER. MORTAR MUST BE MIXED WITH WATER UNTIL IT HAS THE CONSISTENCY OF THICK CREAM. DURING PERIODS OF COLD WEATHER THE MORTAR MUST BE ADEQUATELY PROTECTED FROM FREEZING.

THIS DETAIL IS PROVIDED FOR
REFERENCE PURPOSES ONLY



(A) EXISTING BASE COURSE

(B) EXISTING HOT-MIX ASPHALT SURFACE COURSE

(C1) EXISTING PAVEMENT REMOVED BY MECHANICAL MILLING

(C2) HOT-MIX ASPHALT BINDER COURSE $1\frac{1}{2}$"

(C3) HOT-MIX ASPHALT SURFACE COURSE $1\frac{1}{2}$" OR $1\frac{3}{4}$"

(D) BITUMINOUS MATERIAL (PRIME COAT)

(E) EXISTING CURB & GUTTER

(F) SEE UTILITY TRENCH DETAIL. CLSM TO USED FROM DIVISION ST. TO ROOSEVELT RD. AND HALSTED ST. TO LAKE MICHIGAN.

(G) BASE MATERIAL (7" PCC BASE COURSE) SEE NOTE 1.

(H) SUB-BASE GRANULAR MATERIAL, TYPE B - 6" (OMIT IF CLSM USED AS TRENCH BACKFILL)

(I) #5 EPOXY COATED TIE BARS 18" LONG AT 30" C/C DRILLED AND GROUTED INTO EXISTING CONCRETE BASE (OMIT IF CLSM USED AS TRENCH BACKFILL)

1. WHEN TRENCH BACKFILL IS COMPLETE POUR CONCRETE BASE COURSE FLUSH TO TOP AND AT A MINIMUM BOTTOM OF EXISTING PAVEMENT GRADE. THE ADDITIONAL THICKNESS IS TO BE REMOVED DURING PAVEMENT RESTORATION WORK. FINAL CONCRETE BASE THICKNESS MUST BE PER C.D.O.T./I.D.O.T. REQUIREMENTS. WHEN THE THICKNESS OF THE EXISTING ROADWAY BASE MATERIAL IS LESS THAN THE MINIMUM THICKNESS NOTED BELOW, THE BOTTOM OF BASE MATERIAL WILL EXTEND BELOW THE BOTTOM OF THE BASE MATERIAL OF THE EXISTING PAVEMENT.

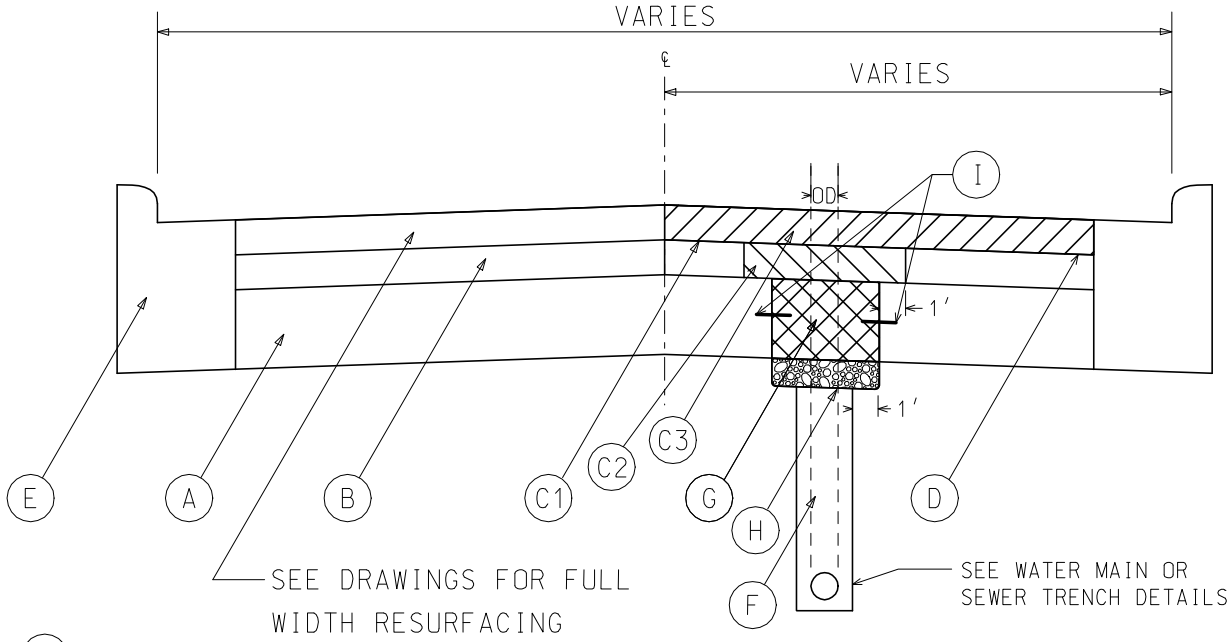
2. FOR ADDITIONAL INFORMATION AND DETAILS SEE PAGES 39 & 40 AND SHEET A-2-2A OF C.D.O.T. REGULATIONS FOR OPENINGS, CONSTRUCTION AND REPAIR IN PUBLIC WAY.

3. PLATE ALL UNATTENDED EXCAVATION IN PAVEMENT AREAS AND SECURE PLATES TO PAVEMENT AND PROVIDE BARRIERS IN PARKWAY AREAS.

PAVEMENT RESTORATION DETAIL
FOR RESIDENTIAL STREETS

REV:06.10

R-2



(A) EXISTING BASE COURSE

(B) EXISTING HOT-MIX ASPHALT SURFACE COURSE

(C1) EXISTING PAVEMENT REMOVED BY MECHANICAL MILLING

(C2) HOT-MIX ASPHALT BINDER COURSE $1\frac{1}{2}$"

(C3) HOT-MIX ASPHALT SURFACE COURSE, $1\frac{1}{2}$" OR $1\frac{3}{4}$"

(D) BITUMINOUS MATERIAL (PRIME COAT)

(E) EXISTING CURB & GUTTER

(F) SEE UTILITY TRENCH DETAIL. CLSM IS TO BE USED FROM DIVISION ST. TO ROOSEVELT RD. AND HALSTED ST. TO LAKE STREET.

(G) BASE COURSE (9" PCC BASE COURSE) SEE NOTE 1.

(H) SUB-BASE GRANULAR MATERIAL, TYPE B - 6" (OMIT IF CLSM USED AS TRENCH BACKFILL)

(I) #5 EPOXY COATED TIE BARS 18" LONG AT 30" C/C DRILLED AND GROUTED INTO EXISTING CONCRETE BASE (OMIT IF CLSM USED AS TRENCH BACKFILL)

1. WHEN TRENCH BACKFILL IS COMPLETE POUR CONCRETE BASE COURSE FLUSH TO TOP AND AT A MINIMUM BOTTOM OF EXISTING PAVEMENT GRADE. THE ADDITIONAL THICKNESS IS TO BE REMOVED DURING PAVEMENT RESTORATION WORK. FINAL CONCRETE BASE THICKNESS MUST BE PER C.D.O.T./I.D.O.T. REQUIREMENTS. WHEN THE THICKNESS OF THE EXISTING ROADWAY BASE MATERIAL IS LESS THAN THE MINIMUM THICKNESS NOTED BELOW, THE BOTTOM OF BASE MATERIAL WILL EXTEND BELOW THE BOTTOM OF THE BASE MATERIAL OF THE EXISTING PAVEMENT.
2. FOR ADDITIONAL INFORMATION AND DETAILS SEE PAGES 39 & 40 AND SHEET A-2-2A OF C.D.O.T. REGULATIONS FOR OPENINGS, CONSTRUCTION AND REPAIR IN PUBLIC WAY.
3. PLATE ALL UNATTENDED EXCAVATION IN PAVEMENT AREAS AND SECURE PLATES TO PAVEMENT AND PROVIDE BARRIERS IN PARKWAY AREAS.

PAVEMENT RESTORATION DETAIL FOR ARTERIAL STREETS

APPENDIX III
EXAMPLE OUC EFP SUBMITTAL FOR EXCAVATIONS OVER 12 FEET DEEP

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Sheet No.: 1 of 20

Project No.: 2014.1556

Revision No.: -----

Date: August 2014

Design Calculations

Project Title: *W. Bryn Mawr Ave. Trench Box Check and ERS Design*

[redacted]

Purpose of These Calculations:

- Verify trench boxes are adequate for soil conditions.
- Design an earth retention system to facilitate the construction of the 84" sewer main.

Conclusion:

- Trench boxes are adequate as detailed in construction excavation procedure.
- HP 12x53 Piles with a tip embedment of 5.08 ft. and with a maximum spacing of 11" are adequate to retain the soil during excavation activities.
- See S-1 through S-6 for additional details.
- The engineer shall be notified if there is standing water of more than a few feet to assess the adequacy of the earth retention system or if more than 18" of water is to be removed from the excavation, to assess the potential of settlement.
- MKA is not responsible for any potential lateral movement or the potential for settlement caused by the excavation or water removal from the excavation.
- **Contractor is responsible for locating existing utilities and avoiding damage to them during construction.**

[redacted]

Date: August 2014

Date: August 2014

Date: August 2014

The following calculations were prepared under my direct supervision.

[redacted]

[redacted]

[redacted]

[redacted]

Design Calculations

Sheet No.: 2 of 20

Project No.: 2014.1556

Revision No.: -----

Date: August 2014

Assumptions Used In This Calculation:

- Design surcharge = 760 psf
- Design Soil = Stiff Clay
- See calculations for additional assumptions.

Criteria and Material Properties:

- HP: f_y = 50 ksi
- W Shape: f_y = 50 ksi
- Weld: E70XX Electrode
- Timber: 5” Rough Sawn

References and Codes Used In This Calculation:

- AASHTO LRFD 6th Edition
- AISC 13th Edition
- FHWA –RD-75-128
- SPW911 Software
- City of Chicago Department of Water Management Bureau of Engineer Services Contract Drawings

[redacted]

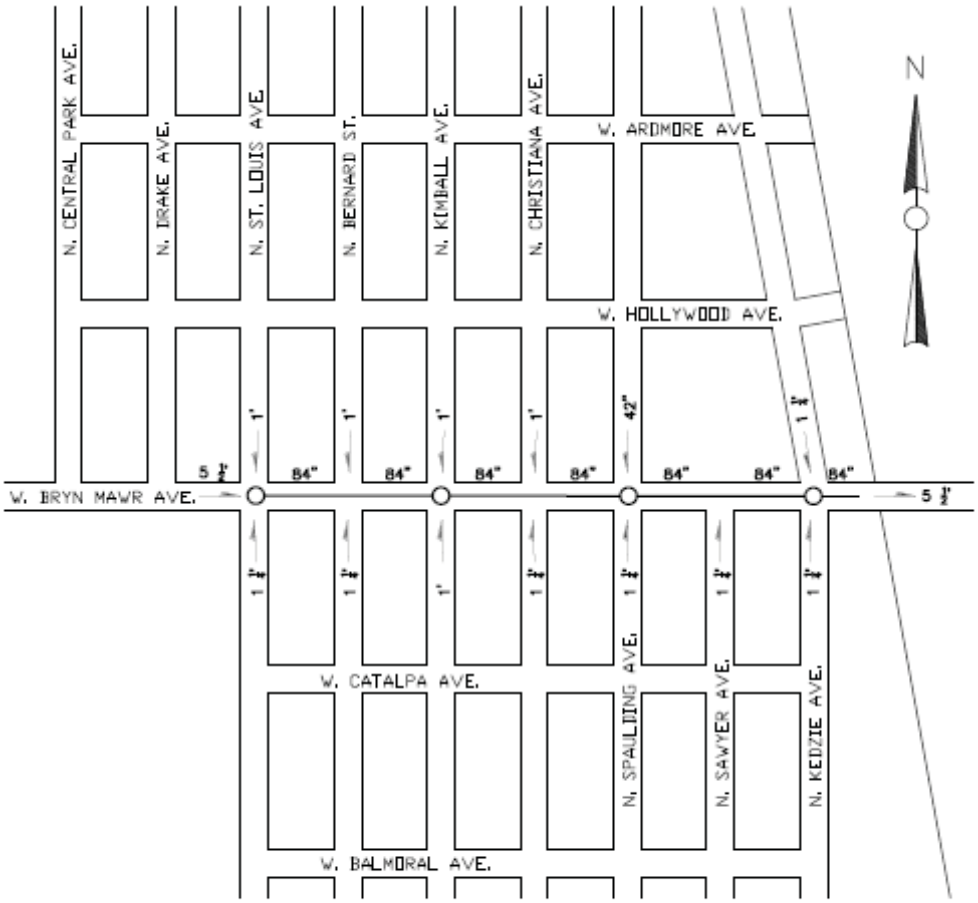
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Situation:

Check trench boxes to resist soil pressures while improving the sewers at:

W. Bryn Mawr Ave.- N. Kedzie Ave. to N. St. Louis Ave.

City of Chicago Department of Water Managment Project No. 6285



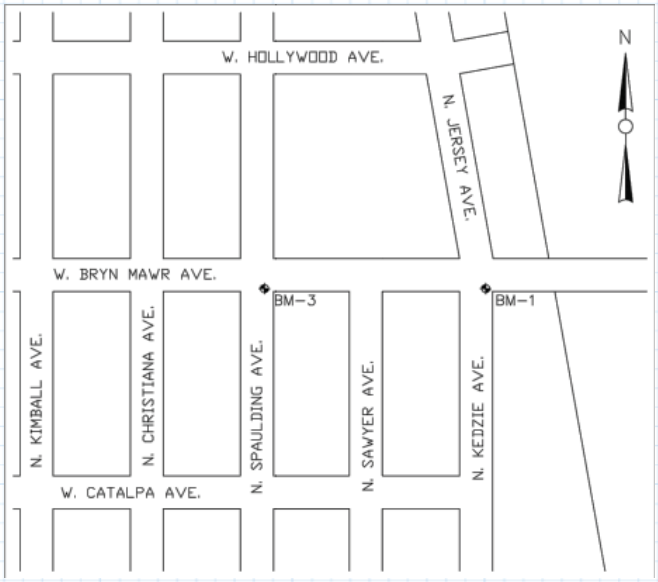
INDEX MAP

N.T.S.

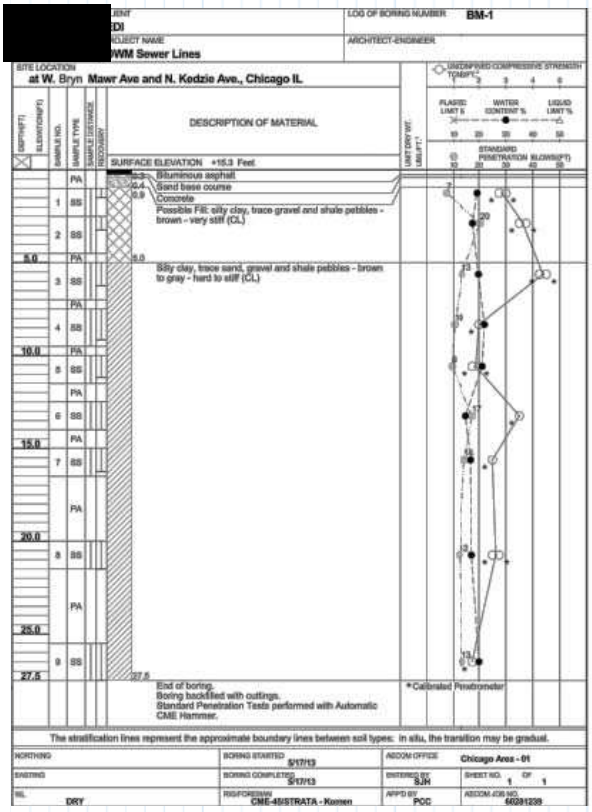
Location map (per City of Chicago Department of Water Managment Bureau of Engineering Services (CDWM) Sheet No. 1)

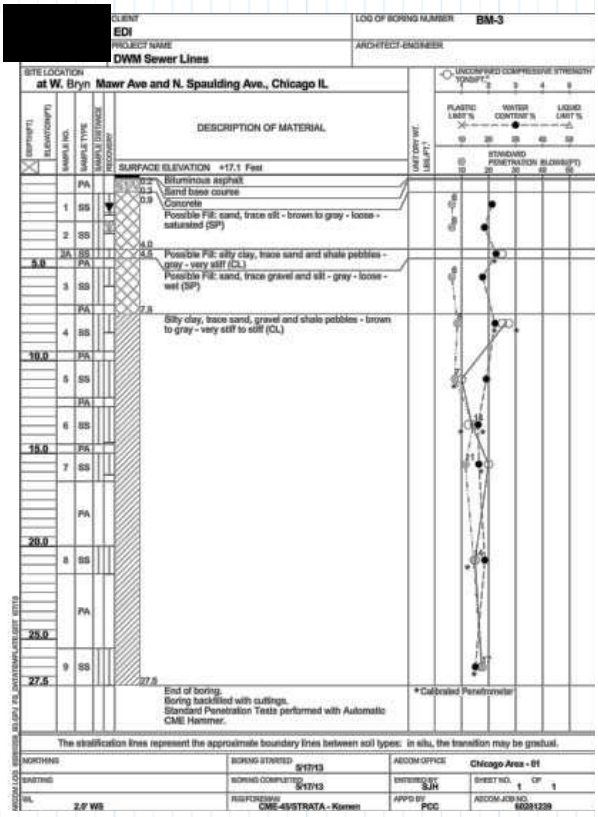
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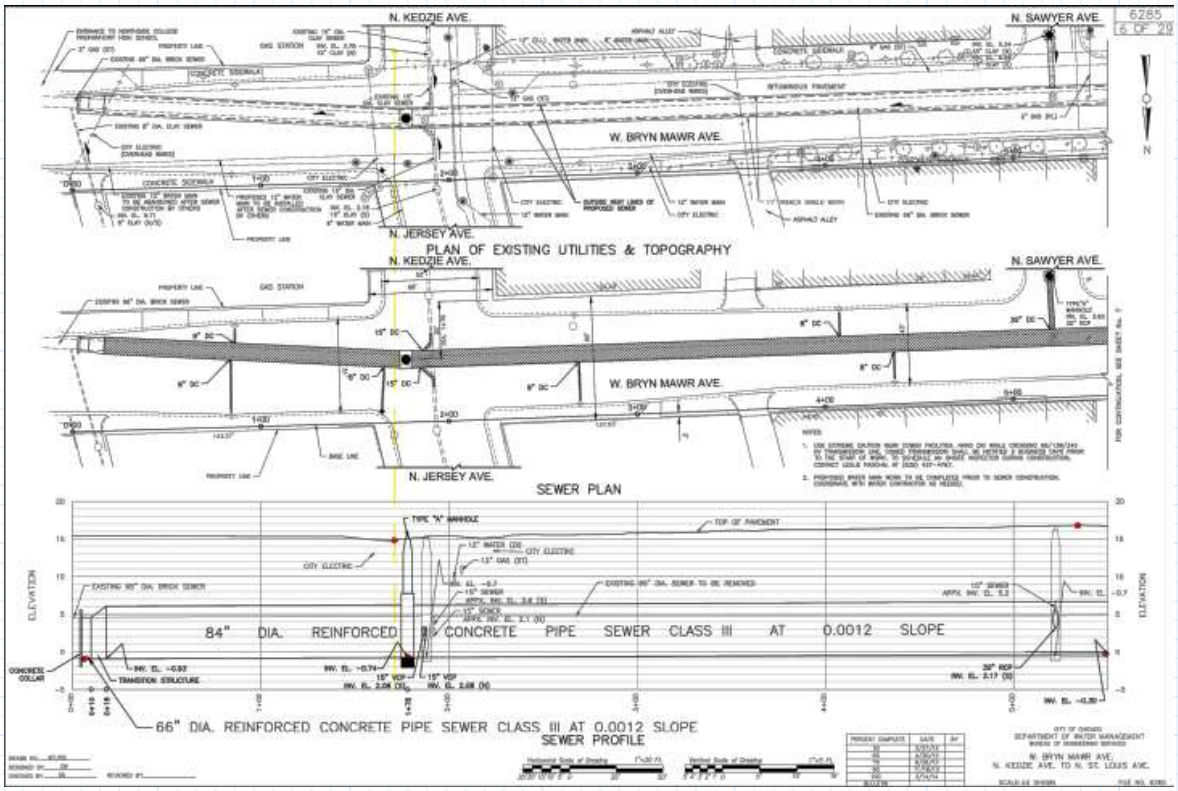
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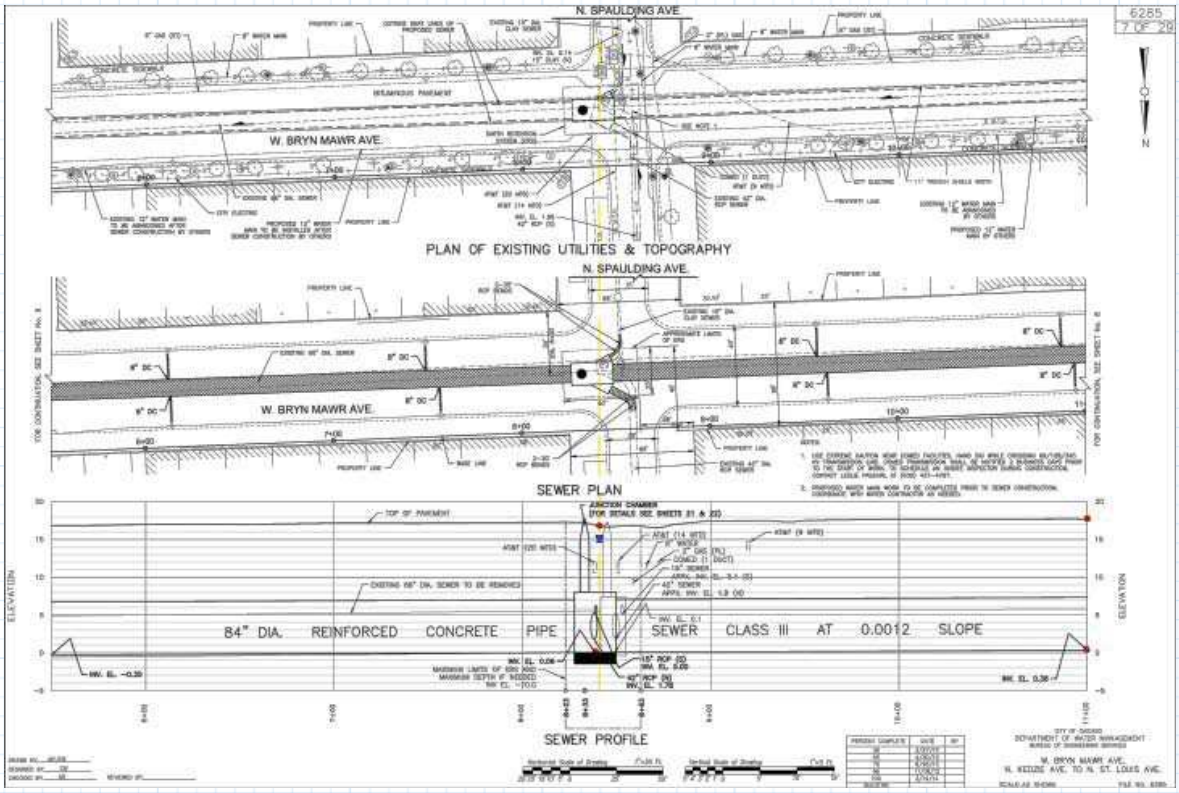


Soil Borings (per City of Chicago Department of Water Managment Bureau of Engineering Services (CDWM) Sheet No. 3)

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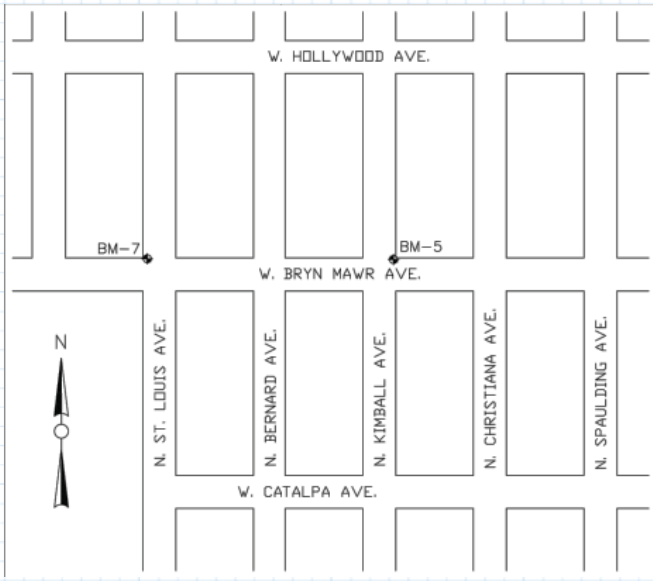


Sewer Plan along W. Bryn Marw (per CDWM Sheet No. 6)

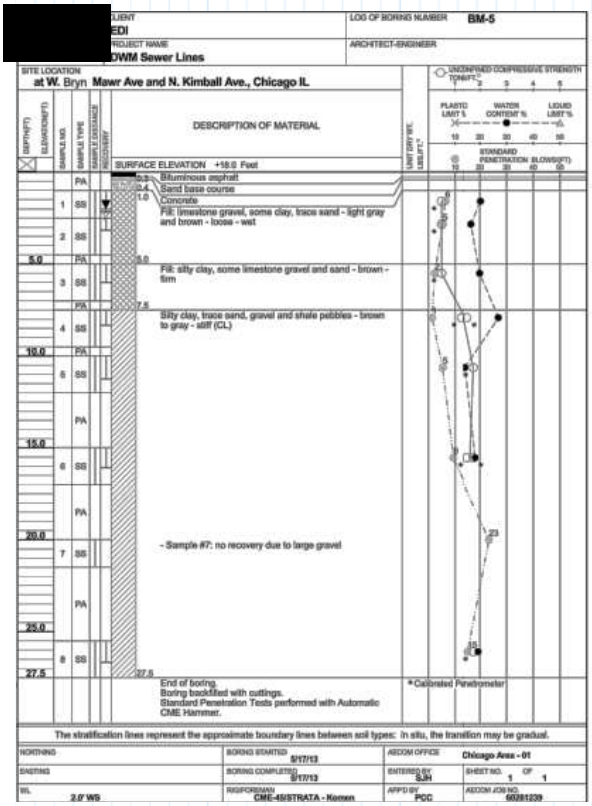


Sewer Plan along W. Bryn Marw (per CDWM Sheet No. 7)

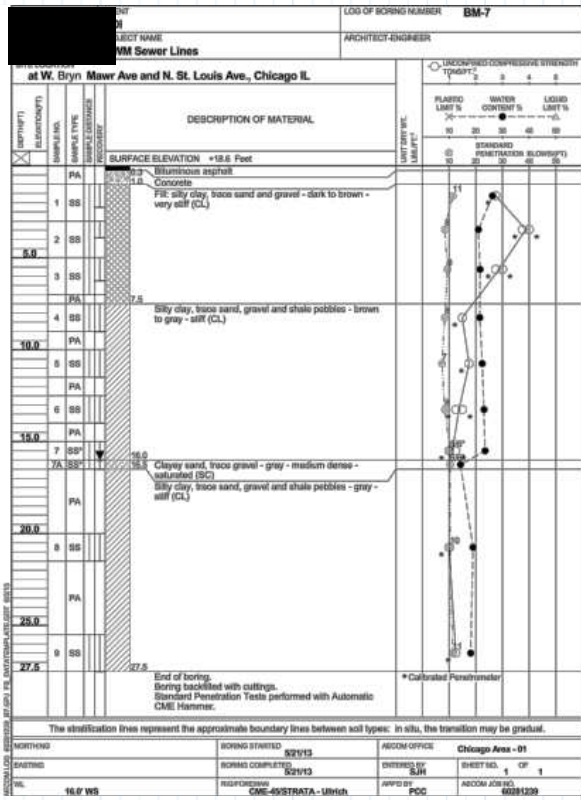
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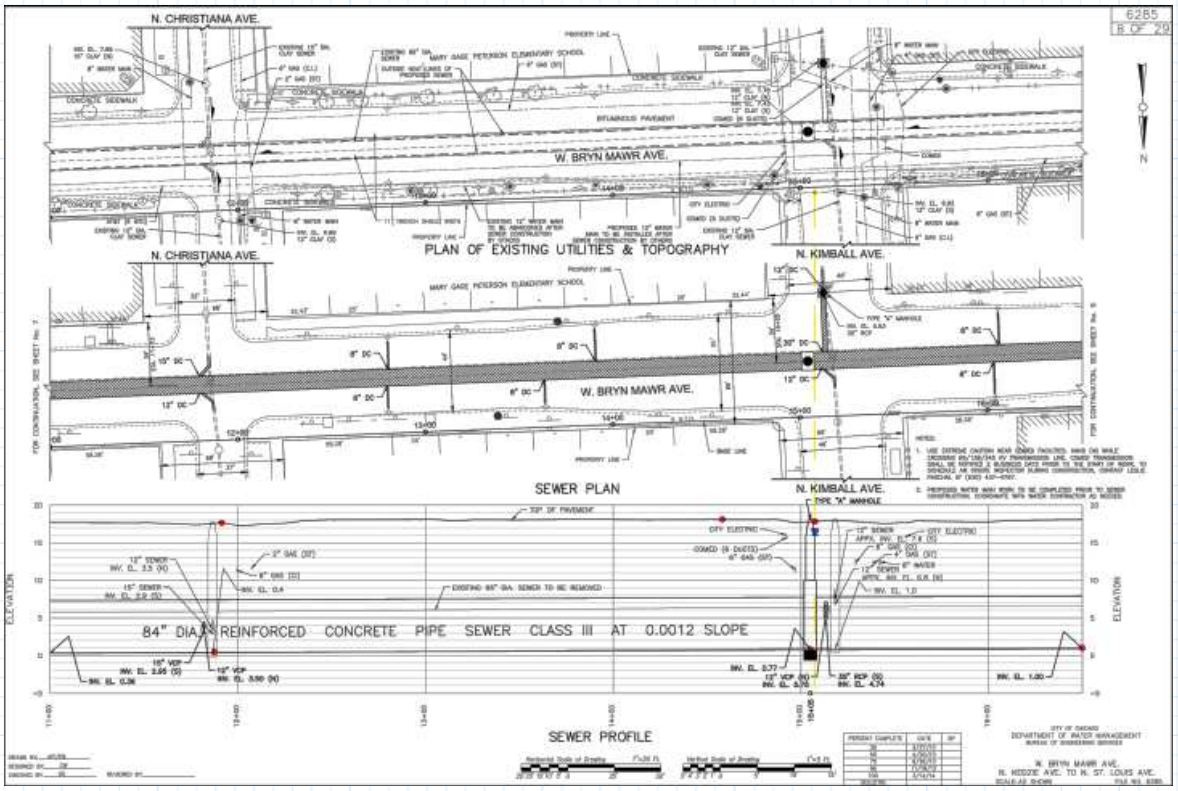


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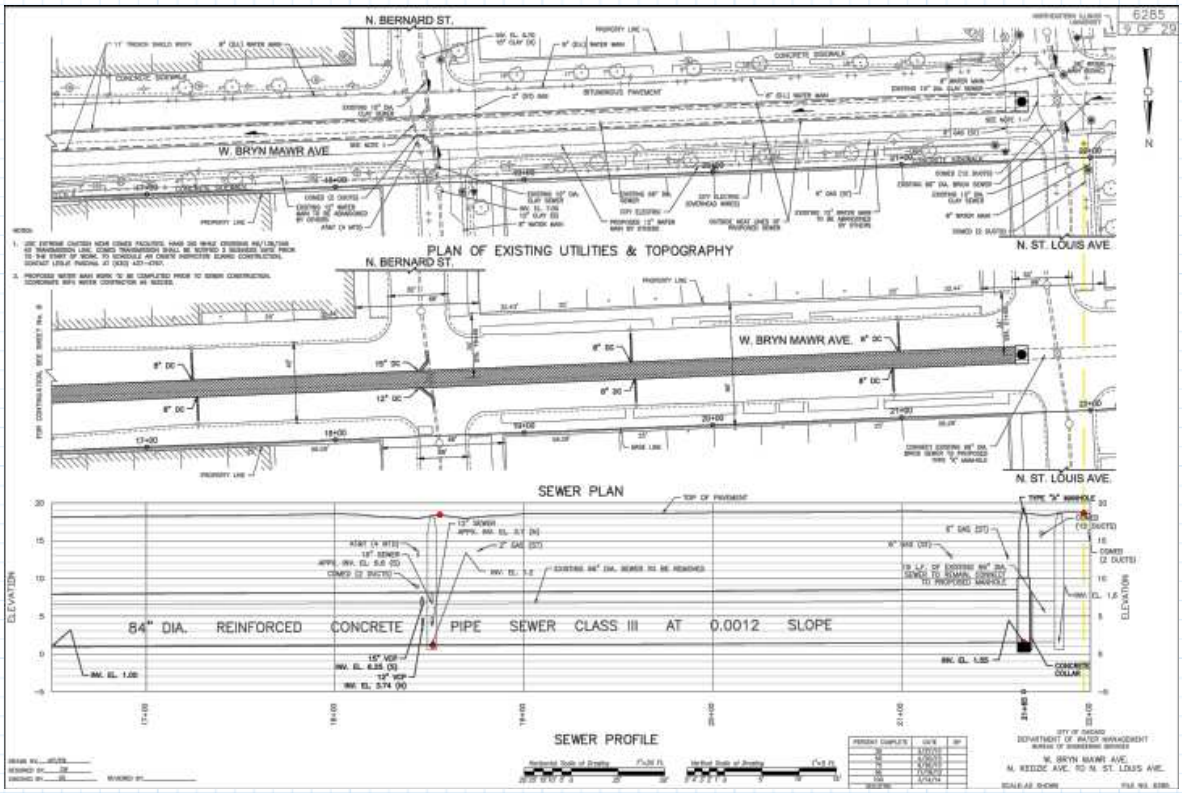


Soil Borings (per City of Chicago Department of Water Managment Bureau of Engineering Services (CDWM) Sheet No. 4)

[redacted]



Sewer Plan along W. Bryn Marw (per CDWM Sheet No. 8)



Sewer Plan along W. Bryn Marw (per CDWM Sheet No. 9)

Depth of Sewer:

$RCP_{84wall} := 8.75\ in$

$Over_{excav} := 12\ in$

$Cut_{below_invert} := RCP_{84wall} + Over_{excav} = 1.729\ ft$

$Pavement_{Kedzie} := 15\ ft$ $Invert_1 := -0.74\ ft$ $Cut_1 := Invert_1 - Cut_{below_invert} = -2.469\ ft$

$Pavement_{Sawyer} := 16.75\ ft$ $Invert_2 := -0.3\ ft$ $Cut_2 := Invert_2 - Cut_{below_invert} = -2.029\ ft$

$Pavement_{Spaulding} := 17.25\ ft$ $Invert_3 := 0.06\ ft$ $Cut_3 := Invert_3 - Cut_{below_invert} = -1.669\ ft$

$d_{water@Spaulding} := 2\ ft$

$Pavement_{Christiana} := 17.75\ ft$ $Invert_4 := 0.4\ ft$ $Cut_4 := Invert_4 - Cut_{below_invert} = -1.329\ ft$

$Pavement_{Kimball} := 18\ ft$ $Invert_5 := 0.77\ ft$ $Cut_5 := Invert_5 - Cut_{below_invert} = -0.959\ ft$

$d_{water@Kimball} := 2\ ft$

$Pavement_{Bernard} := 18.5\ ft$ $Invert_6 := 1.2\ ft$ $Cut_6 := Invert_6 - Cut_{below_invert} = -0.529\ ft$

$Pavement_{St.Louis} := 18.75\ ft$ $Invert_7 := 1.55\ ft$ $Cut_7 := Invert_7 - Cut_{below_invert} = -0.179\ ft$

$Cut_{1_depth} := Pavement_{Kedzie} - Cut_1 = 17.469\ ft$ BM-1

$Cut_{2_depth} := Pavement_{Sawyer} - Cut_2 = 18.779\ ft$

$Cut_{3_depth} := Pavement_{Spaulding} - Cut_3 = 18.919\ ft$ BM-3

$ELV_{wate@Spaulding} := Cut_{3_depth} - d_{water@Spaulding} = 16.919\ ft$

$Cut_{4_depth} := Pavement_{Christiana} - Cut_4 = 19.079\ ft$

$Cut_{5_depth} := Pavement_{Kimball} - Cut_5 = 18.959\ ft$ BM-5

$ELV_{wate@Kimball} := Cut_{5_depth} - d_{water@Kimball} = 16.959\ ft$

$Cut_{6_depth} := Pavement_{Bernard} - Cut_6 = 19.029\ ft$

$Cut_{7_depth} := Pavement_{St.Louis} - Cut_7 = 18.929\ ft$ BM-7

$Depth_{water_after_cut} := \max\left(\langle ELV_{wate@Spaulding}, ELV_{wate@Kimball}\rangle\right) = 16.959\ ft$

$Cut_{max} := \max\left(\langle Cut_{1_depth}, Cut_{2_depth}, Cut_{3_depth}, Cut_{4_depth}, Cut_{5_depth}, Cut_{6_depth}, Cut_{7_depth}\rangle\right) = 19.079\ ft$

[redacted]

Soil Conditions:

Table 2 – Soil Strength Parameters based on Undrained Conditions

Boring No.	Depth (Feet)	Soil Description	Unit Weight, (pcf)	Friction Angle (deg)	Cohesion (psf)
BM-1	0 to 5.0	Possible Fill – Silty clay	120	0	2,000
	5.0 to 27.5	Stiff to hard clay	122	0	2,000
BM-3	0 to 7.5	Possible Fill – Sand	120	30	0
	7.5 to 27.5	Stiff to very stiff clay	120	0	1,500
BM-5	0 to 7.5	Fill – Gravel and Silty clay	122	0	7,50
	7.5 to 27.5	Stiff clay	120	0	1,500
BM-7	0 to 7.5	Fill – Silty clay	120	0	1,800
	7.5 to 27.5	Stiff Clay	120	0	1,500

[redacted]Geotechnical Report Dated June 7, 2013 Table 2.

Boring 1

$d_{1_1start} := 0\ ft$ $d_{1_1end} := 5\ ft$ $\gamma_{1_1} := 120\ pcf$ $\phi_{1_1} := 0\ deg$ $c_{1_1} := 2000\ psf$

$$k_{a1_1} := \left(\tan\left(45\ deg - \frac{\phi_{1_1}}{2}\right)\right)^2 = 1$$

$d_{1_2start} := 5\ ft$ $d_{1_2end} := 27.5\ ft$ $\gamma_{1_2} := 122\ pcf$ $\phi_{1_2} := 0\ deg$ $c_{1_2} := 2000\ psf$

$$k_{a1_2} := \left(\tan\left(45\ deg - \frac{\phi_{1_2}}{2}\right)\right)^2 = 1$$

Boring 3

$d_{3_1start} := 0\ ft$ $d_{3_1end} := 7.5\ ft$ $\gamma_{3_1} := 120\ pcf$ $\phi_{3_1} := 30\ deg$ $c_{3_1} := 0\ psf$

$$k_{a3_1} := \left(\tan\left(45\ deg - \frac{\phi_{3_1}}{2}\right)\right)^2 = 0.333$$

$d_{3_2start} := 7.5\ ft$ $d_{3_2end} := 27.5\ ft$ $\gamma_{3_2} := 120\ pcf$ $\phi_{3_2} := 0\ deg$ $c_{3_2} := 1500\ psf$

$$k_{a3_2} := \left(\tan\left(45\ deg - \frac{\phi_{3_2}}{2}\right)\right)^2 = 1$$

Boring 5

$d_{5_1start} := 0\ ft$ $d_{5_1end} := 7.5\ ft$ $\gamma_{5_1} := 122\ pcf$ $\phi_{5_1} := 0\ deg$ $c_{5_1} := 750\ psf$

$$k_{a5_1} := \left(\tan\left(45\ deg - \frac{\phi_{5_1}}{2}\right)\right)^2 = 1$$

$d_{5_2start} := 7.5\ ft$ $d_{5_2end} := 27.5\ ft$ $\gamma_{5_2} := 120\ pcf$ $\phi_{5_2} := 0\ deg$ $c_{5_2} := 1500\ psf$

$$k_{a5_2} := \left(\tan\left(45\ deg - \frac{\phi_{5_2}}{2}\right)\right)^2 = 1$$

Boring 7

$d_{7_1start} := 0\ ft$ $d_{7_1end} := 7.5\ ft$ $\gamma_{7_1} := 120\ pcf$ $\phi_{7_1} := 0\ deg$ $c_{7_1} := 1800\ psf$

$$k_{a7_1} := \left(\tan\left(45\ deg - \frac{\phi_{7_1}}{2}\right)\right)^2 = 1$$

$d_{7_2start} := 7.5\ ft$ $d_{7_2end} := 27.5\ ft$ $\gamma_{7_2} := 120\ pcf$ $\phi_{7_2} := 0\ deg$ $c_{7_2} := 1500\ psf$

$$k_{a7_2} := \left(\tan\left(45\ deg - \frac{\phi_{7_2}}{2}\right)\right)^2 = 1$$

[redacted]

[redacted]

Density of Water

$\gamma_W := 62.4\ pcf$

Surcharge

$q := 760\ psf$ assume half of CAT 336 Excavator

Theoretical Depths (worst case):

$Stratum_1 := \max\left(\langle d_{1_1end}, d_{3_1end}, d_{5_1end}, d_{7_1end}\rangle\right) = 7.5\ ft$

$Stratum_2 := Cut_{max} - min\left(\langle d_{1_1end}, d_{3_1end}, d_{5_1end}, d_{7_1end}\rangle\right) = 14.079\ ft$

$d_{water_stratum1} := Stratum_1 - min\left(\langle d_{water@Spaulding}, d_{water@Kimball}\rangle\right) = 5.5\ ft$

$d_{0_s1} := 0\ ft$ $d_{0_s2} := 0\ ft$ $d_{0_w} := 0\ ft$

$d_{1_s1} := min\left(\langle d_{water@Spaulding}, d_{water@Kimball}\rangle\right) = 2\ ft$ $d_{1_s2} := 0\ ft$ $d_{1_w} := 0\ ft$

$d_{2_s1} := Stratum_1 = 7.5\ ft$ $d_{2_s2} := 0\ ft$ $d_{2_w} := d_{water_stratum1} = 5.5\ ft$

$d_{3_s2} := Stratum_2 = 14.079\ ft$ $d_{3_w} := Stratum_2 + d_{water_stratum1} = 19.579\ ft$

Soil Lateral Pressure Using Theoretical Depths:

Effective Horizontal Stress at N. Kedzie

$\sigma_{bar1@0} := \gamma_{1_1} \cdot d_{0_s1} - \gamma_W \cdot d_{0_w} = 0\ psf$

$\sigma_{bar1@2} := \gamma_{1_1} \cdot d_{1_s1} - \gamma_W \cdot d_{1_w} = 240\ psf$

$\sigma_{bar1@7.5.1} := \gamma_{1_1} \cdot d_{2_s1} - \gamma_W \cdot d_{2_w} = 556.8\ psf$

$\sigma_{bar1@7.5.2} := \gamma_{1_1} \cdot d_{2_s1} + \gamma_{1_2} \cdot d_{2_s2} - \gamma_W \cdot d_{2_w} = 556.8\ psf$

$\sigma_{bar1@14} := \gamma_{1_1} \cdot d_{2_s1} + \gamma_{1_2} \cdot d_{3_s2} - \gamma_W \cdot d_{3_w} = 1395.918\ psf$

Total Horizontal Stress at N. Kedzie

$\sigma_{1@0} := \left\langle k_{a1_1} \cdot \left\langle \sigma_{bar1@0} + q \right\rangle \right\rangle - \left(2 \cdot c_{1_1} \cdot \sqrt{k_{a1_1}}\right) + \left\langle \gamma_W \cdot d_{0_w} \right\rangle = -3240\ psf$

$\sigma_{1@2} := \left\langle k_{a1_1} \cdot \left\langle \sigma_{bar1@2} + q \right\rangle \right\rangle - \left(2 \cdot c_{1_1} \cdot \sqrt{k_{a1_1}}\right) + \left\langle \gamma_W \cdot d_{1_w} \right\rangle = -3000\ psf$

$\sigma_{1@7.5.1} := \left\langle k_{a1_1} \cdot \left\langle \sigma_{bar1@7.5.1} + q \right\rangle \right\rangle - \left(2 \cdot c_{1_1} \cdot \sqrt{k_{a1_1}}\right) + \left\langle \gamma_W \cdot d_{2_w} \right\rangle = -2340\ psf$

$\sigma_{1@7.5.2} := \left\langle k_{a1_2} \cdot \left\langle \sigma_{bar1@7.5.2} + q \right\rangle \right\rangle - \left(2 \cdot c_{1_2} \cdot \sqrt{k_{a1_2}}\right) + \left\langle \gamma_W \cdot d_{2_w} \right\rangle = -2340\ psf$

$\sigma_{1@14} := \left\langle k_{a1_2} \cdot \left\langle \sigma_{bar1@14} + q \right\rangle \right\rangle - \left(2 \cdot c_{1_2} \cdot \sqrt{k_{a1_2}}\right) + \left\langle \gamma_W \cdot d_{3_w} \right\rangle = -622.342\ psf$

$\sigma_{1max} := \max\left(\langle \sigma_{1@0}, \sigma_{1@2}, \sigma_{1@7.5.1}, \sigma_{1@7.5.2}, \sigma_{1@14}\rangle\right) = -622.342\ psf$

[redacted]

[redacted]

Effective Horizontal Stress at N. Spaulding

$\sigma_{bar3@0} := \gamma_{3_1} \cdot d_{0_s1} - \gamma_W \cdot d_{0_w} = 0$ *psf*

$\sigma_{bar3@2} := \gamma_{3_1} \cdot d_{1_s1} - \gamma_W \cdot d_{1_w} = 240$ *psf*

$\sigma_{bar3@7.5.1} := \gamma_{3_1} \cdot d_{2_s1} - \gamma_W \cdot d_{2_w} = 556.8$ *psf*

$\sigma_{bar3@7.5.2} := \gamma_{3_1} \cdot d_{2_s1} + \gamma_{3_2} \cdot d_{2_s2} - \gamma_W \cdot d_{2_w} = 556.8$ *psf*

$\sigma_{bar3@14} := \gamma_{3_1} \cdot d_{2_s1} + \gamma_{3_2} \cdot d_{3_s2} - \gamma_W \cdot d_{3_w} = 1367.76$ *psf*

Total Horizontal Stress at N. Spaulding

$\sigma_{3@0} := \langle k_{a3_1} \cdot \langle \sigma_{bar3@0} + q \rangle \rangle - \left(2 \cdot c_{3_1} \cdot \sqrt{k_{a3_1}}\right) + \langle \gamma_W \cdot d_{0_w} \rangle = 253.333$ *psf*

$\sigma_{3@2} := \langle k_{a3_1} \cdot \langle \sigma_{bar3@2} + q \rangle \rangle - \left(2 \cdot c_{3_1} \cdot \sqrt{k_{a3_1}}\right) + \langle \gamma_W \cdot d_{1_w} \rangle = 333.333$ *psf*

$\sigma_{3@7.5.1} := \langle k_{a3_1} \cdot \langle \sigma_{bar3@7.5.1} + q \rangle \rangle - \left(2 \cdot c_{3_1} \cdot \sqrt{k_{a3_1}}\right) + \langle \gamma_W \cdot d_{2_w} \rangle = 782.133$ *psf*

$\sigma_{3@7.5.2} := \langle k_{a3_2} \cdot \langle \sigma_{bar3@7.5.2} + q \rangle \rangle - \left(2 \cdot c_{3_2} \cdot \sqrt{k_{a3_2}}\right) + \langle \gamma_W \cdot d_{2_w} \rangle = -1340$ *psf*

$\sigma_{3@14} := \langle k_{a3_2} \cdot \langle \sigma_{bar3@14} + q \rangle \rangle - \left(2 \cdot c_{3_2} \cdot \sqrt{k_{a3_2}}\right) + \langle \gamma_W \cdot d_{3_w} \rangle = 349.5$ *psf*

$\sigma_{3max} := \max\left(\langle \sigma_{3@0}, \sigma_{3@2}, \sigma_{3@7.5.1}, \sigma_{3@7.5.2}, \sigma_{3@14} \rangle\right) = 782.133$ *psf*

Effective Horizontal Stress at N. Kimball

$\sigma_{bar5@0} := \gamma_{5_1} \cdot d_{0_s1} - \gamma_W \cdot d_{0_w} = 0$ *psf*

$\sigma_{bar5@2} := \gamma_{5_1} \cdot d_{1_s1} - \gamma_W \cdot d_{1_w} = 244$ *psf*

$\sigma_{bar5@7.5.1} := \gamma_{5_1} \cdot d_{2_s1} - \gamma_W \cdot d_{2_w} = 571.8$ *psf*

$\sigma_{bar5@7.5.2} := \gamma_{5_1} \cdot d_{2_s1} + \gamma_{5_2} \cdot d_{2_s2} - \gamma_W \cdot d_{2_w} = 571.8$ *psf*

$\sigma_{bar5@14} := \gamma_{5_1} \cdot d_{2_s1} + \gamma_{5_2} \cdot d_{3_s2} - \gamma_W \cdot d_{3_w} = 1382.76$ *psf*

Total Horizontal Stress at N. Kimball

$\sigma_{5@0} := \langle k_{a5_1} \cdot \langle \sigma_{bar5@0} + q \rangle \rangle - \left(2 \cdot c_{5_1} \cdot \sqrt{k_{a5_1}}\right) + \langle \gamma_W \cdot d_{0_w} \rangle = -740$ *psf*

$\sigma_{5@2} := \langle k_{a5_1} \cdot \langle \sigma_{bar5@2} + q \rangle \rangle - \left(2 \cdot c_{5_1} \cdot \sqrt{k_{a5_1}}\right) + \langle \gamma_W \cdot d_{1_w} \rangle = -496$ *psf*

$\sigma_{5@7.5.1} := \langle k_{a5_1} \cdot \langle \sigma_{bar5@7.5.1} + q \rangle \rangle - \left(2 \cdot c_{5_1} \cdot \sqrt{k_{a5_1}}\right) + \langle \gamma_W \cdot d_{2_w} \rangle = 175$ *psf*

$\sigma_{5@7.5.2} := \langle k_{a5_2} \cdot \langle \sigma_{bar5@7.5.2} + q \rangle \rangle - \left(2 \cdot c_{5_2} \cdot \sqrt{k_{a5_2}}\right) + \langle \gamma_W \cdot d_{2_w} \rangle = -1325$ *psf*

$\sigma_{5@14} := \langle k_{a5_2} \cdot \langle \sigma_{bar5@14} + q \rangle \rangle - \left(2 \cdot c_{5_2} \cdot \sqrt{k_{a5_2}}\right) + \langle \gamma_W \cdot d_{3_w} \rangle = 364.5$ *psf*

$\sigma_{5max} := \max\left(\langle \sigma_{5@0}, \sigma_{5@2}, \sigma_{5@7.5.1}, \sigma_{5@7.5.2}, \sigma_{5@14} \rangle\right) = 364.5$ *psf*

[redacted]

[redacted]

Effective Horizontal Stress at N. St. Louis

$\sigma_{bar7@0} := \gamma_{7_1} \cdot d_{0_s1} - \gamma_W \cdot d_{0_w} = 0\ psf$

$\sigma_{bar7@2} := \gamma_{7_1} \cdot d_{1_s1} - \gamma_W \cdot d_{1_w} = 240\ psf$

$\sigma_{bar7@7.5.1} := \gamma_{7_1} \cdot d_{2_s1} - \gamma_W \cdot d_{2_w} = 556.8\ psf$

$\sigma_{bar7@7.5.2} := \gamma_{7_1} \cdot d_{2_s1} + \gamma_{7_2} \cdot d_{2_s2} - \gamma_W \cdot d_{2_w} = 556.8\ psf$

$\sigma_{bar7@14} := \gamma_{7_1} \cdot d_{2_s1} + \gamma_{7_2} \cdot d_{3_s2} - \gamma_W \cdot d_{3_w} = 1367.76\ psf$

Total Horizontal Stress at N. St. Louis

$\sigma_{7@0} := \langle k_{a7_1} \cdot \langle \sigma_{bar7@0} + q \rangle \rangle - \left(2 \cdot c_{7_1} \cdot \sqrt{k_{a7_1}}\right) + \langle \gamma_W \cdot d_{0_w} \rangle = -2840\ psf$

$\sigma_{7@2} := \langle k_{a7_1} \cdot \langle \sigma_{bar7@2} + q \rangle \rangle - \left(2 \cdot c_{7_1} \cdot \sqrt{k_{a7_1}}\right) + \langle \gamma_W \cdot d_{1_w} \rangle = -2600\ psf$

$\sigma_{7@7.5.1} := \langle k_{a7_1} \cdot \langle \sigma_{bar7@7.5.1} + q \rangle \rangle - \left(2 \cdot c_{7_1} \cdot \sqrt{k_{a7_1}}\right) + \langle \gamma_W \cdot d_{2_w} \rangle = -1940\ psf$

$\sigma_{7@7.5.2} := \langle k_{a7_2} \cdot \langle \sigma_{bar7@7.5.2} + q \rangle \rangle - \left(2 \cdot c_{7_2} \cdot \sqrt{k_{a7_2}}\right) + \langle \gamma_W \cdot d_{2_w} \rangle = -1340\ psf$

$\sigma_{7@14} := \langle k_{a7_2} \cdot \langle \sigma_{bar7@14} + q \rangle \rangle - \left(2 \cdot c_{7_2} \cdot \sqrt{k_{a7_2}}\right) + \langle \gamma_W \cdot d_{3_w} \rangle = 349.5\ psf$

$\sigma_{7max} := \max\left(\sigma_{7@0}, \sigma_{7@2}, \sigma_{7@7.5.1}, \sigma_{7@7.5.2}, \sigma_{7@14}\right) = 349.5\ psf$

Maximum Horizontal Stess

$\sigma_{max} := \max\left(\sigma_{1max}, \sigma_{3max}, \sigma_{5max}, \sigma_{7max}\right) = 782.133\ psf$

Trench Boxes Type C Soil:

RECALL:

$Cut_{max} = 19.079\ ft$

$\sigma_{max} = 782.133\ psf$

$PRO8_13485_{resist} := 1841\ psf$ $\quad$ $PRO8_13485_{depth} := 23\ ft$

$PRO8_28328_{resist} := 1841\ psf$ $\quad$ $PRO8_28328_{depth} := 23\ ft$

$PRO8_19457_{resist} := 1841\ psf$ $\quad$ $PRO8_19457_{depth} := 20\ ft$

$PRO6_13484_{resist} := 1200\ psf$ $\quad$ $PRO6_13484_{depth} := 15\ ft$

$PRO6_28327_{resist} := 1200\ psf$ $\quad$ $PRO6_28327_{depth} := 15\ ft$

$PRO6_16991_{resist} := 1200\ psf$ $\quad$ $PRO6_16991_{depth} := 15\ ft$

$PRO4_14361_{resist} := 1111\ psf$ $\quad$ $PRO4_14361_{depth} := 14\ ft$

[redacted]

Trench Box Check:

$PRO8_13485_{check} := \text{if}\left(PRO8_13485_{resist} \geq \sigma_{max}, \text{if}\left(PRO8_13485_{depth} \geq Cut_{max}, \text{“PRO8_13485 is adequate”}, \text{“Fail”}\right), \text{“Fail”}\right)$

$PRO8_13485_{check} = \text{“PRO8_13485 is adequate”}$

$PRO8_28328_{check} := \text{if}\left(PRO8_28328_{resist} \geq \sigma_{max}, \text{if}\left(PRO8_28328_{depth} \geq Cut_{max}, \text{“PRO8_28328 is adequate”}, \text{“Fail”}\right), \text{“Fail”}\right)$

$PRO8_28328_{check} = \text{“PRO8_28328 is adequate”}$

$PRO8_19457_{check} := \text{if}\left(PRO8_19457_{resist} \geq \sigma_{max}, \text{if}\left(PRO8_19457_{depth} \geq Cut_{max}, \text{“PRO8_19457 is adequate”}, \text{“Fail”}\right), \text{“Fail”}\right)$

$PRO8_19457_{check} = \text{“PRO8_19457 is adequate”}$

$PRO6_13484_{check} := \text{if}\left(PRO6_13484_{resist} \geq \sigma_{max}, \text{if}\left(PRO6_13484_{depth} \geq Cut_{max}, \text{“PRO6_13484 is adequate”}, \text{“Fail”}\right), \text{“Fail”}\right)$

$PRO6_13484_{check} = \text{“Fail”}$

$PRO6_28327_{check} := \text{if}\left(PRO6_28327_{resist} \geq \sigma_{max}, \text{if}\left(PRO6_28327_{depth} \geq Cut_{max}, \text{“PRO6_28327 is adequate”}, \text{“Fail”}\right), \text{“Fail”}\right)$

$PRO6_28327_{check} = \text{“Fail”}$

$PRO6_16991_{check} := \text{if}\left(PRO6_16991_{resist} \geq \sigma_{max}, \text{if}\left(PRO6_16991_{depth} \geq Cut_{max}, \text{“PRO6_16991 is adequate”}, \text{“Fail”}\right), \text{“Fail”}\right)$

$PRO6_16991_{check} = \text{“Fail”}$

$PRO4_14361_{check} := \text{if}\left(PRO4_14361_{resist} \geq \sigma_{max}, \text{if}\left(PRO4_14361_{depth} \geq Cut_{max}, \text{“PRO4_14361 is adequate”}, \text{“Fail”}\right), \text{“Fail”}\right)$

$PRO4_14361_{check} = \text{“Fail”}$

Summary:

The trench boxes PRO8_1348, PRO8_28328, PRO8_ 19457, and PRO6_16991 are adequate to resist the surcharge and soil loading at the esitmated excavation depth of 19.07 feet.

The trench boxes PRO6_13484, PRO6_28327, and PRO4_14361 with a maximum toe depth of 14 feet are adequate for use as "stack boxes" by inspection.

[redacted]

Beam and Lagging at N. Spaulding Ave.:

Check W-Pile HP12x53

HP Size and Properties

$F_{y50} := 50\ ksi$ $F_{u50} := 65\ ksi$

$A_{HP} := 15.5\ in^2$ $I_{HP} := 393\ in^4$ $Z_{xHP} := 74\ in^3$

$depth_{cut1} := 3.5\ ft$

$depth_{cut2} := 17.5\ ft$

$depth_{cut3} := 19\ ft$

$HP_{spacing} := 11.75\ ft$

Check Flexure

$\phi_f := 1.00$ AASHTO 6.5.4.2 $\phi_{Ll} := 1.6$

$M_{nHP} := F_{y50} \cdot Z_{xHP} = 308.333\ kip \cdot ft$ AASHTO 6.12.2.2.1-1

$\phi M_{nHP} := \phi_f \cdot M_{nHP} = 308.333\ kip \cdot ft$

$M_{cut1} := \frac{5.66\ kip \cdot ft}{ft}$ From SPW911 Stage 1

$M_{cut2} := \frac{15.86\ kip \cdot ft}{ft}$ From SPW911 Stage 2

$M_{cut3.1} := \frac{13.95\ kip \cdot ft}{ft}$ From SPW911 Stage 3 INT Wale 1

$M_{cut3.2} := \frac{7.67\ kip \cdot ft}{ft}$ From SPW911 Stage 2 INT Wale 2

$M_{cut3.3} := \frac{12.44\ kip \cdot ft}{ft}$ From SPW911 Stage 3

$M_1 := M_{cut1} \cdot HP_{spacing} = 66.505\ kip \cdot ft$
$M_{u1} := \phi_{Ll} \cdot M_1 = 106.408\ kip \cdot ft$

$M_2 := M_{cut2} \cdot HP_{spacing} = 186.355\ kip \cdot ft$
$M_{u2} := \phi_{Ll} \cdot M_2 = 298.168\ kip \cdot ft$

$M_{3.1} := M_{cut3.1} \cdot HP_{spacing} = 163.913\ kip \cdot ft$
$M_{u3.1} := \phi_{Ll} \cdot M_{3.1} = 262.26\ kip \cdot ft$

$M_{3.2} := M_{cut3.2} \cdot HP_{spacing} = 90.123\ kip \cdot ft$
$M_{u3.2} := \phi_{Ll} \cdot M_{3.2} = 144.196\ kip \cdot ft$

$M_{3.3} := M_{cut3.3} \cdot HP_{spacing} = 146.17\ kip \cdot ft$
$M_{u3.3} := \phi_{Ll} \cdot M_{3.3} = 233.872\ kip \cdot ft$

[redacted]

$M_{u_bem\&lagging} := \max\left(M_{u1}, M_{u2}, M_{u3.1}, M_{u3.2}, M_{u3.3}\right) = 298.168\ kip \cdot ft$

$Flex_{HP_check} := \text{if}\left(\phi M_{nHP} \geq M_{u_bem\&lagging}, \text{“Adequate”}, \text{“Fail”}\right) = \text{“Adequate”}$

Summary:

HP12x53 at maximum 11.75' c/c spacing with required toe of 5.08' (elv. -6.75) is adequate to resist the soil load and surcharge of the excavator.

Option Number 1 (No Corner Bracing)

Check Waler - W18x175

Check Flexure

$\phi_f := 1.00$ AASHTO 6.5.4.2 $\phi_{Dl} := 1.2$ $\phi_{Ll} := 1.6$

$F_{y50} := 50\ ksi$ $F_{u50} := 65\ ksi$

$A_{12x96} := 51.2\ in^2$ $I_{xW} := 3450\ in^4$ $I_{yW} := 391\ in^4$ $Z_{xW} := 398\ in^3$ $Z_{yW} := 106\ in^3$

$M_{nxW} := F_{y50} \cdot Z_{xW} = \left(1.658 \cdot 10^3\right)\ kip \cdot ft$ AASHTO 6.12.2.2.1-1

$\phi M_{nxW} := \phi_f \cdot M_{nxW} = 1658.333\ kip \cdot ft$

$M_{nyW} := F_{y50} \cdot Z_{yW} = 441.667\ kip \cdot ft$ AASHTO 6.12.2.2.1-1

$\phi M_{nyW} := \phi_f \cdot M_{nyW} = 441.667\ kip \cdot ft$

$l_{1_excavationarea} := 36\ ft$

$l_{2_excavationarea} := 25\ ft$

$l_{wale} := \max\left(l_{1_excavationarea}, l_{2_excavationarea}\right) = 36\ ft$

$w_{cut2_wale1} := 4.39\ klf$ From SPW911 Cut 2

$w_{cut3_wale1} := 3.92\ klf$ From SPW911 Cut 3

$w_{cut3.1_waleINT1} := 5.53\ klf$ From SPW911 Cut 3 INT Wale 1

$w_{cut3.2_waleINT2} := 5.26\ klf$ From SPW911 Cut 3 INT Wale 2

$w_{cut3.3_wale2} := 5.85\ klf$ From SPW911 Cut 3

$w_{wale} := \max\left(\phi_{Ll} \cdot w_{cut2_wale1}, \phi_{Ll} \cdot w_{cut3_wale1}, \phi_{Ll} \cdot w_{cut3.1_waleINT1}, \phi_{Ll} \cdot w_{cut3.2_waleINT2}, \phi_{Ll} \cdot w_{cut3.3_wale2}\right) = 9.36\ klf$

$w_{wale_self} := \phi_{Dl}\ 0.175 \cdot klf = 0.21\ klf$

$M_{u_xwale} := \dfrac{w_{wale} \cdot l_{wale}^2}{8} = 1516.32\ kip \cdot ft$

$Flex_{x12x96_check} := \text{if}\left(\phi M_{nxW} \geq M_{u_xwale}, \text{“Adequate”}, \text{“Fail”}\right) = \text{“Adequate”}$

$$M_{u_ywale} := \frac{w_{wale_self} \cdot l_{wale}^{2}}{8} = 34.02\ kip \cdot ft$$

$$Flex_{y12x96_check} := \text{if}\left(\phi M_{nyW} \geq M_{u_ywale}, \text{“Adequate”}, \text{“Fail”}\right) = \text{“Adequate”}$$

$$combined_{momnet} := \frac{M_{u_xwale}}{\phi M_{nxW}} + \frac{M_{u_ywale}}{\phi M_{nyW}} = 0.991 \qquad \text{AASHTO 6.8.2.3-1}$$

$$Flex_{12x96_check} := \text{if}\left(1 \geq combined_{momnet}, \text{“Adequate”}, \text{“Fail”}\right) = \text{“Adequate”}$$

Summary:

W18x175 at 36' (max.) is adequate to brace the HP Piles at both wale elevations.

Check Wale to Pile Connection

Recall

$HP_{spacing} = 11.75\ ft$ $w_{wale} = 9.36\ klf$

Weld Check

$$R_{u_weld} := w_{wale} \cdot HP_{spacing} \qquad R_{u_weld} = 109.98\ kip$$

$r_{weld} := \frac{5}{16} \cdot in$ $l_{weld} := 24\ in$ $F_{y36} := 36\ ksi$ $F_{EXX} := 70\ ksi$ $\Omega_{weld} := 2$

$weld_{throat} := \left(\cos(45\ °) \cdot r_{weld}\right)$ $weld_{throat} = 0.221\ in$

$$R_{nweld} := \frac{0.6 \cdot F_{EXX} \cdot weld_{throat} \cdot l_{weld}}{\Omega_{weld}} \qquad \text{AISC 13th Table J2.5} \qquad R_{nweld} = 111.369\ kip$$

$$Weld_{check} := \text{if}\left(R_{nweld} \geq R_{u_weld}, \text{“Adequate”}, \text{“Fail”}\right) \qquad Weld_{check} = \text{“Adequate”}$$

Summary:

5/16" weld is adequate to connect wales at both elevations to the HP Piles.

Option Number 2 (Corner Bracing)

Check Waler - W16x100

Check Flexure

$\phi_f := 1.00$ AASHTO 6.5.4.2 $\phi_{Dl} := 1.2$ $\phi_{Ll} := 1.6$

$F_{y50} := 50\ ksi$ $F_{u50} := 65\ ksi$

$A_{12x96} := 29.5\ in^2$ $I_{xW} := 1490\ in^4$ $I_{yW} := 186\ in^4$ $Z_{xW} := 198\ in^3$ $Z_{yW} := 54.9\ in^3$

$M_{nxW} := F_{y50} \cdot Z_{xW} = 825\ kip \cdot ft$ AASHTO 6.12.2.2.1-1

$\phi M_{nxW} := \phi_f \cdot M_{nxW} = 825\ kip \cdot ft$

$M_{nyW} := F_{y50} \cdot Z_{yW} = 228.75\ kip \cdot ft$ AASHTO 6.12.2.2.1-1

$\phi M_{nyW} := \phi_f \cdot M_{nyW} = 228.75\ kip \cdot ft$

$l_{1_wale} := 30\ ft + 2.5\ in$

$l_{2_wale} := 4\ ft + 4.8125\ in$

$l_{3_wale} := 7\ ft + 2.1875\ in$

$l_{4_brace} := 4\ ft + 9.75\ in$

$l_{5_brace_leg} := 2\ ft + 9.75\ in$

$l_{wale} := \max\left(l_{1_wale} - 2 \cdot l_{5_brace_leg}, l_{2_wale}, l_{3_wale}\right) = 24.583\ ft$

$l_{wale} := 25\ ft$

$w_{cut2_wale1} := 4.39\ klf$ From SPW911 Cut 2

$w_{cut3_wale1} := 3.92\ klf$ From SPW911 Cut 3

$w_{cut3.1_waleINT1} := 5.53\ klf$ From SPW911 Cut 3 INT Wale 1

$w_{cut3.2_waleINT2} := 5.26\ klf$ From SPW911 Cut 3 INT Wale 2

$w_{cut3.3_wale2} := 5.85\ klf$ From SPW911 Cut 3

$w_{wale} := \max\left(\phi_{Ll} \cdot w_{cut2_wale1}, \phi_{Ll} \cdot w_{cut3_wale1}, \phi_{Ll} \cdot w_{cut3.1_waleINT1}, \phi_{Ll} \cdot w_{cut3.2_waleINT2}, \phi_{Ll} \cdot w_{cut3.3_wale2}\right) = 9.36\ klf$

$w_{wale_self} := \phi_{Dl}\ 0.100 \cdot klf = 0.12\ klf$

$M_{u_xwale} := \frac{w_{wale} \cdot l_{wale}^{2}}{8} = 731.25\ kip \cdot ft$

$Flex_{x12x96_check} := \text{if}\left(\phi M_{nxW} \geq M_{u_xwale}, \text{“Adequate”}, \text{“Fail”}\right) = \text{“Adequate”}$

$M_{u_ywale} := \frac{w_{wale_self} \cdot l_{wale}^{2}}{8} = 9.375\ kip \cdot ft$ AASHTO 6.8.2.3-1

$Flex_{y12x96_check} := \text{if}\left(\phi M_{nyW} \geq M_{u_ywale}, \text{“Adequate”}, \text{“Fail”}\right) = \text{“Adequate”}$

$combined_{momnet} := \frac{M_{u_xwale}}{\phi M_{nxW}} + \frac{M_{u_ywale}}{\phi M_{nyW}} = 0.927$

$Flex_{12x96_check} := \text{if}\left(1 \geq combined_{momnet}, \text{“Adequate”}, \text{“Fail”}\right) = \text{“Adequate”}$

Summary:

W16x100 at 25' (max.) is adequate to brace the HP Piles at both wale elevations.

Check Corner Bracing W 16x100

$F_{y50} := 50\ ksi$ $E_s := 29000\ ksi$ $\phi_c := 0.9$

$R_{@brace} := 288.62\ kip$

$R_{brace} := \frac{R_{@brace}}{\cos(45\ deg)} = 408.17\ kip$

W 16x100 Properties

$A_{brace} := 29.5\ in^2$ $b_{tf_brace} := 10.4\ in$ $t_{tf_brace} := 0.985\ in$ $b_{bf_brace} := 10.4\ in$ $t_{bf_brace} := 0.985\ in$

$t_{w_brace} := 0.585\ in$ $d_{brace} := 15.03\ in$ $D_{brace} := d_{brace} + t_{tf_brace} + t_{bf_brace} = 17\ in$

$I_{xbrace} := 1490\ in^4$ $r_{xbrace} := 7.1\ in$ $Z_{xbrace} := 198\ in^3$

$I_{ybrace} := 186\ in^4$ $r_{ybrace} := 2.51\ in$ $Z_{ybrace} := 54.9\ in^3$

$w_{brace_self} := 100\ plf$ $K := 1$

$l_{brace_max} := 5\ ft$

Axial

$P_u := R_{brace} = 408.17\ kip$

$Q := 1$

AASHTO 6.9.4.1.1-2

$P_o := Q \cdot F_{y50} \cdot A_{brace} = 1475\ kip$

$P_e := \frac{\pi^2 \cdot E_s}{\left(\frac{K \cdot l_{brace_max}}{r_{ybrace}}\right)^2} \cdot A_{brace} = 14776.266\ kip$ AASHTO 6.9.4.1.2-1

$P_n := \text{if}\left(\frac{P_e}{P_o} \geq 0.44, 0.658^{\left(\frac{P_o}{P_e}\right)} \cdot P_o, 0.877 \cdot P_e\right) = 1414.643\ kip$ AASHTO 6.9.4.1.1-1

$P_r := \phi_c \cdot P_n = 1273.179\ kip$

Flexural

$M_{uy_brace} := \frac{w_{brace_self} \cdot l_{brace_max}^2}{8} = 0.313\ kip \cdot ft$

$M_{ny_brace} := F_{y50} \cdot Z_{ybrace} = 228.75\ kip \cdot ft$

$\phi M_{ny_brace} := \phi_f \cdot M_{ny_brace} = 228.75\ kip \cdot ft$

[redacted]

Combined Axial and Flexural Check

$$Brace_{combined} := \text{if}\left[\frac{P_u}{P_r} \geq 0.2\,,\ \frac{P_u}{P_r} + \left(\frac{8.0}{9.0}\right)\cdot\left(\frac{M_{uy_brace}}{\phi M_{ny_brace}}\right),\ \frac{P_u}{2.0\cdot P_r} + \frac{M_{uy_brace}}{\phi M_{ny_brace}}\right] = 0.322 \qquad \text{AASHTO 6.9.2.2-1}$$

$$Combined_{axial_flex_check} := \text{if}\left(Brace_{combined} \leq 1\,,\ \text{“Adequate”}\,,\ \text{“Fail”}\right) = \text{“Adequate”}$$

Summary:

W16 x 100 x 5ft maximum is adequate to resist the forces at the bracing locations.

Check Wale to Corner Brace Connection

Recall

$$R_{@brace} = 288.62\ \textit{kip}$$

Weld Check

$$Perimeter := 2\cdot D_{brace} + 2\cdot b_{tf_brace} - t_{w_brace} + 2\cdot b_{bf_brace} - t_{w_brace} = 74.43\ \textit{in}$$

$$R_{u_weld} := R_{@brace} = 288.62\ \textit{kip}$$

$$r_{weld} := \frac{5}{16}\cdot \textit{in} \qquad l_{weld} := Perimeter \qquad F_{y50} := 50\ \textit{ksi} \qquad F_{EXX} := 70\ \textit{ksi} \qquad \Omega_{weld} := 2$$

$$weld_{throat} := \left(\cos\left(45\ °\right)\cdot r_{weld}\right) = 0.221\ \textit{in}$$

$$R_{nweld} := \frac{0.6\cdot F_{EXX}\cdot weld_{throat}\cdot l_{weld}}{\Omega_{weld}} \qquad \text{AISC 13th Table J2.5} \qquad R_{nweld} = 345.384\ \textit{kip}$$

$$Weld_{check} := \text{if}\left(R_{nweld} \geq R_{u_weld}\,,\ \text{“Adequate”}\,,\ \text{“Fail”}\right) \qquad Weld_{check} = \text{“Adequate”}$$

Summary:

5/16" weld is adequate to connect the corner bracing to the wales at both elevations.

[redacted]

Check Lagging

Table 4. Recommended thicknesses of wood lagging.

	Soil Description	Unified Classification	Depth	Recommended Thicknesses of Lagging (roughcut) for Clear Spans of: 5'	6'	7'	8'	9'	10'
COMPETENT SOILS	Silts or fine sand and silt above water table	ML SM-ML	0' to 25'	2"	3"	3"	3"	4"	4"
	Sands and gravels (medium dense to dense).	GW, GP, GM, GC, SW, SP, SM							
	Clays (stiff to very stiff): non-fissured.	CL, CH	25' to 60'	3"	3"	3"	4"	4"	5"
	Clays, medium consistency and $\frac{\gamma H}{S_u} < 5$	CL, CH							
DIFFICULT SOILS	Sands and silty sands, (loose).	SW, SP, SM	0' to 25'	3"	3"	3"	4"	4"	5"
	Clayey sands (medium dense to dense) below water table.	SC							
	Clays, heavily over-consolidated fissured.	CL, CH	25' to 60'	3"	3"	4"	4"	5"	5"
	Cohesionless silt or fine sand and silt below water table.	ML, SM-ML							
* POTENTIALLY DANGEROUS SOILS	Soft clays $\frac{\gamma H}{S_u} > 5$.	CL, CH	0' to 15'	3"	3"	4"	5"	--	--
	Slightly plastic silts below water table.	ML	15' to 25'	3"	4"	5"	6"	--	--
	Clayey sands (loose), below water table.	SC	25' to 35'	4"	5"	6"	--	--	--

Note:
* In the category of "potentially dangerous soils", use of lagging is questionable.

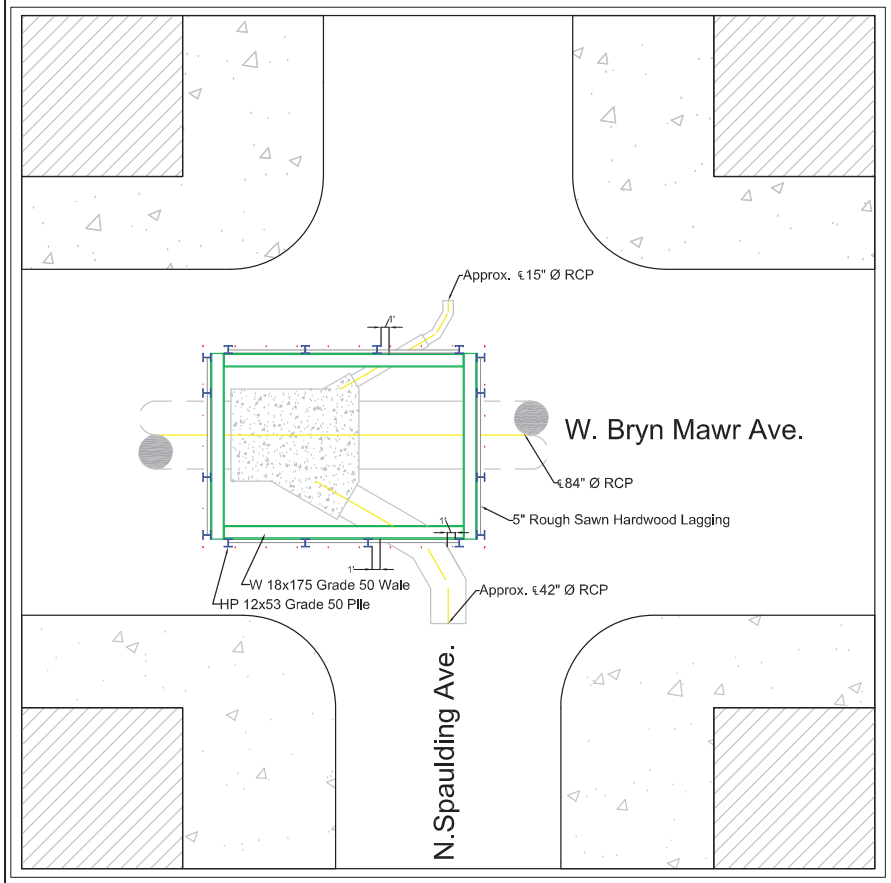
PER FHWA-RD-75-128

Recall:

$HP_{spacing} = 11.75\ ft$ $depth_{cut3} = 19\ ft$

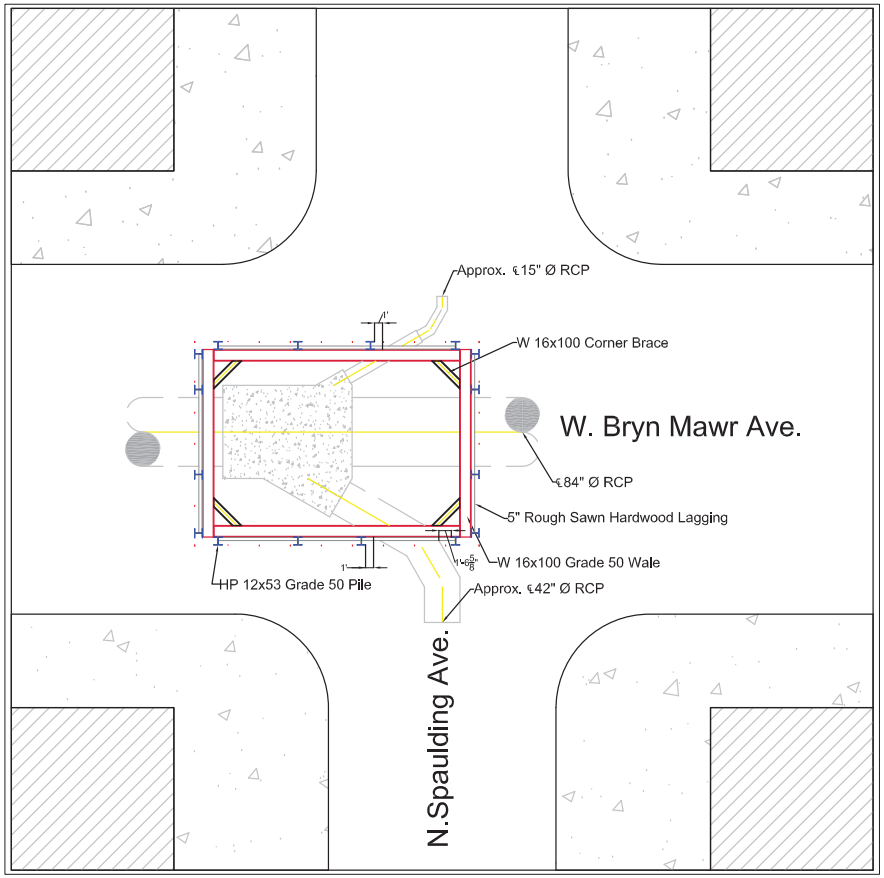
Summary:

By inspection 5" rough sawn hardwood lagging at 10.75' clear spacing is adequate to resisit the design soil pressures.



OPTION 1

General Layout without Corner Bracing (W18x175 Wale)



OPTION 2

General Layout with Corner Bracing (W16x100 Wale)

Construction Sequence:

1. Install HP Piles to a minimum tip elevation of -6.75 (5.08' of toe).
2. Excavate down to elevation +14.25 (Cut 1).
3. Install 5" rough sawn lagging as excavation progresses.
4. Install Waler 1 at elevation +15.75 (1.5' above cut).
5. Excavate down to elevation approximatly +8.27.
6. Install 5" rough sawn lagging as excavation progresses.
7. Install Intermediate waler over ERS opening for 84" Ø pipe (Approximately EL. +9.77)
8. Excavate down to elevation +0.75 (cut 2).
9. Install 5" rough sawn lagging as excavation progresses.
10. Install Waler 2 at elevation +2.25
11. Install 5" rough sawn lagging as excavation progresses.
12. Excavate down to elevation -1.67 (Cut Final).
13. Install 5" rough sawn lagging as excavation progresses.

Notes:

- Contractor responsible for locating all existing utilities.
- Contractor shall take care while installing the earth retention system to avoid damage/disturbance of existing utilities.
- ERS layout dimensions may vary due to utility conflicts.
- MKA was not provided with existing utility location information, therefore is not responsible for any damage/disturbance of the existing utilities.
- Pile location may vary due to utility conflicts.
- Maximum pile spacing is 11.75'.
- Waler lengths may vary due to pile locations.
- Maximum unbraced waler length is 36' for use with the W18x175 waler and 25' with the use of the W16x100 waler.

Materials:

- HP Pile - HP 12x53 Grade 50
- Walers - Grade 50
- Lagging - 5" Rough Sawn Timber
- Weld - E70XX Electrodes

REVISIONS:

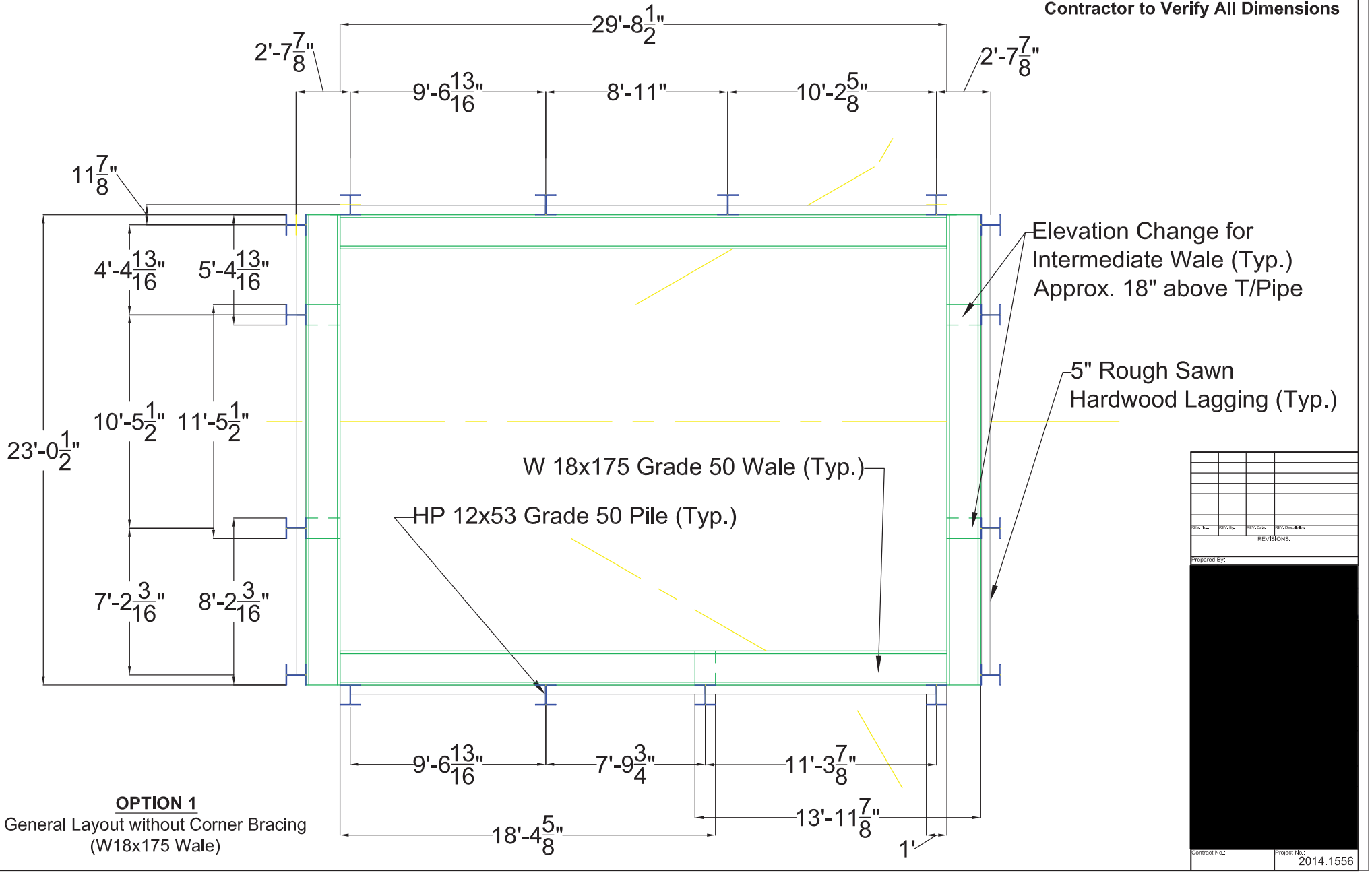
Prepared By:

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Contract No.:

Project No.: 2014.1556

Contractor to Verify All Dimensions



OPTION 1
General Layout without Corner Bracing
(W18x175 Wale)

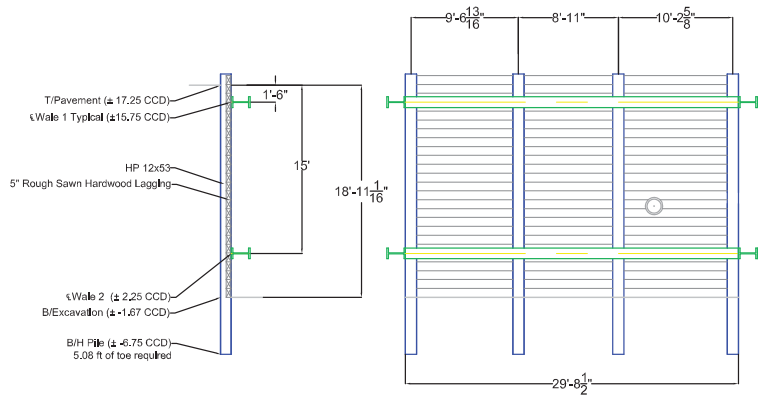
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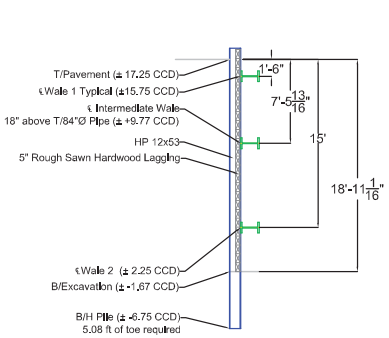
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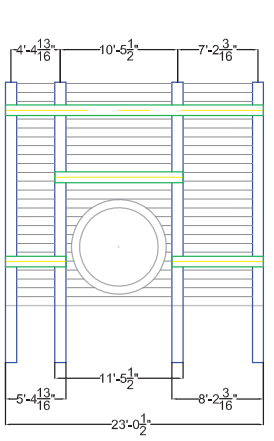
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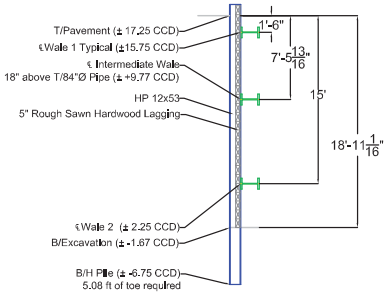
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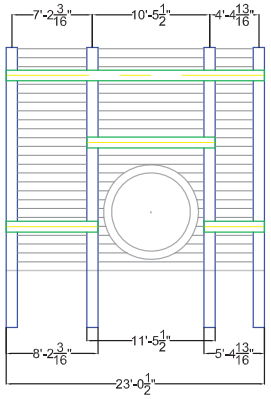
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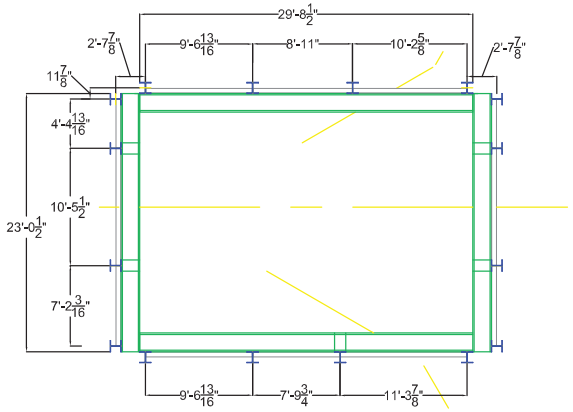


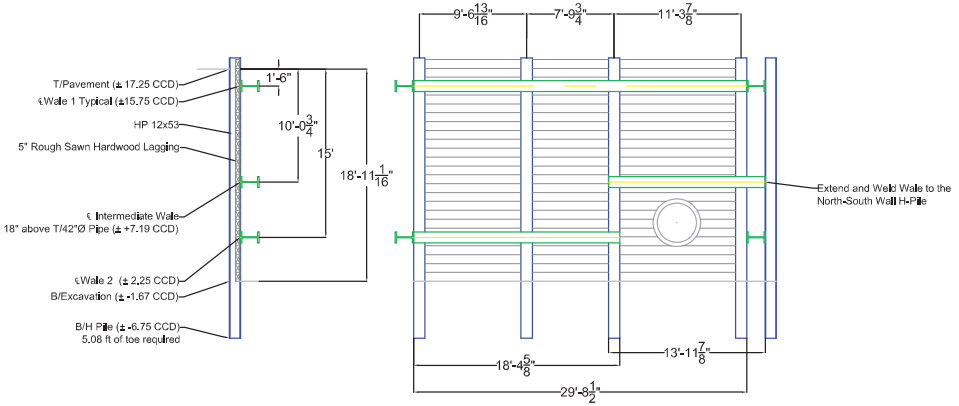












OPTION 1

General Layout without Corner Bracing
(W18x175 Wale)

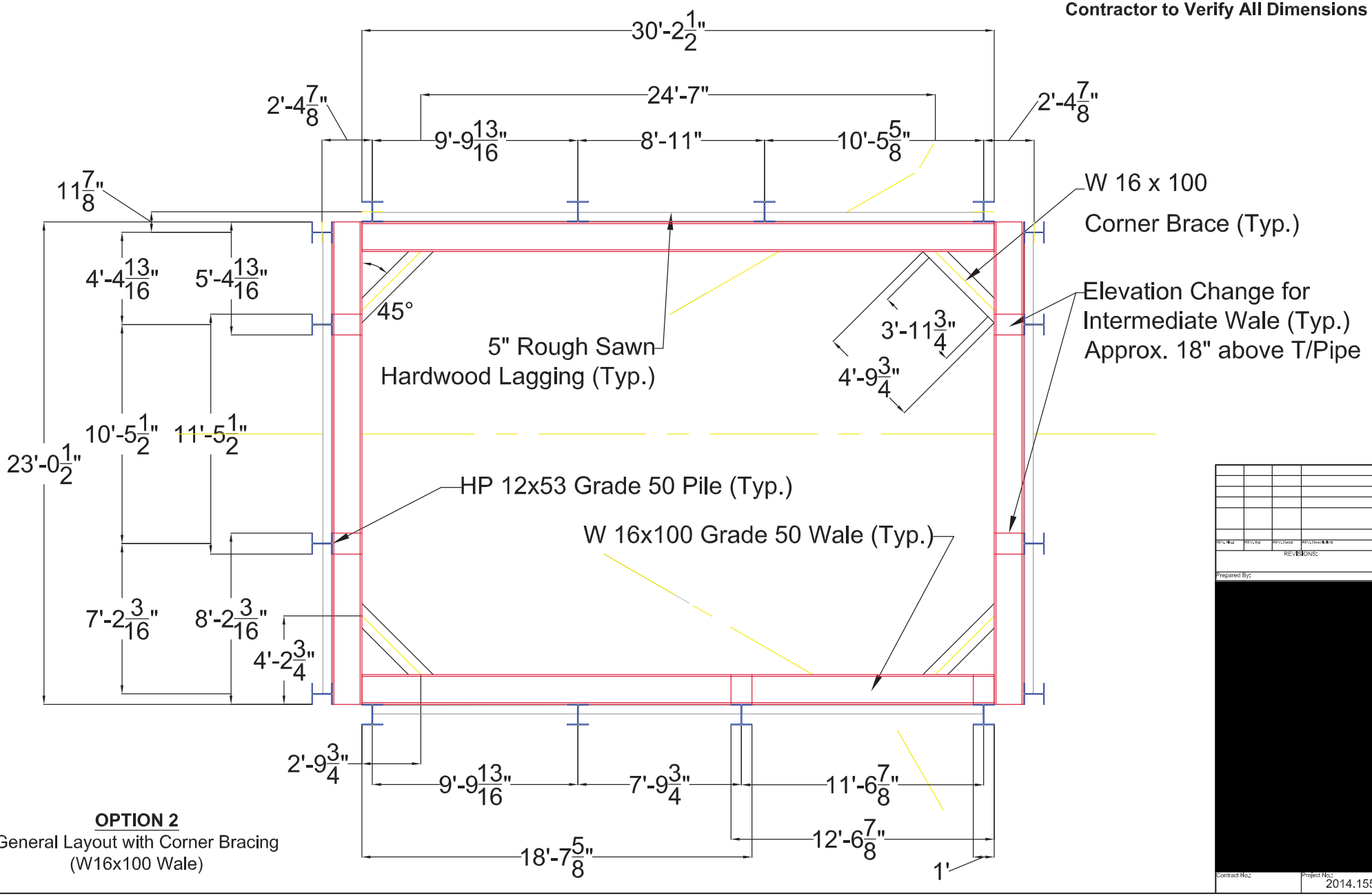
REVISIONS:

Prepared By:

Contract No.:

Project No.: 2014.1556

Contractor to Verify All Dimensions



OPTION 2
General Layout with Corner Bracing
(W16x100 Wale)

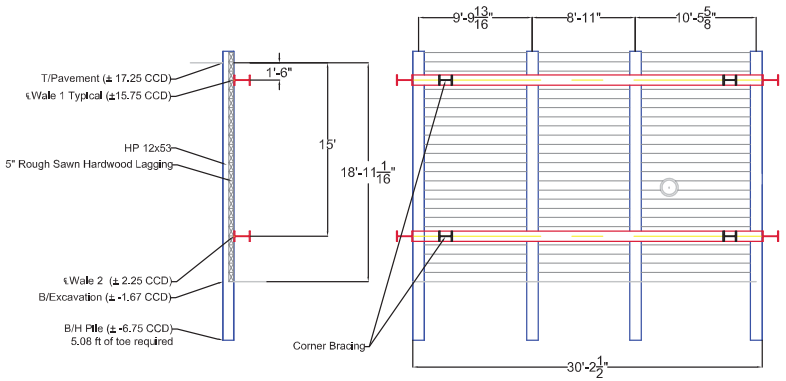
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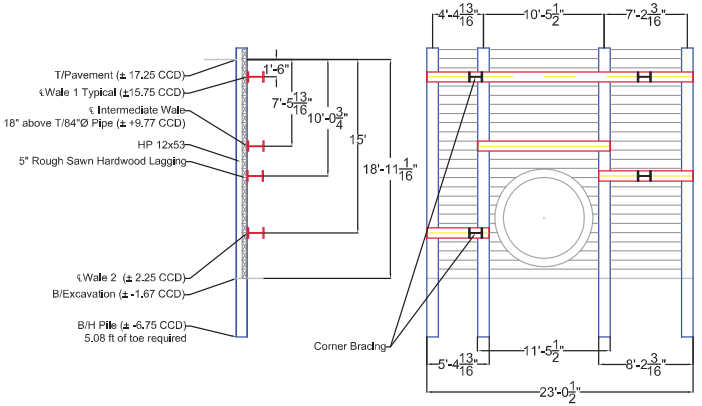
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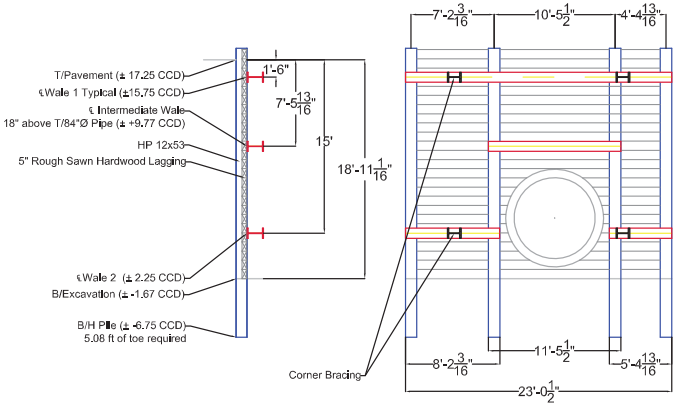
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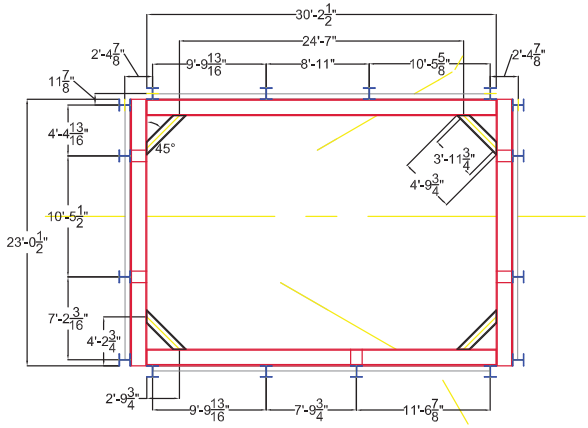
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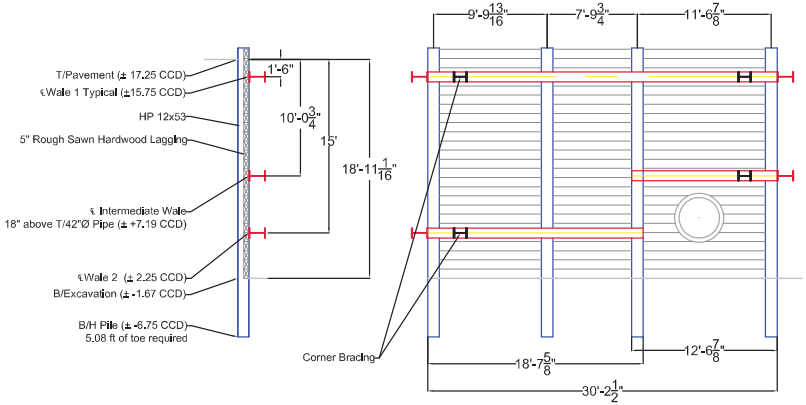
Contractor to Verify All Dimensions











OPTION 2

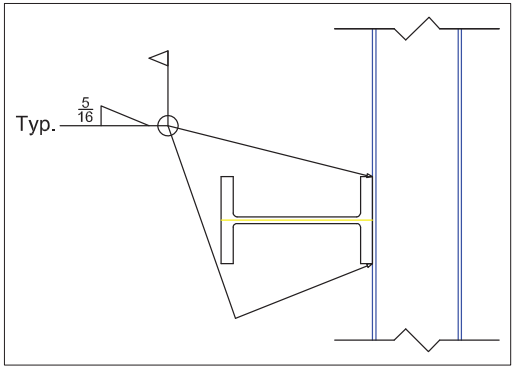
General Layout with Corner Bracing
(W16x100 Wale)

REVISIONS:

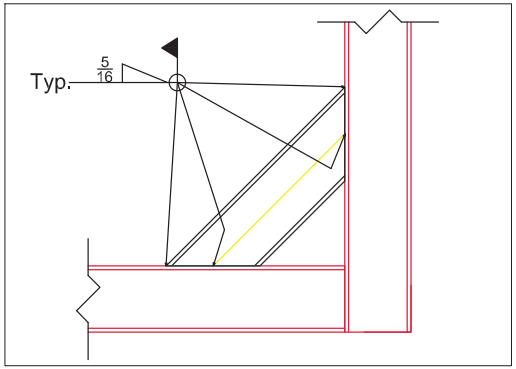
Prepared By:

Contract No.:

Project No.: 2014.1556



Option 1 and 2 Connection of Wales to HP Piles
(Typical at each HP Pile Location)



Option 2 Connection of Corner Brace to Wale
(Typical)

REVISIONS:

Prepared By:

Contract No.:

Project No.:
2014.1556

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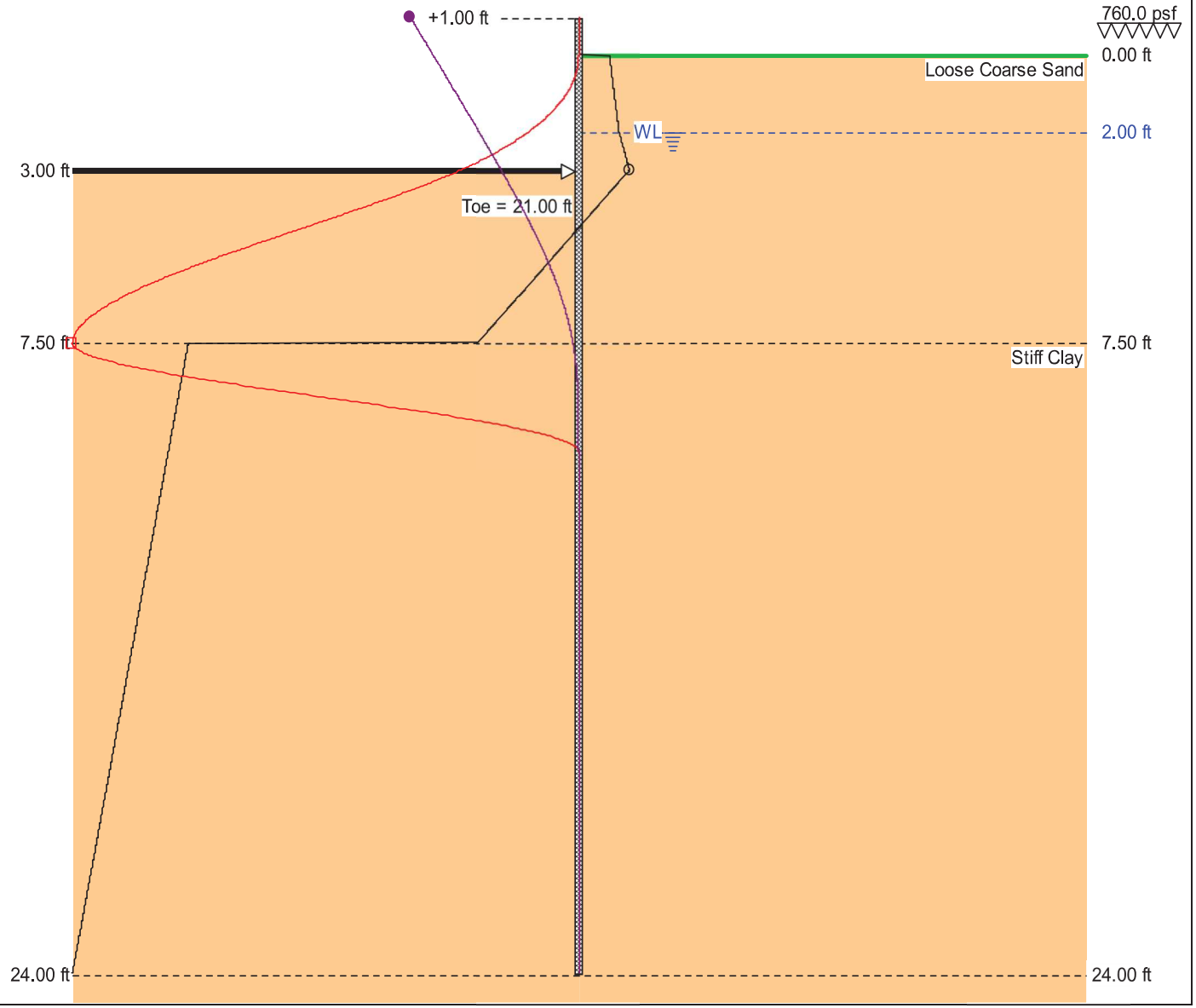
Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Cantilever

Maximum	d (ft)
415.1 psf	3.00
5655.1 ftlb/ft	7.52
0.0 in	-1.00

Stage 1 Excavation:

Cut 1 Depth = 3'
Cut 1 ELV = +/- +14.25 CCD

HP Tip = -6.75 CCD



[redacted]

[redacted]

Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Cantilever

Stage 1 Excavation:

Cut 1 Depth = 3'
Cut 1 ELV = +/- +14.25 CCD

HP Tip = -6.75 CCD

Input Data

Depth Of Excavation = 3.00 ft Depth Of Active Water = 2.00 ft Water Density = 62.40 pcf
Surcharge = 760.0 psf Depth Of Passive Water = 35.00 ft Minimum Fluid Density = 31.82 pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C_a (psf)	ϕ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Loose Coarse Sand	120.00	68.73	0.0	0.0	30.0	0.0	0.33	0.00	3.00	0.00
7.50	Stiff Clay	120.00	68.73	1500.0	0.0	0.0	0.0	1.00	2.00	1.00	2.00

Solution

Sheet

Sheet Name	I (in^4/ft)	E (psi)	Z (in^3/ft)	f (psi)	Maximum Bending Moment (ftlb/ft)	Upstand (ft)	Toe (ft)	Pile Length (ft)
HP 12 x 53	393.00	2.9E+07	74.00	50.0	308.3	1.00	21.00	25.00

Maxima

	Maximum	Depth
Bending Moment	5655.1 ftlb/ft	7.52 ft
Deflection	0.0 in	-1.00 ft
Pressure	415.1 psf	3.00 ft
Shear Force	1269.5 lb/ft	4.50 ft

[redacted]

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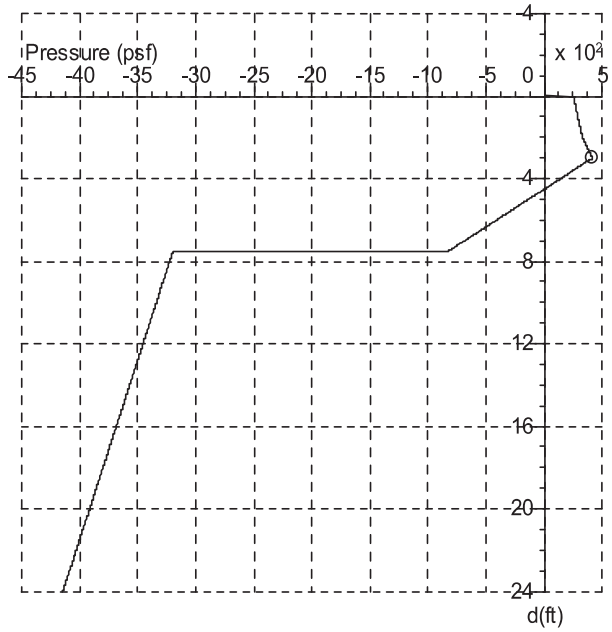
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Pressure: Coulomb
Toe: Cantilever

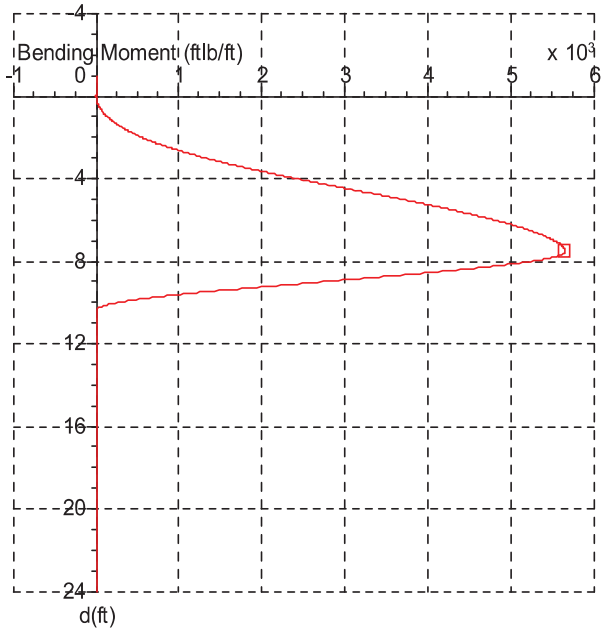
Maximum	d (ft)
○ 415.1 psf	3.00
□ 5655.1 ftlb/ft	7.52
◇ 1269.5 lb/ft	4.50
● 0.0 in	-1.00

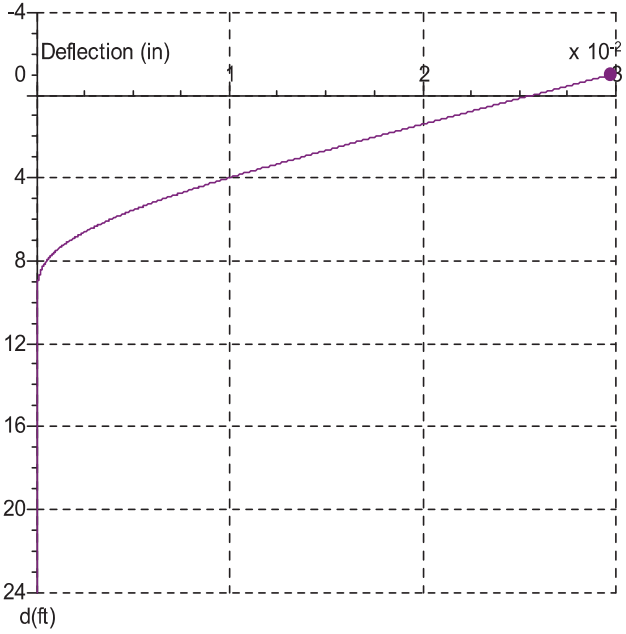
Stage 1 Excavation:

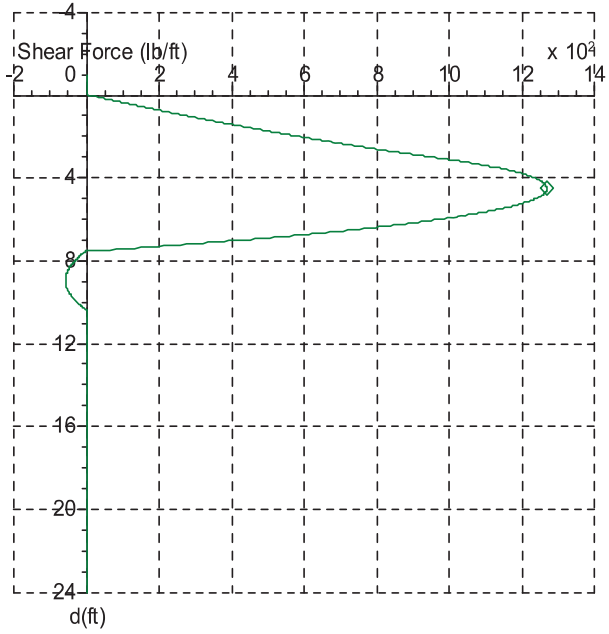
Cut 1 Depth = 3'
Cut 1 ELV = +/- +14.25 CCD

HP Tip = -6.75 CCD









[redacted]

[redacted]

Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Cantilever

Stage 1 Excavation:

Cut 1 Depth = 3'
Cut 1 ELV = +/- +14.25 CCD

HP Tip = -6.75 CCD

depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)
0.00	250.8	0.0	0.0	5.2	8.07	-3230.4	5094.4	0.0	-36.8	16.14	-3694.8	0.0	0.0	0.0
0.21	259.9	7.2	0.0	63.8	8.28	-3242.4	4651.4	0.0	-45.8	16.35	-3706.8	0.0	0.0	0.0
0.42	268.1	25.6	0.0	118.9	8.50	-3254.4	4123.5	0.0	-52.3	16.57	-3720.0	0.0	0.0	0.0
0.64	276.4	55.5	0.0	175.7	8.71	-3266.4	3537.6	0.0	-56.3	16.78	-3732.0	0.0	0.0	0.0
0.85	284.6	97.4	0.0	234.2	8.92	-3279.6	2858.3	0.0	-57.8	16.99	-3744.0	0.0	0.0	0.0
1.06	292.9	151.6	0.0	294.5	9.13	-3291.6	2238.5	0.0	-56.6	17.20	-3756.0	0.0	0.0	0.0
1.27	302.0	225.9	0.0	362.7	9.35	-3303.6	1644.3	0.0	-52.8	17.42	-3768.0	0.0	0.0	0.0
1.49	310.2	307.1	0.0	426.6	9.56	-3315.6	1102.7	0.0	-46.6	17.63	-3781.2	0.0	0.0	0.0
1.70	318.5	401.7	0.0	492.2	9.77	-3327.6	640.7	0.0	-37.8	17.84	-3793.2	0.0	0.0	0.0
1.91	326.7	510.1	0.0	559.4	9.98	-3340.8	256.6	0.0	-25.3	18.05	-3805.2	0.0	0.0	0.0
2.12	340.6	632.6	0.0	628.9	10.19	-3352.8	49.5	0.0	-11.3	18.27	-3817.2	0.0	0.0	0.0
2.34	360.1	784.4	0.0	709.4	10.41	-3364.8	0.0	0.0	0.0	18.48	-3829.2	0.0	0.0	0.0
2.55	377.9	938.7	0.0	786.4	10.62	-3376.8	0.0	0.0	0.0	18.69	-3842.4	0.0	0.0	0.0
2.76	395.6	1109.4	0.0	867.2	10.83	-3388.8	0.0	0.0	0.0	18.90	-3854.4	0.0	0.0	0.0
2.97	413.3	1297.1	0.0	951.6	11.04	-3402.0	0.0	0.0	0.0	19.12	-3866.4	0.0	0.0	0.0
3.19	363.5	1502.4	0.0	1032.9	11.26	-3414.0	0.0	0.0	0.0	19.33	-3878.4	0.0	0.0	0.0
3.40	300.5	1746.2	0.0	1108.3	11.47	-3426.0	0.0	0.0	0.0	19.54	-3890.4	0.0	0.0	0.0
3.61	243.3	1981.6	0.0	1164.4	11.68	-3438.0	0.0	0.0	0.0	19.75	-3903.6	0.0	0.0	0.0
3.82	186.0	2227.6	0.0	1208.5	11.89	-3450.0	0.0	0.0	0.0	19.96	-3915.6	0.0	0.0	0.0
4.04	128.7	2481.5	0.0	1240.7	12.11	-3463.2	0.0	0.0	0.0	20.18	-3927.6	0.0	0.0	0.0
4.25	71.4	2741.0	0.0	1260.9	12.32	-3475.2	0.0	0.0	0.0	20.39	-3939.6	0.0	0.0	0.0
4.46	8.4	3030.0	0.0	1269.4	12.53	-3487.2	0.0	0.0	0.0	20.60	-3951.6	0.0	0.0	0.0
4.67	-48.9	3293.2	0.0	1265.6	12.74	-3499.2	0.0	0.0	0.0	20.81	-3964.8	0.0	0.0	0.0
4.88	-106.1	3554.6	0.0	1250.0	12.96	-3511.2	0.0	0.0	0.0	21.03	-3976.8	0.0	0.0	0.0
5.10	-163.4	3811.6	0.0	1222.5	13.17	-3524.4	0.0	0.0	0.0	21.24	-3988.8	0.0	0.0	0.0
5.31	-220.7	4061.8	0.0	1183.1	13.38	-3536.4	0.0	0.0	0.0	21.45	-4000.8	0.0	0.0	0.0
5.52	-283.7	4326.2	0.0	1126.0	13.59	-3548.4	0.0	0.0	0.0	21.66	-4012.8	0.0	0.0	0.0
5.73	-341.0	4554.0	0.0	1061.5	13.81	-3560.4	0.0	0.0	0.0	21.88	-4026.0	0.0	0.0	0.0
5.95	-398.2	4767.3	0.0	985.1	14.02	-3572.4	0.0	0.0	0.0	22.09	-4038.0	0.0	0.0	0.0
6.16	-455.5	4963.7	0.0	896.8	14.23	-3585.6	0.0	0.0	0.0	22.30	-4050.0	0.0	0.0	0.0
6.37	-512.8	5140.6	0.0	796.5	14.44	-3597.6	0.0	0.0	0.0	22.51	-4062.0	0.0	0.0	0.0
6.58	-575.8	5309.8	0.0	672.4	14.65	-3609.6	0.0	0.0	0.0	22.73	-4074.0	0.0	0.0	0.0
6.80	-633.1	5437.8	0.0	547.1	14.87	-3621.6	0.0	0.0	0.0	22.94	-4087.2	0.0	0.0	0.0
7.01	-690.3	5538.7	0.0	409.9	15.08	-3633.6	0.0	0.0	0.0	23.15	-4099.2	0.0	0.0	0.0
7.22	-747.6	5610.1	0.0	260.7	15.29	-3646.8	0.0	0.0	0.0	23.36	-4111.2	0.0	0.0	0.0
7.43	-804.9	5649.3	0.0	99.6	15.50	-3658.8	0.0	0.0	0.0	23.58	-4123.2	0.0	0.0	0.0
7.65	-3206.4	5617.7	0.0	-11.3	15.72	-3670.8	0.0	0.0	0.0	23.79	-4135.2	0.0	0.0	0.0
7.86	-3218.4	5425.5	0.0	-25.3	15.93	-3682.8	0.0	0.0	0.0	24.00	-4147.2	0.0	0.0	0.0

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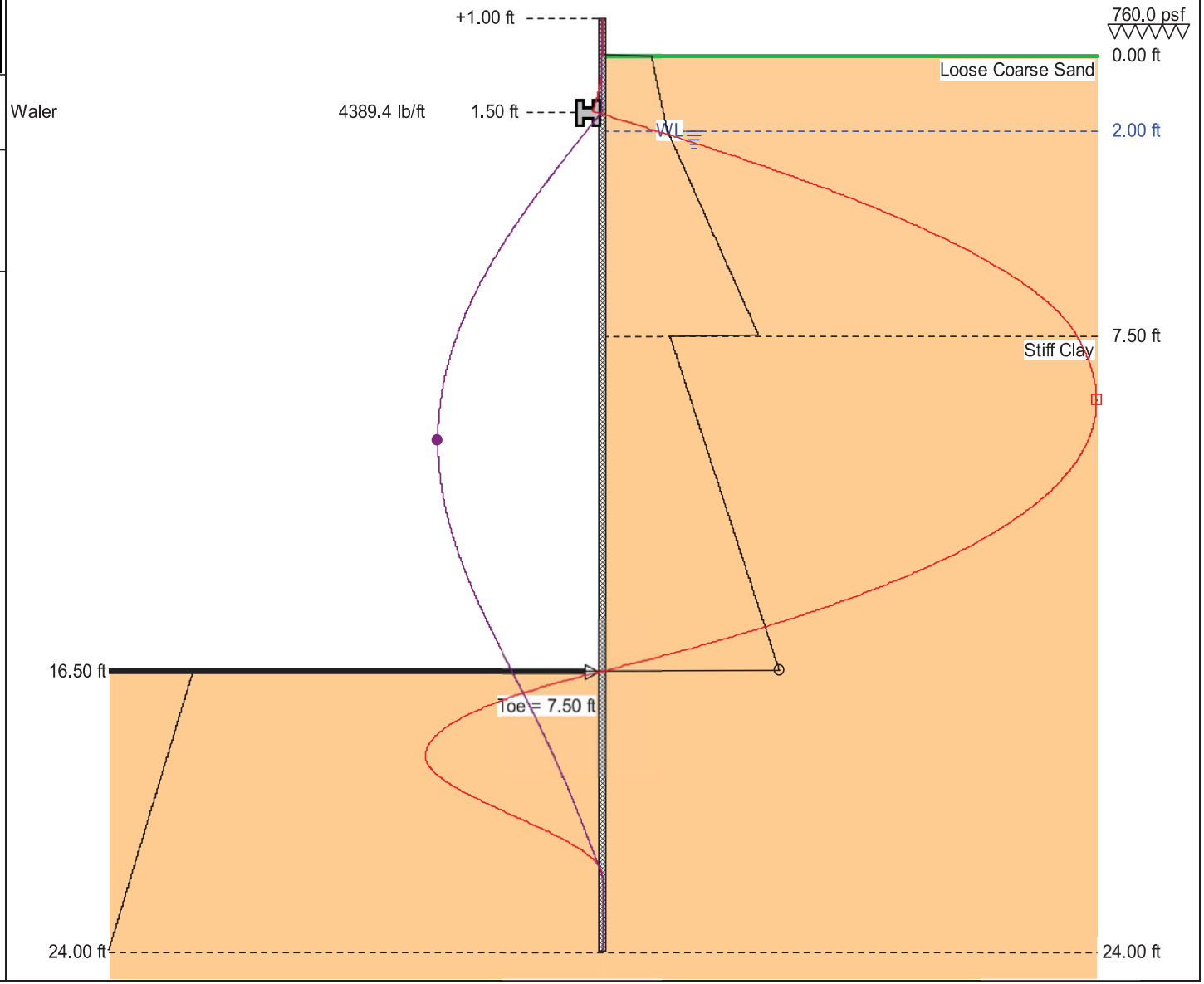
Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Fixed Earth Support

Maximum		d (ft)
○	904.8 psf	16.50
□	15862.0 ftlb/ft	9.25
●	0.1 in	10.33

Stage 2 Excavation:

Cut 1 Depth = 16.5'
Cut 1 ELV = +/- +0.75 CCD

HP Tip = -6.75 CCD



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Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Fixed Earth Support

Stage 2 Excavation:

Cut 1 Depth = 16.5'
Cut 1 ELV = +/- +0.75 CCD

HP Tip = -6.75 CCD

Input Data

Depth Of Excavation = 16.50 ft Depth Of Active Water = 2.00 ft Water Density = 62.40 pcf
Surcharge = 760.0 psf Depth Of Passive Water = 35.00 ft Minimum Fluid Density = 31.82 pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C_a (psf)	ϕ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Loose Coarse Sand	120.00	68.73	0.0	0.0	30.0	0.0	0.33	0.00	3.00	0.00
7.50	Stiff Clay	120.00	68.73	1500.0	0.0	0.0	0.0	1.00	2.00	1.00	2.00

Solution

Sheet

Sheet Name	I (in^4/ft)	E (psi)	Z (in^3/ft)	f (psi)	Maximum Bending Moment (ftlb/ft)	Upstand (ft)	Toe (ft)	Pile Length (ft)
HP 12 x 53	393.00	2.9E+07	74.00	50.0	308.3	1.00	7.50	25.00

Load Model: Hinge Method

Supports

Depth (ft)	Type	Linear Load (lb/ft)
1.50	Waler	4389.4

Maxima

	Maximum	Depth
Bending Moment	15862.0 ftlb/ft	9.25 ft
Deflection	0.1 in	10.33 ft
Pressure	904.8 psf	16.50 ft
Shear Force	4925.9 lb/ft	16.50 ft

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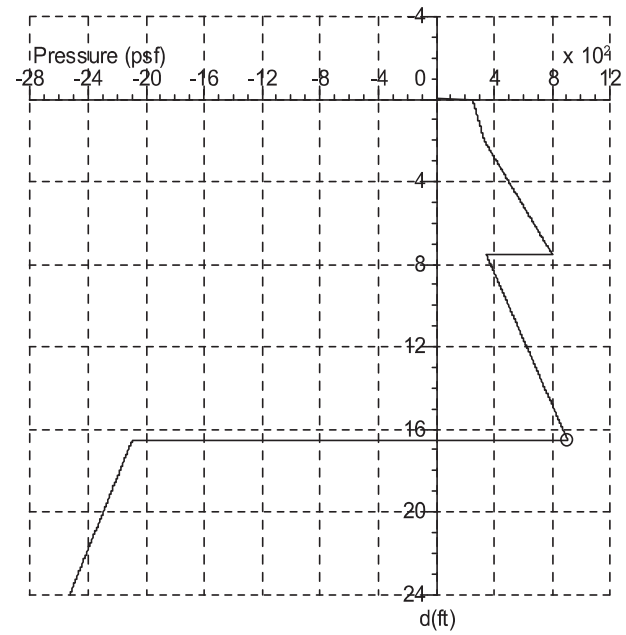
Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Fixed Earth Support

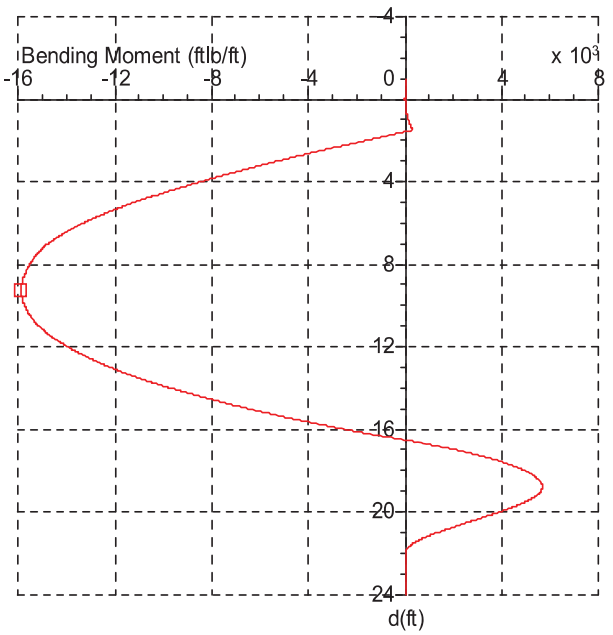
Maximum		d (ft)
○	904.8 psf	16.50
□	15862.0 ftlb/ft	9.25
◇	4925.9 lb/ft	16.50
●	0.1 in	10.33

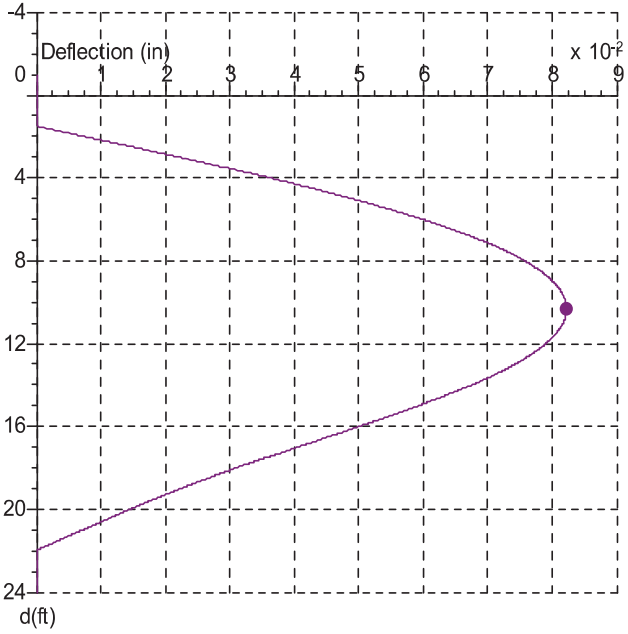
Stage 2 Excavation:

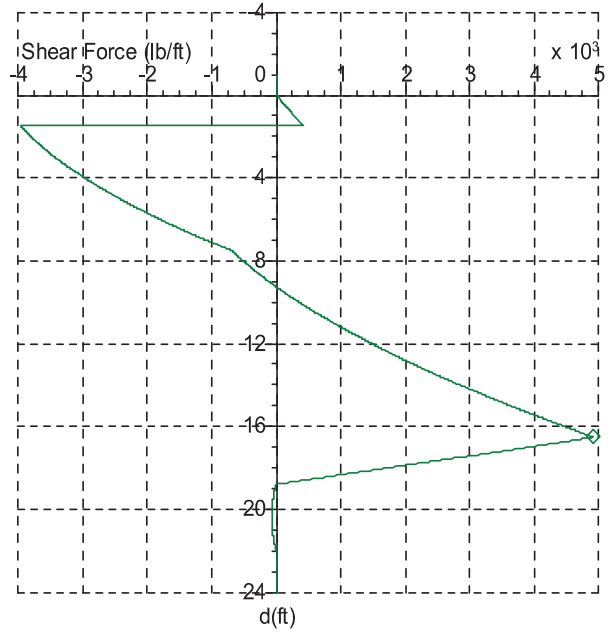
Cut 1 Depth = 16.5'
Cut 1 ELV = +/- +0.75 CCD

HP Tip = -6.75 CCD









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Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Fixed Earth Support

Stage 2 Excavation:

Cut 1 Depth = 16.5'
Cut 1 ELV = +/- +0.75 CCD

HP Tip = -6.75 CCD

depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)
0.00	250.8	-0.2	0.0	5.2	8.07	379.6	-15565.8	0.1	-484.7	16.14	882.7	-1718.4	0.0	4609.2
0.21	259.9	7.0	0.0	63.8	8.28	392.6	-15659.3	0.1	-404.1	16.35	895.7	-740.8	0.0	4794.6
0.42	268.1	25.5	0.0	118.9	8.50	405.6	-15735.7	0.1	-320.9	16.57	-2100.0	371.6	0.0	4751.2
0.64	276.4	55.5	0.0	175.7	8.71	418.6	-15794.6	0.1	-234.9	16.78	-2112.0	1320.4	0.0	4312.6
0.85	284.6	97.6	0.0	234.2	8.92	432.9	-15838.3	0.1	-137.2	16.99	-2124.0	2177.5	0.0	3871.5
1.06	292.9	152.0	0.0	294.5	9.13	445.9	-15858.3	0.1	-45.5	17.20	-2136.0	2942.6	0.0	3427.9
1.27	302.0	226.6	0.0	362.7	9.35	458.9	-15859.9	0.1	48.9	17.42	-2148.0	3614.9	0.0	2981.7
1.49	310.2	307.9	0.0	-3962.8	9.56	471.9	-15840.6	0.1	146.0	17.63	-2161.2	4246.9	0.0	2488.1
1.70	318.5	-511.5	0.0	-3897.3	9.77	484.9	-15800.9	0.1	245.8	17.84	-2173.2	4723.0	0.0	2036.8
1.91	326.7	-1317.2	0.0	-3830.0	9.98	499.2	-15732.9	0.1	358.7	18.05	-2185.2	5104.8	0.0	1582.9
2.12	340.6	-2108.6	0.0	-3760.6	10.19	512.2	-15648.3	0.1	464.2	18.27	-2197.2	5391.8	0.0	1126.6
2.34	360.1	-2962.1	0.0	-3680.1	10.41	525.2	-15541.5	0.1	572.4	18.48	-2209.2	5583.5	0.0	667.7
2.55	377.9	-3721.6	0.0	-3603.0	10.62	538.2	-15411.9	0.1	683.3	18.69	-2222.4	5683.7	0.0	160.1
2.76	395.6	-4464.8	0.0	-3522.2	10.83	551.2	-15259.0	0.1	796.9	18.90	-2234.4	5661.4	0.0	-12.9
2.97	413.3	-5190.7	0.0	-3437.8	11.04	565.5	-15063.0	0.1	925.0	19.12	-2246.4	5509.0	0.0	-29.1
3.19	431.0	-5898.7	0.0	-3349.7	11.26	578.5	-14859.2	0.1	1044.3	19.33	-2258.4	5243.4	0.0	-42.9
3.40	450.5	-6655.9	0.0	-3248.5	11.47	591.5	-14630.2	0.1	1166.3	19.54	-2270.4	4883.4	0.0	-54.1
3.61	468.3	-7323.7	0.0	-3152.6	11.68	604.5	-14375.6	0.1	1291.1	19.75	-2283.6	4400.7	0.0	-63.6
3.82	486.0	-7971.2	0.0	-3053.0	11.89	617.5	-14094.7	0.1	1418.5	19.96	-2295.6	3903.2	0.0	-69.6
4.04	503.7	-8597.7	0.0	-2949.7	12.11	631.8	-13754.8	0.1	1561.8	20.18	-2307.6	3369.3	0.0	-73.1
4.25	521.4	-9202.2	0.0	-2842.7	12.32	644.8	-13417.0	0.1	1694.9	20.39	-2319.6	2817.7	0.0	-74.1
4.46	540.9	-9841.1	0.0	-2720.8	12.53	657.8	-13051.2	0.1	1830.7	20.60	-2331.6	2267.0	0.0	-72.6
4.67	558.7	-10397.2	0.0	-2606.1	12.74	670.8	-12656.9	0.1	1969.3	20.81	-2344.8	1684.6	0.0	-68.1
4.88	576.4	-10929.1	0.0	-2487.7	12.96	683.8	-12233.4	0.1	2110.5	21.03	-2356.8	1196.7	0.0	-61.3
5.10	594.1	-11436.0	0.1	-2365.6	13.17	698.1	-11733.3	0.1	2269.0	21.24	-2368.8	767.7	0.0	-52.1
5.31	611.8	-11917.1	0.1	-2239.8	13.38	711.1	-11246.9	0.1	2415.9	21.45	-2380.8	416.3	0.0	-40.3
5.52	631.3	-12415.6	0.1	-2097.1	13.59	724.1	-10729.6	0.1	2565.5	21.66	-2392.8	161.2	0.0	-26.1
5.73	649.1	-12840.0	0.1	-1963.6	13.81	737.1	-10180.9	0.1	2717.9	21.88	-2406.0	14.1	0.0	-7.5
5.95	666.8	-13236.3	0.1	-1826.3	14.02	750.1	-9600.1	0.1	2872.9	22.09	-2418.0	0.0	0.0	0.0
6.16	684.5	-13603.6	0.1	-1685.4	14.23	764.4	-8923.7	0.1	3046.6	22.30	-2430.0	0.0	0.0	0.0
6.37	702.2	-13941.2	0.1	-1540.7	14.44	777.4	-8274.0	0.1	3207.4	22.51	-2442.0	0.0	0.0	0.0
6.58	721.7	-14277.4	0.1	-1377.4	14.65	790.4	-7590.5	0.1	3370.8	22.73	-2454.0	0.0	0.0	0.0
6.80	739.5	-14550.1	0.1	-1225.0	14.87	803.4	-6872.7	0.1	3537.0	22.94	-2467.2	0.0	0.0	0.0
7.01	757.2	-14790.8	0.1	-1068.9	15.08	816.4	-6120.1	0.1	3705.8	23.15	-2479.2	0.0	0.0	0.0
7.22	774.9	-14998.5	0.1	-909.1	15.29	830.7	-5251.2	0.1	3894.7	23.36	-2491.2	0.0	0.0	0.0
7.43	792.6	-15172.7	0.1	-745.6	15.50	843.7	-4423.5	0.1	4069.3	23.58	-2503.2	0.0	0.0	0.0
7.65	353.6	-15330.0	0.1	-637.7	15.72	856.7	-3559.2	0.1	4246.5	23.79	-2515.2	0.0	0.0	0.0
7.86	366.6	-15455.9	0.1	-562.6	15.93	869.7	-2657.6	0.1	4426.5	24.00	-2527.2	0.0	0.0	0.0

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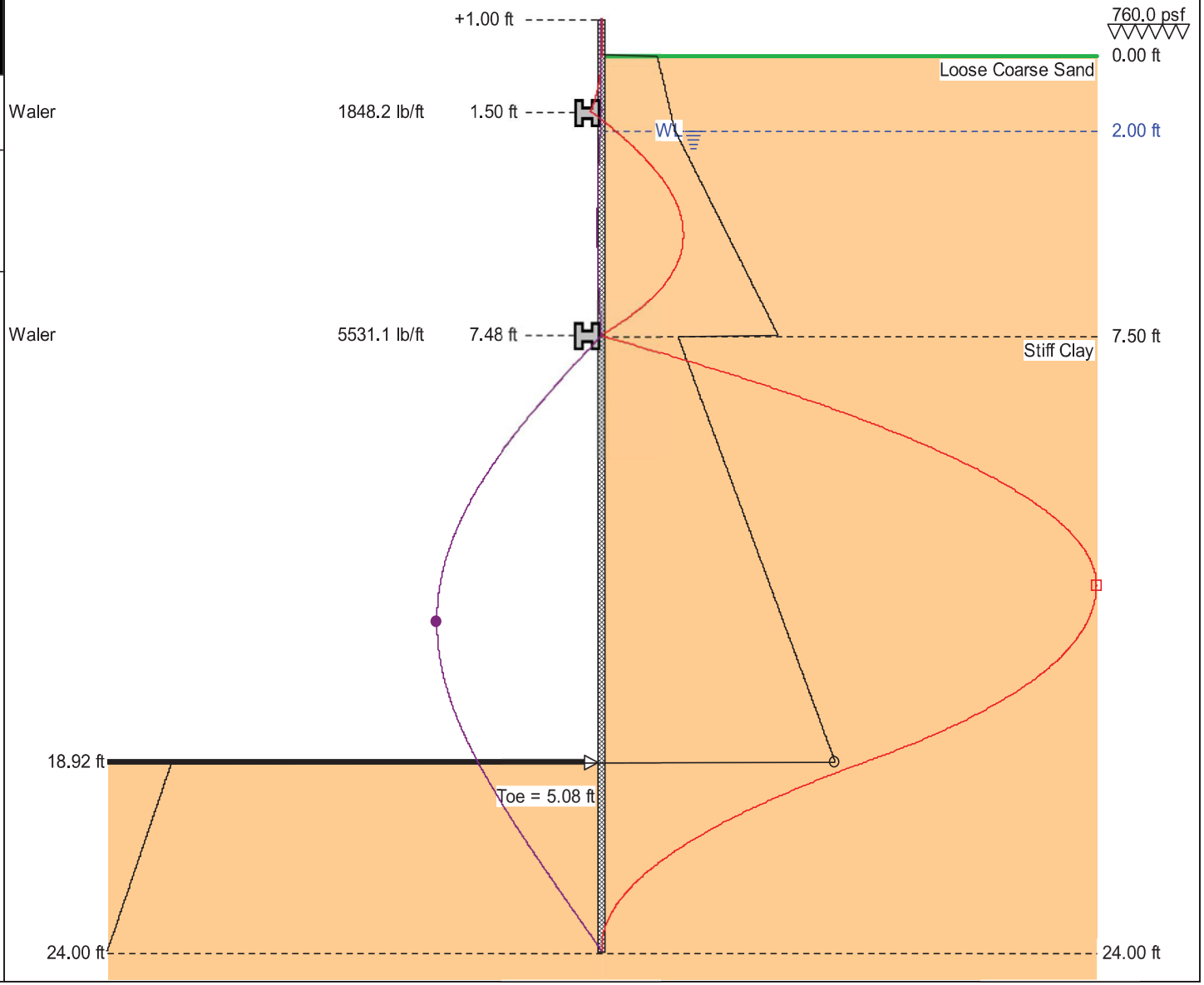
Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Free Earth Support

Maximum	d (ft)
○ 1055.8 psf	18.92
□ 13946.8 ftlb/ft	14.19
● 0.1 in	15.17

Stage 3 Excavation INT Wale 1:

Cut 3 Depth = 18.92'
Cut 3 ELV = +/- -1.67 CCD

HP Tip = -6.75 CCD



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[redacted]

Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Free Earth Support

Stage 3 Excavation INT Wale 1:

Cut 3 Depth = 18.92'
Cut 3 ELV = +/- -1.67 CCD

HP Tip = -6.75 CCD

Input Data

Depth Of Excavation = 18.92 ft Depth Of Active Water = 2.00 ft Water Density = 62.40 pcf
Surcharge = 760.0 psf Depth Of Passive Water = 35.00 ft Minimum Fluid Density = 31.82 pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C_a (psf)	ϕ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Loose Coarse Sand	120.00	68.73	0.0	0.0	30.0	0.0	0.33	0.00	3.00	0.00
7.50	Stiff Clay	120.00	68.73	1500.0	0.0	0.0	0.0	1.00	2.00	1.00	2.00

Solution

Sheet

Sheet Name	I (in^4/ft)	E (psi)	Z (in^3/ft)	f (psi)	Maximum Bending Moment (ftlb/ft)	Upstand (ft)	Toe (ft)	Pile Length (ft)
HP 12 x 53	393.00	2.9E+07	74.00	50.0	308.3	1.00	5.08	25.00

Load Model: Hinge Method

Supports

Depth (ft)	Type	Linear Load (lb/ft)
1.50	Waler	1848.2
7.48	Waler	5531.1

Maxima

	Maximum	Depth
Bending Moment	13946.8 ftlb/ft	14.19 ft
Deflection	0.1 in	15.17 ft
Pressure	1055.8 psf	18.92 ft
Shear Force	4328.4 lb/ft	18.94 ft

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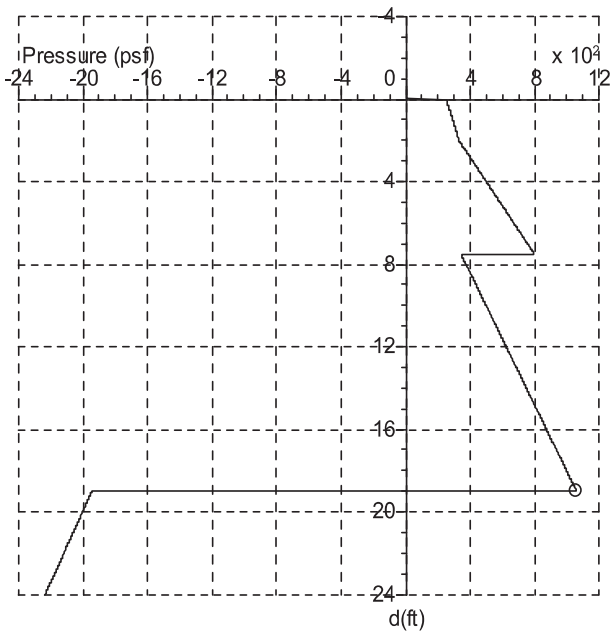
Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Free Earth Support

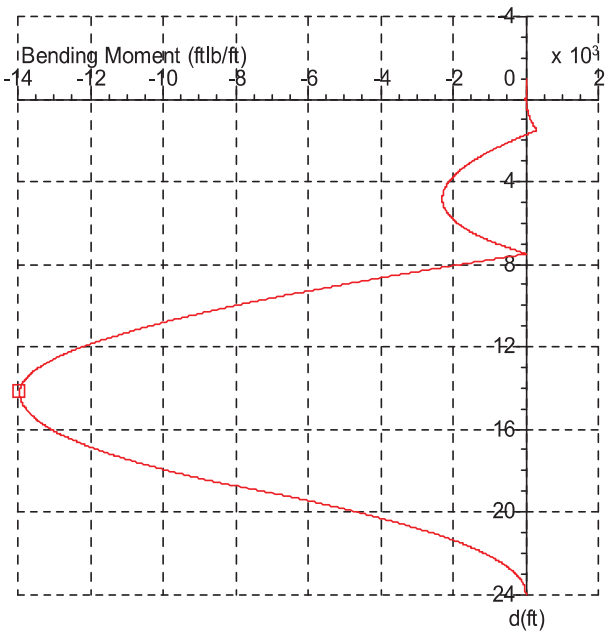
Maximum		d (ft)
○	1055.8 psf	18.92
□	13946.8 ftlb/ft	14.19
◇	4328.4 lb/ft	18.94
●	0.1 in	15.17

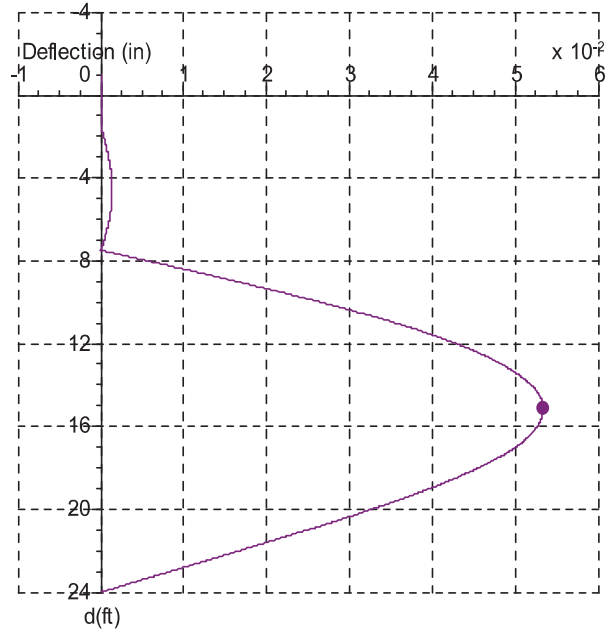
Stage 3 Excavation INT Wale 1:

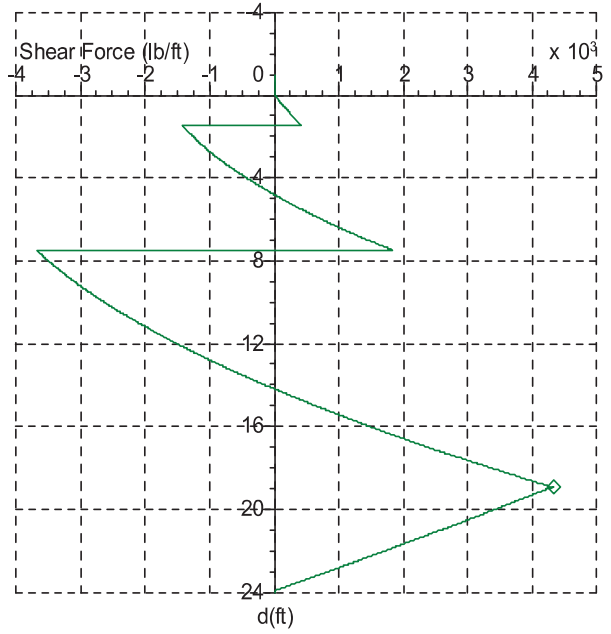
Cut 3 Depth = 18.92'
Cut 3 ELV = +/- -1.67 CCD

HP Tip = -6.75 CCD









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Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Free Earth Support

Stage 3 Excavation INT Wale 1:

Cut 3 Depth = 18.92'
Cut 3 ELV = +/- -1.67 CCD

HP Tip = -6.75 CCD

depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)
0.00	250.8	-0.2	0.0	5.2	8.07	379.6	-2075.8	0.0	-3474.6	16.14	882.7	-12906.4	0.1	1619.3
0.21	259.9	7.0	0.0	63.8	8.28	392.6	-2796.7	0.0	-3394.0	16.35	895.7	-12666.6	0.1	1804.7
0.42	268.1	25.5	0.0	118.9	8.50	405.6	-3500.5	0.0	-3310.8	16.57	910.0	-12372.4	0.1	2011.7
0.64	276.4	55.5	0.0	175.7	8.71	418.6	-4186.5	0.0	-3224.8	16.78	923.0	-12076.9	0.1	2202.8
0.85	284.6	97.6	0.0	234.2	8.92	432.9	-4920.1	0.0	-3127.1	16.99	936.0	-11754.4	0.0	2396.6
1.06	292.9	152.0	0.0	294.5	9.13	445.9	-5567.1	0.0	-3035.4	17.20	949.0	-11404.4	0.0	2593.1
1.27	302.0	226.6	0.0	362.7	9.35	458.9	-6194.6	0.0	-2941.0	17.42	962.0	-11026.5	0.0	2792.3
1.49	310.2	307.9	0.0	-1421.6	9.56	471.9	-6802.0	0.0	-2843.9	17.63	976.3	-10578.2	0.0	3014.5
1.70	318.5	17.8	0.0	-1356.1	9.77	484.9	-7388.9	0.0	-2744.1	17.84	989.3	-10140.6	0.0	3219.4
1.91	326.7	-258.4	0.0	-1288.8	9.98	499.2	-8010.0	0.0	-2631.2	18.05	1002.3	-9674.0	0.0	3427.0
2.12	340.6	-520.4	0.0	-1219.4	10.19	512.2	-8551.7	0.0	-2525.7	18.27	1015.3	-9177.9	0.0	3637.2
2.34	360.1	-791.6	0.0	-1138.9	10.41	525.2	-9071.1	0.0	-2417.5	18.48	1028.3	-8652.1	0.0	3850.2
2.55	377.9	-1021.7	0.0	-1061.8	10.62	538.2	-9567.5	0.0	-2306.6	18.69	1042.6	-8038.8	0.0	4087.7
2.76	395.6	-1235.4	0.0	-981.0	10.83	551.2	-10040.4	0.0	-2193.0	18.90	1055.6	-7449.1	0.0	4306.4
2.97	413.3	-1431.9	0.0	-896.6	11.04	565.5	-10532.8	0.0	-2064.9	19.12	-1956.0	-6853.2	0.0	4129.9
3.19	431.0	-1610.5	0.0	-808.5	11.26	578.5	-10954.5	0.0	-1945.6	19.33	-1968.0	-6282.1	0.0	3961.3
3.40	450.5	-1785.3	0.0	-707.3	11.47	591.5	-11350.9	0.0	-1823.6	19.54	-1980.0	-5734.9	0.0	3791.7
3.61	468.3	-1923.7	0.0	-611.4	11.68	604.5	-11721.5	0.0	-1698.8	19.75	-1993.2	-5160.5	0.0	3603.9
3.82	486.0	-2041.8	0.0	-511.8	11.89	617.5	-12065.7	0.0	-1571.4	19.96	-2005.2	-4663.7	0.0	3432.2
4.04	503.7	-2138.8	0.0	-408.5	12.11	631.8	-12413.1	0.0	-1428.1	20.18	-2017.2	-4191.2	0.0	3259.4
4.25	521.4	-2214.0	0.0	-301.5	12.32	644.8	-12700.0	0.0	-1295.0	20.39	-2029.2	-3743.1	0.0	3085.5
4.46	540.9	-2270.5	0.0	-179.6	12.53	657.8	-12958.8	0.0	-1159.2	20.60	-2041.2	-3319.5	0.0	2910.6
4.67	558.7	-2297.2	0.0	-64.9	12.74	670.8	-13188.8	0.0	-1020.6	20.81	-2054.4	-2882.1	0.0	2717.1
4.88	576.4	-2299.7	0.0	53.5	12.96	683.8	-13389.5	0.0	-879.4	21.03	-2066.4	-2510.5	0.0	2540.1
5.10	594.1	-2277.2	0.0	175.6	13.17	698.1	-13575.7	0.0	-720.9	21.24	-2078.4	-2164.0	0.0	2362.0
5.31	611.8	-2228.8	0.0	301.4	13.38	711.1	-13713.1	0.1	-574.0	21.45	-2090.4	-1842.6	0.0	2182.9
5.52	631.3	-2145.0	0.0	444.1	13.59	724.1	-13819.3	0.1	-424.3	21.66	-2102.4	-1546.5	0.0	2002.8
5.73	649.1	-2040.0	0.0	577.6	13.81	737.1	-13894.0	0.1	-272.0	21.88	-2115.6	-1250.2	0.0	1803.5
5.95	666.8	-1906.9	0.0	714.9	14.02	750.1	-13936.4	0.1	-117.0	22.09	-2127.6	-1007.7	0.0	1621.2
6.16	684.5	-1744.8	0.0	855.8	14.23	764.4	-13945.7	0.1	56.7	22.30	-2139.6	-790.9	0.0	1437.9
6.37	702.2	-1553.0	0.0	1000.5	14.44	777.4	-13927.6	0.1	217.5	22.51	-2151.6	-600.0	0.0	1253.5
6.58	721.7	-1306.8	0.0	1163.8	14.65	790.4	-13886.6	0.1	380.9	22.73	-2163.6	-435.2	0.0	1068.1
6.80	739.5	-1050.1	0.0	1316.2	14.87	803.4	-13822.4	0.1	547.1	22.94	-2176.8	-284.1	0.0	863.0
7.01	757.2	-761.3	0.0	1472.3	15.08	816.4	-13734.7	0.1	715.9	23.15	-2188.8	-174.4	0.0	675.5
7.22	774.9	-439.7	0.0	1632.1	15.29	830.7	-13610.5	0.1	904.8	23.36	-2200.8	-91.2	0.0	486.9
7.43	792.6	-84.4	0.0	1795.6	15.50	843.7	-13472.0	0.1	1079.4	23.58	-2212.8	-34.6	0.0	297.3
7.65	353.6	-584.8	0.0	-3627.6	15.72	856.7	-13308.7	0.1	1256.6	23.79	-2224.8	-4.8	0.0	106.7
7.86	366.6	-1338.3	0.0	-3552.5	15.93	869.7	-13120.3	0.1	1436.6	24.00	-2236.8	0.0	0.0	0.0

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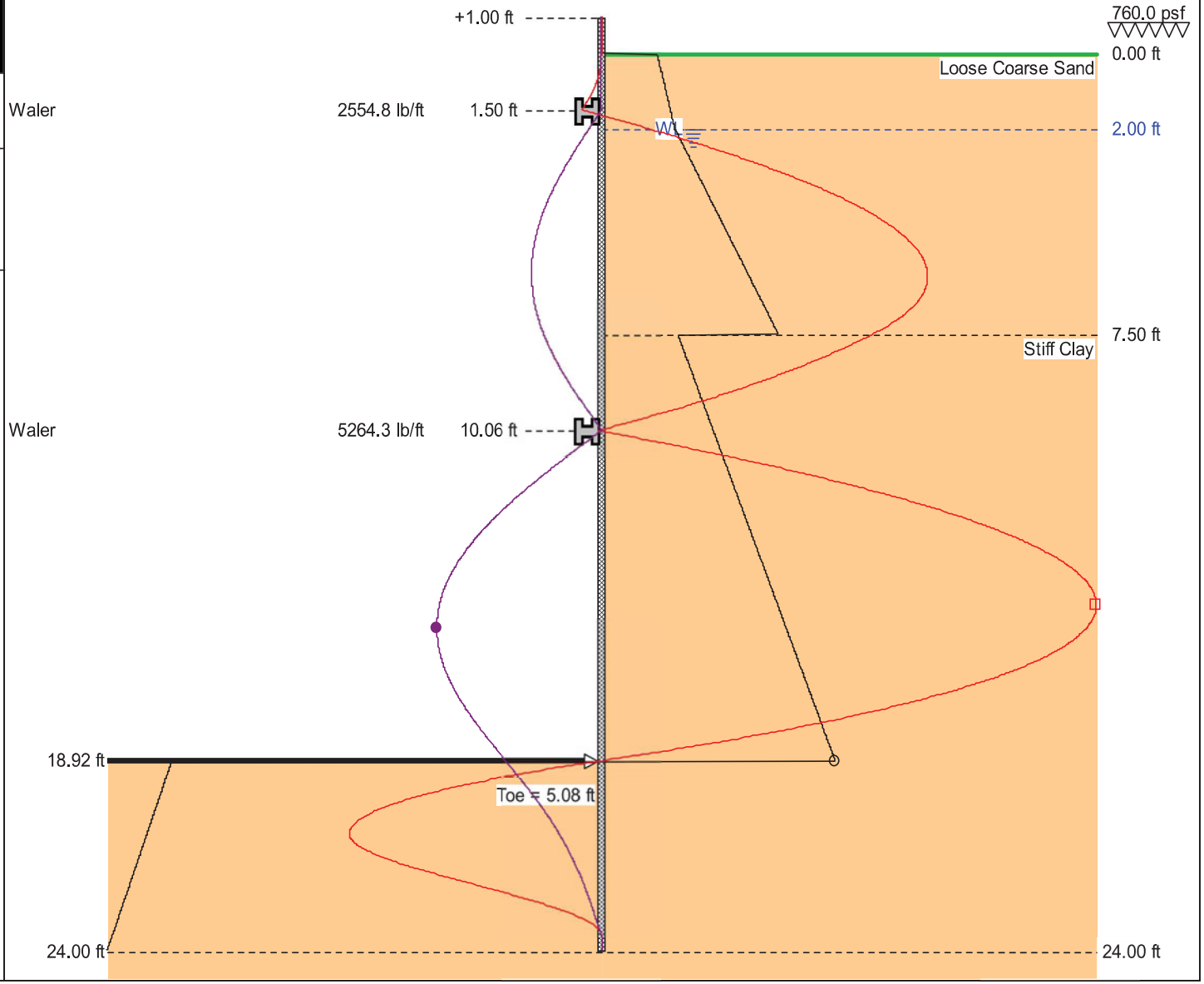
Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Fixed Earth Support

Maximum	d (ft)
○ 1055.8 psf	18.92
□ 7674.3 ftlb/ft	14.75
● 0.0 in	15.35

Stage 3 Excavation INT Wale 2:

Cut 3 Depth = 18.92'
Cut 3 ELV = +/- -1.67 CCD

HP Tip = -6.75 CCD



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Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Fixed Earth Support

Stage 3 Excavation INT Wale 2:

Cut 3 Depth = 18.92'
Cut 3 ELV = +/- -1.67 CCD

HP Tip = -6.75 CCD

Input Data

Depth Of Excavation = 18.92 ft Depth Of Active Water = 2.00 ft Water Density = 62.40 pcf
Surcharge = 760.0 psf Depth Of Passive Water = 35.00 ft Minimum Fluid Density = 31.82 pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C_a (psf)	ϕ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Loose Coarse Sand	120.00	68.73	0.0	0.0	30.0	0.0	0.33	0.00	3.00	0.00
7.50	Stiff Clay	120.00	68.73	1500.0	0.0	0.0	0.0	1.00	2.00	1.00	2.00

Solution

Sheet

Sheet Name	I (in^4/ft)	E (psi)	Z (in^3/ft)	f (psi)	Maximum Bending Moment (ftlb/ft)	Upstand (ft)	Toe (ft)	Pile Length (ft)
HP 12 x 53	393.00	2.9E+07	74.00	50.0	308.3	1.00	5.08	25.00

Load Model: Hinge Method

Supports

Depth (ft)	Type	Linear Load (lb/ft)
1.50	Waler	2554.8
10.06	Waler	5264.3

Maxima

	Maximum	Depth
Bending Moment	7674.3 ftlb/ft	14.75 ft
Deflection	0.0 in	15.35 ft
Pressure	1055.8 psf	18.92 ft
Shear Force	3888.6 lb/ft	18.94 ft

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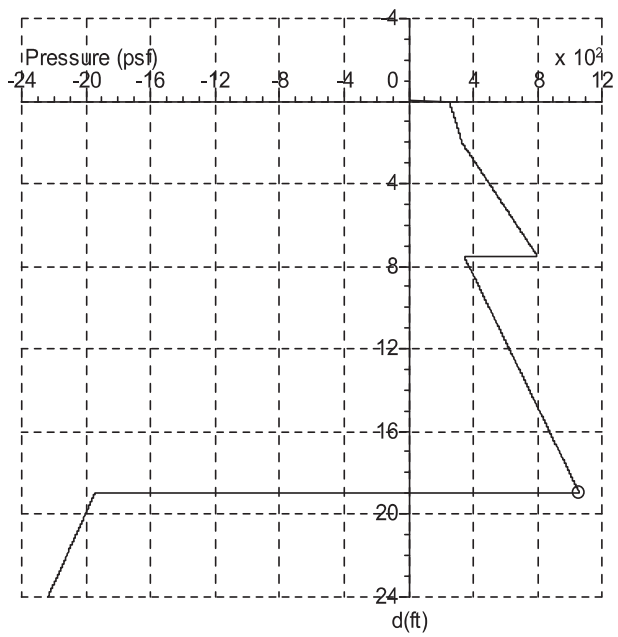
Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Fixed Earth Support

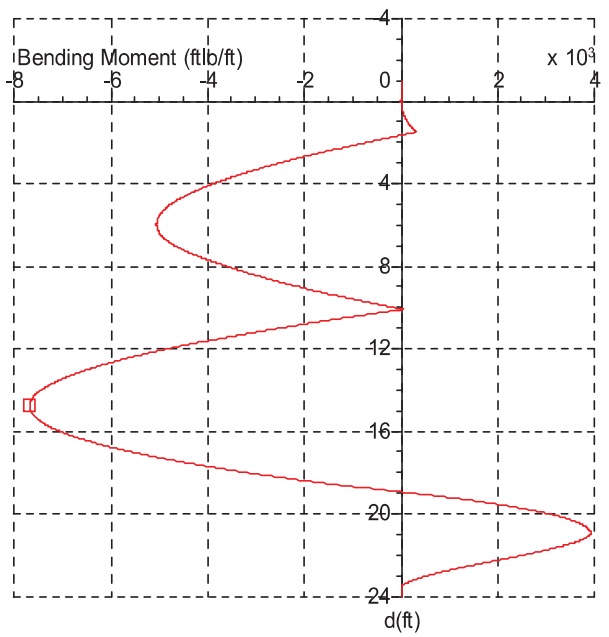
Maximum		d (ft)
○	1055.8 psf	18.92
□	7674.3 ftlb/ft	14.75
◇	3888.6 lb/ft	18.94
●	0.0 in	15.35

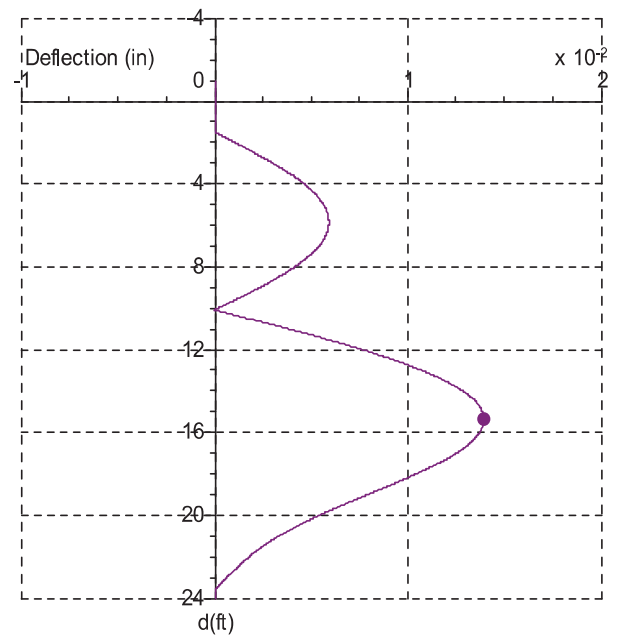
Stage 3 Excavation INT Wale 2:

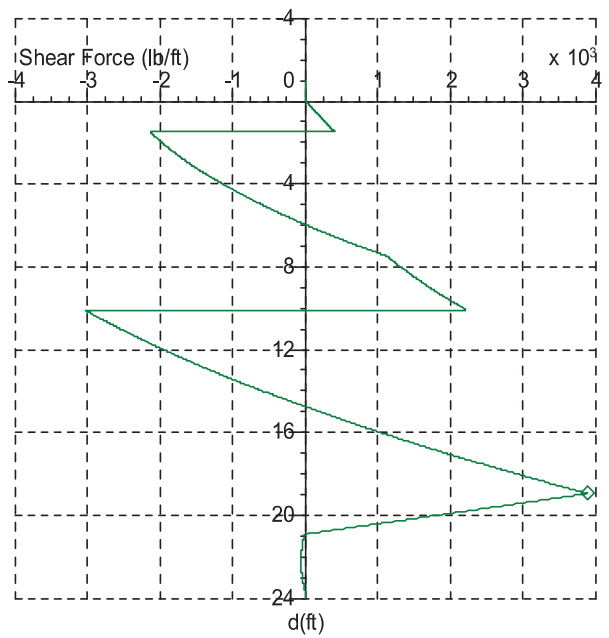
Cut 3 Depth = 18.92'
Cut 3 ELV = +/- -1.67 CCD

HP Tip = -6.75 CCD









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Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Fixed Earth Support

Stage 3 Excavation INT Wale 2:

Cut 3 Depth = 18.92'
Cut 3 ELV = +/- -1.67 CCD

HP Tip = -6.75 CCD

depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)
0.00	250.8	-0.2	0.0	5.2	8.07	379.6	-3488.0	0.0	1349.9	16.14	882.7	-6872.3	0.0	1179.5
0.21	259.9	7.0	0.0	63.8	8.28	392.6	-3199.3	0.0	1430.5	16.35	895.7	-6609.3	0.0	1364.9
0.42	268.1	25.5	0.0	118.9	8.50	405.6	-2893.5	0.0	1513.7	16.57	910.0	-6275.0	0.0	1572.0
0.64	276.4	55.5	0.0	175.7	8.71	418.6	-2570.1	0.0	1599.7	16.78	923.0	-5929.6	0.0	1763.0
0.85	284.6	97.6	0.0	234.2	8.92	432.9	-2193.4	0.0	1697.4	16.99	936.0	-5544.2	0.0	1956.8
1.06	292.9	152.0	0.0	294.5	9.13	445.9	-1831.2	0.0	1789.1	17.20	949.0	-5118.1	0.0	2153.3
1.27	302.0	226.6	0.0	362.7	9.35	458.9	-1449.7	0.0	1883.5	17.42	962.0	-4650.9	0.0	2352.5
1.49	310.2	307.8	0.0	-2128.2	9.56	471.9	-1048.2	0.0	1980.6	17.63	976.3	-4088.7	0.0	2574.7
1.70	318.5	-129.5	0.0	-2062.7	9.77	484.9	-626.3	0.0	2080.4	17.84	989.3	-3533.1	0.0	2779.6
1.91	326.7	-552.9	0.0	-1995.4	9.98	499.2	-137.8	0.0	2193.3	18.05	1002.3	-2934.6	0.0	2987.2
2.12	340.6	-962.1	0.0	-1925.9	10.19	512.2	-333.8	0.0	-2965.5	18.27	1015.3	-2292.6	0.0	3197.5
2.34	360.1	-1395.2	0.0	-1845.4	10.41	525.2	-950.4	0.0	-2857.3	18.48	1028.3	-1606.6	0.0	3410.5
2.55	377.9	-1772.5	0.0	-1768.4	10.62	538.2	-1543.7	0.0	-2746.3	18.69	1042.6	-800.3	0.0	3647.9
2.76	395.6	-2133.4	0.0	-1687.6	10.83	551.2	-2113.4	0.0	-2632.7	18.90	1055.6	-19.9	0.0	3866.6
2.97	413.3	-2477.2	0.0	-1603.2	11.04	565.5	-2712.1	0.0	-2504.6	19.12	-1956.0	759.3	0.0	3523.0
3.19	431.0	-2803.0	0.0	-1515.1	11.26	578.5	-3230.1	0.0	-2385.3	19.33	-1968.0	1455.0	0.0	3114.4
3.40	450.5	-3139.7	0.0	-1413.8	11.47	591.5	-3722.7	0.0	-2263.3	19.54	-1980.0	2065.4	0.0	2703.3
3.61	468.3	-3425.3	0.0	-1318.0	11.68	604.5	-4189.3	0.0	-2138.6	19.75	-1993.2	2637.5	0.0	2248.2
3.82	486.0	-3690.6	0.0	-1218.4	11.89	617.5	-4629.2	0.0	-2011.2	19.96	-2005.2	3066.9	0.0	1831.8
4.04	503.7	-3934.8	0.0	-1115.1	12.11	631.8	-5081.7	0.0	-1867.9	20.18	-2017.2	3409.3	0.0	1412.9
4.25	521.4	-4157.2	0.0	-1008.1	12.32	644.8	-5463.9	0.0	-1734.8	20.39	-2029.2	3664.2	0.0	991.6
4.46	540.9	-4375.6	0.0	-886.2	12.53	657.8	-5817.6	0.0	-1598.9	20.60	-2041.2	3831.1	0.0	567.7
4.67	558.7	-4549.5	0.0	-771.5	12.74	670.8	-6142.4	0.0	-1460.4	20.81	-2054.4	3912.4	0.0	98.6
4.88	576.4	-4699.2	0.0	-653.1	12.96	683.8	-6437.7	0.0	-1319.2	21.03	-2066.4	3878.1	0.0	-12.2
5.10	594.1	-4823.9	0.0	-531.0	13.17	698.1	-6727.7	0.0	-1160.7	21.24	-2078.4	3721.9	0.0	-25.2
5.31	611.8	-4922.8	0.0	-405.1	13.38	711.1	-6959.1	0.0	-1013.7	21.45	-2090.4	3464.1	0.0	-35.7
5.52	631.3	-5000.8	0.0	-262.5	13.59	724.1	-7159.2	0.0	-864.1	21.66	-2102.4	3126.2	0.0	-43.7
5.73	649.1	-5043.1	0.0	-128.9	13.81	737.1	-7327.4	0.0	-711.8	21.88	-2115.6	2687.3	0.0	-49.6
5.95	666.8	-5057.0	0.0	8.3	14.02	750.1	-7463.1	0.0	-556.7	22.09	-2127.6	2250.5	0.0	-52.4
6.16	684.5	-5042.1	0.0	149.2	14.23	764.4	-7574.2	0.0	-383.0	22.30	-2139.6	1799.8	0.0	-52.6
6.37	702.2	-4997.5	0.0	293.9	14.44	777.4	-7640.0	0.0	-222.3	22.51	-2151.6	1356.6	0.0	-50.4
6.58	721.7	-4913.3	0.0	457.2	14.65	790.4	-7671.4	0.0	-58.8	22.73	-2163.6	942.2	0.0	-45.6
6.80	739.5	-4803.8	0.0	609.6	14.87	803.4	-7668.2	0.0	107.3	22.94	-2176.8	545.3	0.0	-37.5
7.01	757.2	-4662.2	0.0	765.7	15.08	816.4	-7630.0	0.0	276.2	23.15	-2188.8	261.3	0.0	-27.5
7.22	774.9	-4487.8	0.0	925.5	15.29	830.7	-7547.1	0.0	465.1	23.36	-2200.8	72.3	0.0	-15.0
7.43	792.6	-4279.7	0.0	1089.0	15.50	843.7	-7433.9	0.0	639.6	23.58	-2212.8	0.0	0.0	0.0
7.65	353.6	-4016.6	0.0	1196.9	15.72	856.7	-7284.1	0.0	816.9	23.79	-2224.8	0.0	0.0	0.0
7.86	366.6	-3760.2	0.0	1272.0	15.93	869.7	-7097.1	0.0	996.8	24.00	-2236.8	0.0	0.0	0.0

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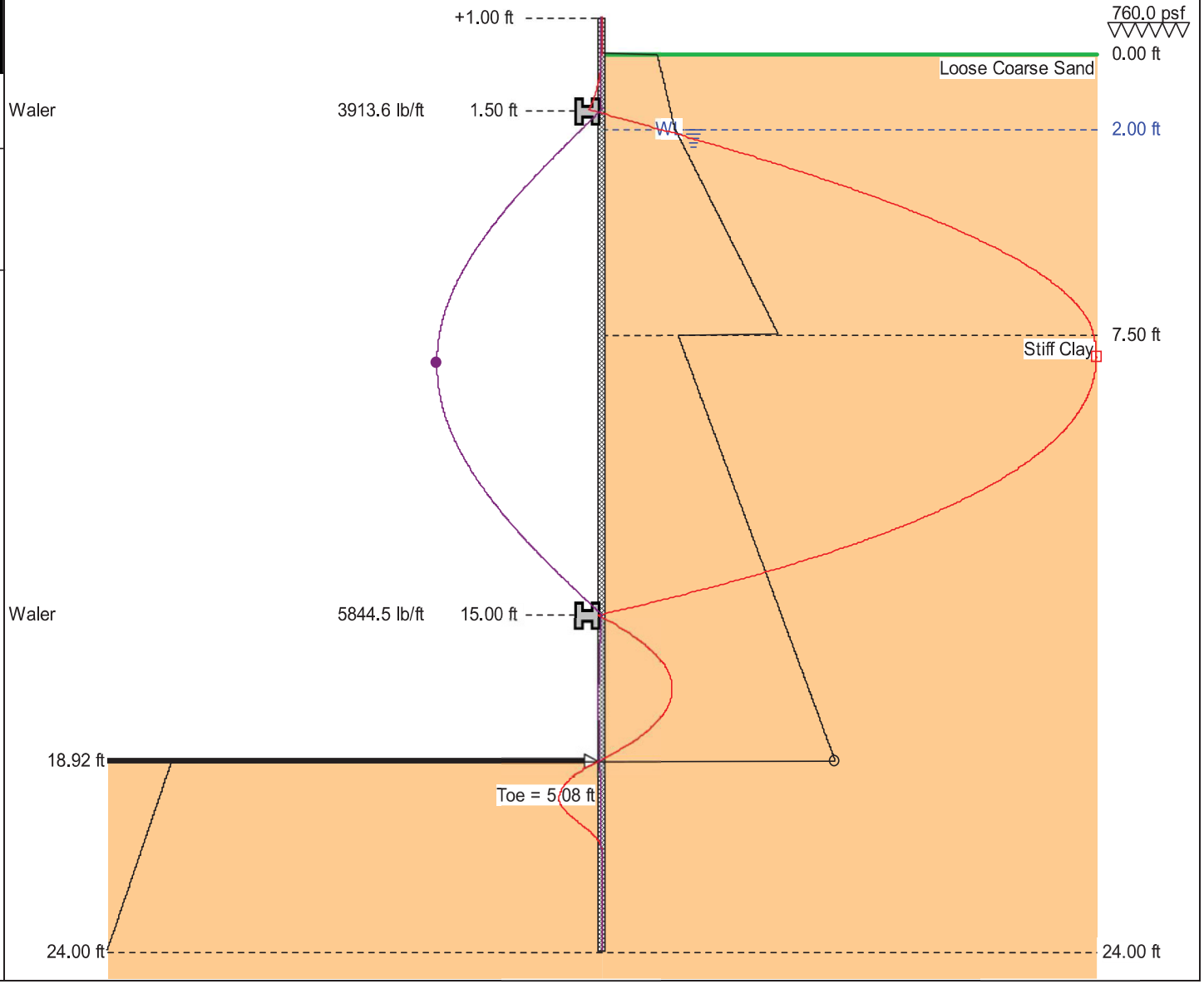
Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Fixed Earth Support

Maximum		d (ft)
○	1055.8 psf	18.92
□	12433.5 ftlb/ft	8.13
●	0.0 in	8.29

Stage 3 Excavation:

Cut 3 Depth = 18.92'
Cut 3 ELV = +/- -1.67 CCD

HP Tip = -6.75 CCD



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Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Fixed Earth Support

Stage 3 Excavation:

Cut 3 Depth = 18.92'
Cut 3 ELV = +/- -1.67 CCD

HP Tip = -6.75 CCD

Input Data

Depth Of Excavation = 18.92 ft Depth Of Active Water = 2.00 ft Water Density = 62.40 pcf
Surcharge = 760.0 psf Depth Of Passive Water = 35.00 ft Minimum Fluid Density = 31.82 pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C_a (psf)	ϕ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Loose Coarse Sand	120.00	68.73	0.0	0.0	30.0	0.0	0.33	0.00	3.00	0.00
7.50	Stiff Clay	120.00	68.73	1500.0	0.0	0.0	0.0	1.00	2.00	1.00	2.00

Solution

Sheet

Sheet Name	I (in^4/ft)	E (psi)	Z (in^3/ft)	f (psi)	Maximum Bending Moment (ftlb/ft)	Upstand (ft)	Toe (ft)	Pile Length (ft)
HP 12 x 53	393.00	2.9E+07	74.00	50.0	308.3	1.00	5.08	25.00

Load Model: Hinge Method

Supports

Depth (ft)	Type	Linear Load (lb/ft)
1.50	Waler	3913.6
15.00	Waler	5844.5

Maxima

	Maximum	Depth
Bending Moment	12433.5 ftlb/ft	8.13 ft
Deflection	0.0 in	8.29 ft
Pressure	1055.8 psf	18.92 ft
Shear Force	4113.8 lb/ft	15.00 ft

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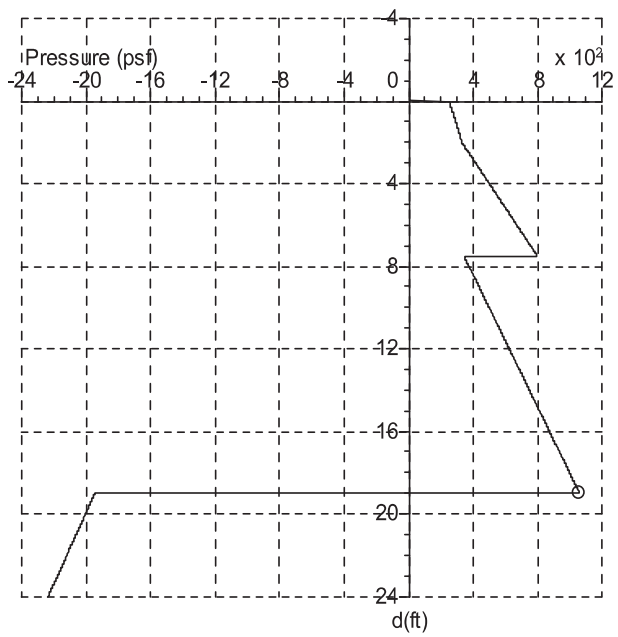
Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Fixed Earth Support

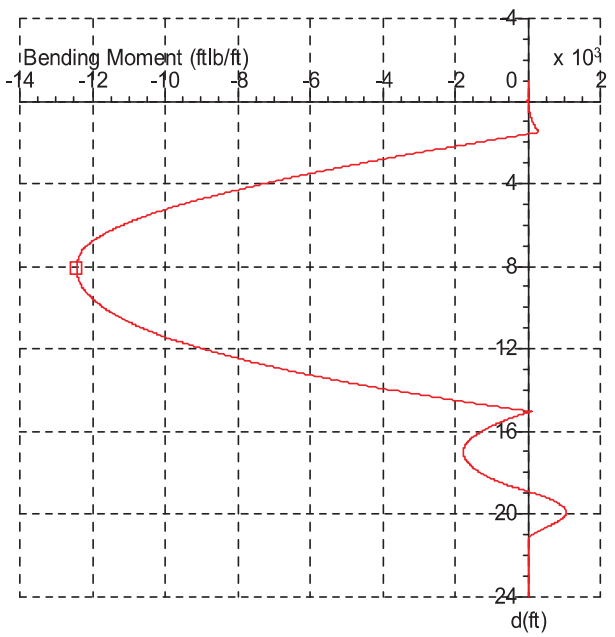
Maximum		d (ft)
○	1055.8 psf	18.92
□	12433.5 ftlb/ft	8.13
◇	4113.8 lb/ft	15.00
●	0.0 in	8.29

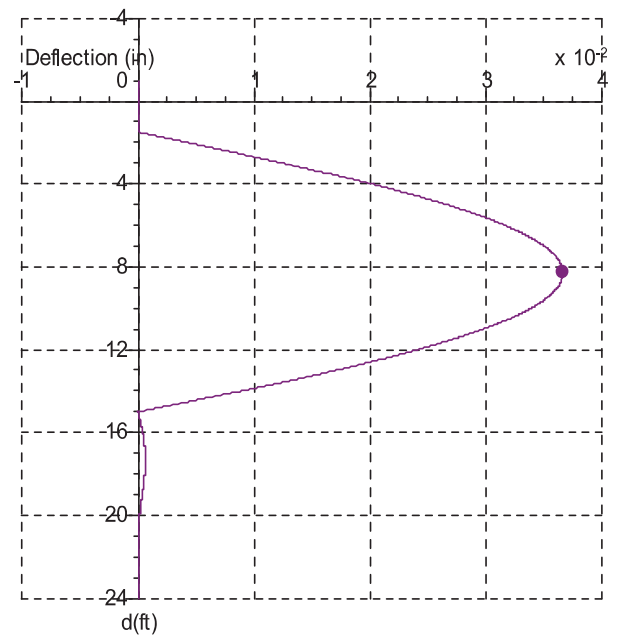
Stage 3 Excavation:

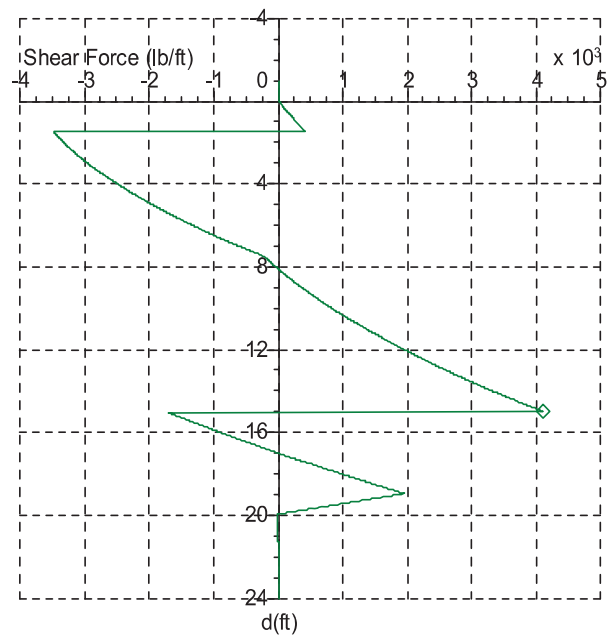
Cut 3 Depth = 18.92'
Cut 3 ELV = +/- -1.67 CCD

HP Tip = -6.75 CCD









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Sheet: HP 12 x 53
Pressure: Coulomb
Toe: Fixed Earth Support

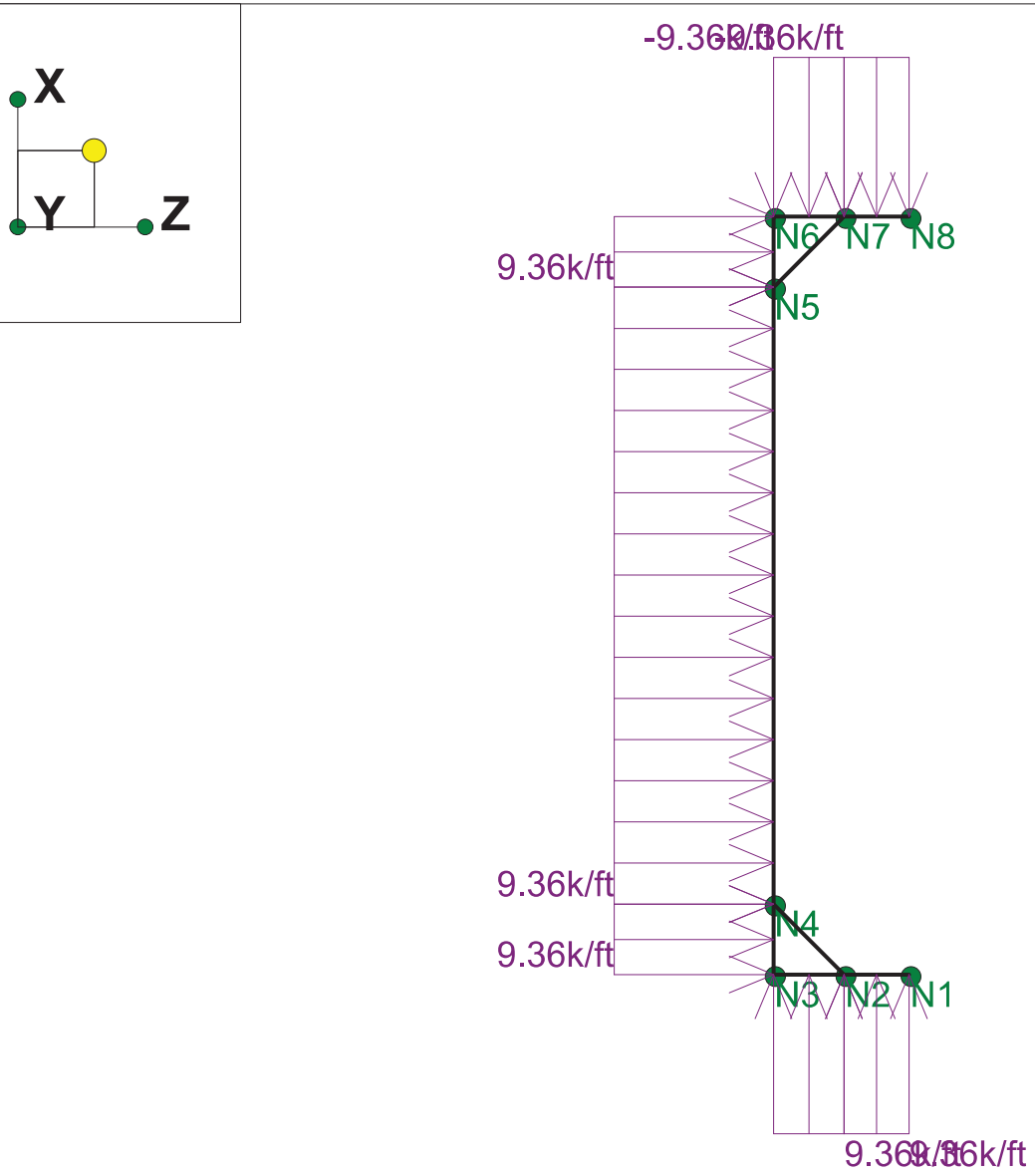
Stage 3 Excavation:

Cut 3 Depth = 18.92'
Cut 3 ELV = +/- -1.67 CCD

HP Tip = -6.75 CCD

depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)
0.00	250.8	-0.2	0.0	5.2	8.07	379.6	-12433.0	0.0	-8.9	16.14	882.7	-1420.3	0.0	-759.4
0.21	259.9	7.0	0.0	63.8	8.28	392.6	-12427.7	0.0	71.7	16.35	895.7	-1571.5	0.0	-574.0
0.42	268.1	25.5	0.0	118.9	8.50	405.6	-12405.0	0.0	155.0	16.57	910.0	-1689.7	0.0	-367.0
0.64	276.4	55.5	0.0	175.7	8.71	418.6	-12364.7	0.0	241.0	16.78	923.0	-1752.5	0.0	-175.9
0.85	284.6	97.6	0.0	234.2	8.92	432.9	-12299.3	0.0	338.7	16.99	936.0	-1770.7	0.0	17.9
1.06	292.9	152.0	0.0	294.5	9.13	445.9	-12220.2	0.0	430.4	17.20	949.0	-1748.6	0.0	214.4
1.27	302.0	226.6	0.0	362.7	9.35	458.9	-12121.8	0.0	524.8	17.42	962.0	-1685.3	0.0	413.5
1.49	310.2	308.0	0.0	-3487.0	9.56	471.9	-12003.4	0.0	621.9	17.63	976.3	-1567.5	0.0	635.8
1.70	318.5	-412.3	0.0	-3421.4	9.77	484.9	-11864.5	0.0	721.7	17.84	989.3	-1415.9	0.0	840.7
1.91	326.7	-1118.8	0.0	-3354.1	9.98	499.2	-11687.4	0.0	834.6	18.05	1002.3	-1221.3	0.0	1048.3
2.12	340.6	-1811.2	0.0	-3284.7	10.19	512.2	-11503.7	0.0	940.1	18.27	1015.3	-983.2	0.0	1258.5
2.34	360.1	-2555.6	0.0	-3204.2	10.41	525.2	-11297.8	0.0	1048.3	18.48	1028.3	-701.1	0.0	1471.5
2.55	377.9	-3216.0	0.0	-3127.1	10.62	538.2	-11069.0	0.0	1159.2	18.69	1042.6	-339.2	0.0	1709.0
2.76	395.6	-3860.0	0.0	-3046.4	10.83	551.2	-10816.9	0.0	1272.8	18.90	1055.6	37.3	0.0	1927.7
2.97	413.3	-4486.8	0.0	-2961.9	11.04	565.5	-10512.0	0.0	1400.9	19.12	-1956.0	412.5	0.0	1584.0
3.19	431.0	-5095.7	0.0	-2873.8	11.26	578.5	-10209.0	0.0	1520.2	19.33	-1968.0	704.3	0.0	1175.4
3.40	450.5	-5743.8	0.0	-2772.6	11.47	591.5	-9880.9	0.0	1642.2	19.54	-1980.0	910.7	0.0	764.3
3.61	468.3	-6312.5	0.0	-2676.7	11.68	604.5	-9527.1	0.0	1766.9	19.75	-1993.2	1038.5	0.0	309.2
3.82	486.0	-6860.8	0.0	-2577.1	11.89	617.5	-9147.1	0.0	1894.3	19.96	-2005.2	1060.9	0.0	-2.3
4.04	503.7	-7388.1	0.0	-2473.8	12.11	631.8	-8698.1	0.0	2037.6	20.18	-2017.2	962.5	0.0	-8.5
4.25	521.4	-7893.5	0.0	-2366.9	12.32	644.8	-8261.2	0.0	2170.8	20.39	-2029.2	770.9	0.0	-12.1
4.46	540.9	-8423.3	0.0	-2244.9	12.53	657.8	-7796.3	0.0	2306.6	20.60	-2041.2	532.7	0.0	-13.2
4.67	558.7	-8880.3	0.0	-2130.2	12.74	670.8	-7302.8	0.0	2445.1	20.81	-2054.4	272.5	0.0	-11.6
4.88	576.4	-9313.1	0.0	-2011.8	12.96	683.8	-6780.2	0.0	2586.4	21.03	-2066.4	88.1	0.0	-7.4
5.10	594.1	-9720.8	0.0	-1889.7	13.17	698.1	-6171.0	0.0	2744.8	21.24	-2078.4	1.5	0.0	-0.8
5.31	611.8	-10102.8	0.0	-1763.9	13.38	711.1	-5585.5	0.0	2891.8	21.45	-2090.4	0.0	0.0	0.0
5.52	631.3	-10492.3	0.0	-1621.3	13.59	724.1	-4969.0	0.0	3041.4	21.66	-2102.4	0.0	0.0	0.0
5.73	649.1	-10817.6	0.0	-1487.7	13.81	737.1	-4321.2	0.0	3193.8	21.88	-2115.6	0.0	0.0	0.0
5.95	666.8	-11114.7	0.0	-1350.4	14.02	750.1	-3641.3	0.0	3348.8	22.09	-2127.6	0.0	0.0	0.0
6.16	684.5	-11382.9	0.0	-1209.5	14.23	764.4	-2855.9	0.0	3522.5	22.30	-2139.6	0.0	0.0	0.0
6.37	702.2	-11621.4	0.0	-1064.9	14.44	777.4	-2107.0	0.0	3683.2	22.51	-2151.6	0.0	0.0	0.0
6.58	721.7	-11848.5	0.0	-901.5	14.65	790.4	-1324.4	0.0	3846.7	22.73	-2163.6	0.0	0.0	0.0
6.80	739.5	-12022.1	0.0	-749.1	14.87	803.4	-507.4	0.0	4012.8	22.94	-2176.8	0.0	0.0	0.0
7.01	757.2	-12163.6	0.0	-593.0	15.08	816.4	-22.4	0.0	-1662.8	23.15	-2188.8	0.0	0.0	0.0
7.22	774.9	-12272.2	0.0	-433.3	15.29	830.7	-410.4	0.0	-1473.9	23.36	-2200.8	0.0	0.0	0.0
7.43	792.6	-12347.2	0.0	-269.8	15.50	843.7	-722.4	0.0	-1299.3	23.58	-2212.8	0.0	0.0	0.0
7.65	353.6	-12395.5	0.0	-161.9	15.72	856.7	-995.2	0.0	-1122.1	23.79	-2224.8	0.0	0.0	0.0
7.86	366.6	-12422.2	0.0	-86.7	15.93	869.7	-1228.0	0.0	-942.1	24.00	-2236.8	0.0	0.0	0.0

[redacted]



Loads: BLC 1, Soil
Results for LC 1, Wale

		SK - 4
		July 30, 2014 at 7:37 AM
		untitled.r3d

Company :
Designer :
Job Number :
Model Name :

July 30, 2014

Checked By:_____

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	N1	0	0	5.40704	0	
2	N2	0	0	2.8125	0	
3	N3	0	0	0	0	
4	N4	2.8125	0	0	0	
5	N5	27.3958	0	0	0	
6	N6	30.208	0	0	0	
7	N7	30.208	0	2.8125	0	
8	N8	30.208	0	5.40704	0	

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	N1	-18.816	0	0	0	0	0
2	1	N3	27.924	0	99.15	0	0	0
3	1	N6	-27.922	0	99.165	0	0	0
4	1	N8	18.815	0	0	0	0	0
5	1	N2	-11.631	0	48.087	0	0	0
6	1	N4	-48.087	0	-288.612	0	0	0
7	1	N5	48.091	0	-288.623	0	0	0
8	1	N7	11.626	0	48.086	0	0	0
9	1	Totals:	0	0	-282.747			
10	1	COG (ft):	NC	NC	NC			

Member Distributed Loads (BLC 1 : Soil)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	9.36	9.36	0	0
2	M2	X	9.36	9.36	0	0
3	M3	Z	9.36	9.36	0	0
4	M4	Z	9.36	9.36	0	0
5	M5	Z	9.36	9.36	0	0
6	M6	X	-9.36	-9.36	0	0
7	M7	X	-9.36	-9.36	0	0

[redacted]

July 30, 2014

[redacted]

Re: Earth Retention for Sewer Trenching & Connection Structure
Bryn Mawr Sewer Improvement Project
Sewer Improvement Project
CDWM Project #6285
Specification #119805

[redacted]

Attached please find our design calculations and certifications for the earth retention systems proposed for use on the referenced project. Included are our trench shield certifications for seven trench boxes we are proposing to use for the sewer installation. Due to the depth of the proposed invert in some locations, this project will require stacked boxes for most of the mainline sewer. The PRO-TEC PRO8-1020D (Serial #13485, #28328, & #19457) will be used as the bottom boxes. For the majority of the mainline sewer, the PRO-TEC PRO6-1020D (Serial #13484, #28327, & #16991) will be used as the stacking boxes. When the depth of the sewer trench is less than thirteen feet (13'), the PRO-TEC PRO4-620D (Serial #14361) will be used as the stacking box.

The excavation procedure will follow the procedure for use of a trench shield in unstable soils as set forth by the trench box manufacturer, PRO-TEC Equipment, Inc., and as detailed below. Please note our intent is to use trench boxes for the entire project, excluding the earth retention system required for the connection structure at Spaulding Ave.; this ERS will be a beam & lagging system as shown in the attached drawings by MKA.

Detailed Construction Procedure for Trench Boxes

1. Sawcut for Sewer Trench (maximum width = 11')
2. Remove asphalt/concrete pavement
3. Excavate to four below (4') below top of pavement
4. Install Bottom Trench Box (Serial #13485, #28328, & #19457) to bottom of excavation
5. Continue excavation to required depth by removing material from within the trench box while concurrently pushing the box downward. Trench Box shall always be installed to bottom of trench.
6. When excavation reaches a depth of fourteen feet (14') below top of pavement, install a stacking box (Serial #13484, #28327, #16991, & #14361) on top of the bottom box.
7. Continue excavation to required depth by removing material from within the trench boxes while concurrently pushing the boxes downward. Trench box shall always be installed to bottom of trench.

[redacted]

[redacted]

8. Once desired depth is reached, install bedding stone, pipe, and backfill.
9. Begin excavating "ahead" (outside) of trench boxes for next pipe segment.
10. Once the full depth excavation is made, the stacked boxes will be pulled forward to the new excavation limit. The boxes will be pulled forward as often as possible and in small increments to limit the distance of unsupported trench.
11. In the event ground conditions warrant intermediate support prior to completing the full-depth excavation and being able to pull the boxes forward, steel plates will be used in front of the trench boxes. The steel plates would be pushed down concurrently with excavation until the proposed depth is reached and the trench boxes can be pulled forward. The steel plates would then be removed and used again for the next segment of excavation.
12. Any annular space left between the outside wall of the trench box and the wall of the trench shall be backfilled with FA-6 sand after the trench boxes are pulled forward.
13. Repeat steps 8-12 for all subsequent pipe segments.

Procedure at Utility Crossings

1. Stacked trench boxes shall be pulled up to the existing utility as detailed in the procedure above.
2. A second set of trench boxes shall be installed on the other side of the existing utility using Procedures 1-7 above.
3. Once the sewer pipe is installed beyond the utility, the first set of stacked boxes will be lifted out of the trench using a backhoe while a loader is concurrently backfilling the trench.
4. Sewer Installation will continue in accordance with steps 8-12 above.

Feel free to contact me with any questions.

Sincerely,

[redacted]

[redacted]

Bottom Box #1

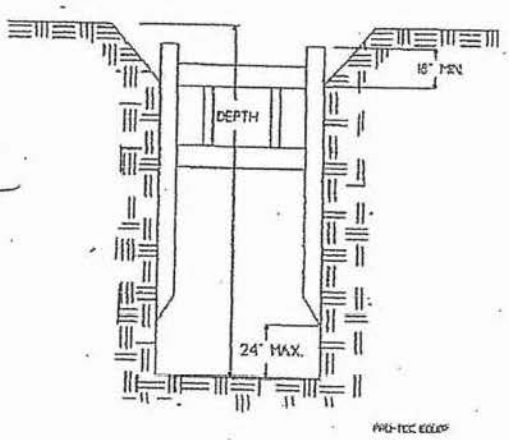
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TRENCH SHIELD CERTIFICATION

A COPY OF THIS SHEET MUST ACCOMPANY EACH CORRESPONDING TRENCH SHIELD AT EVERY JOB SITE.

MODEL NUMBER	WEIGHT	SERIAL NUMBER	SIZE
PRO8-1020D	13,100	13485	10' HIGH X 20' LONG

SOIL	MAX. DEPTH	PSF	SOIL DESCRIPTION
TYPE A	75 FEET	1860	Stiff Cohesive Soil, 25 PSF per foot, clay, silty clay, clay loam with unconfined compressive strength of 1.5 ton per square foot or greater. See note 7.
TYPE B	41 FEET	1860	Medium Cohesive to granular soil, 45 PSF per foot of depth. Clay with unconfined compressive strength greater than 0.5 TSF but less than 1.5 TSF. Cohesionless gravel, silt, silt loam or sandy loam. See note 8.
TYPE C	31 FEET	1860	Soft Cohesive to Saturated Soil, 60 PSF per foot of depth. Clay with unconfined compressive strength less than 0.5 TSF, saturated sand, clay or fractured rock that is not stable. See note 9.



[redacted]

LIMITATIONS

1) Soil above shield must be sloped according to OSHA Subpart P. Slope must begin no less than 18" below the top of shield.
2) Shield may be suspended no more than 2 feet above bottom of the trench and only if there is no possible loss of soil from behind or below bottom of shield.
3) A minimum of 2 spreader pipes are required on each end with manufacturer approved pins and keepers.
4) Repairs and modifications must first be approved by manufacturer or registered professional engineer.
5) Shields may be stacked as long as each is rated to the depth it is used and manufacturer approved stack connections are utilized to prevent lateral movement of the shields.
6) Surcharge loads have not been included in the above depth ratings. The allowable working depth of the shield must be reduced to account for any surcharge loading which occurs within the influence line of the shield.
7) Not Type A if fissured, subject to vibration, previously disturbed or part of a sloped layered system where layers dip into excavation on a slope of four horizontals to one vertical (4H:1V) or greater.
8) Previously disturbed soils may be Type B unless they would be classed as Type C. Soil that meets requirements of Type A but is subject to vibration or fissured may be Type B. Dry rock that is not stable or soil that is part of a sloped layered system where layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V) are Type B if material would otherwise be classified as Type B.
9) Soil in a sloped layered system where layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or steeper may be Type C. Saturated soil or soils from which water is freely seeping but is not standing in the trench.
   * Conditions more severe would require dewatering or the sealing of four sides of the excavation and pumping the trench. Such severe conditions would require the services of a soils engineer to establish the design pressure. Consult the manufacturer for pressures exceeding tabulated values.
10) PRO-TEC trench shields are to be used in accordance with Federal, state and Local laws. Refer to Occupational Safety and Health Administration (OSHA) rules and regulations Vol. 54, No. 209, 10/31/89, Part 1926, Subpart P.

Usage of trench shields other than specified could cause failure or cave-ins resulting in serious injury or death.

P.O. Box Box 130 • 1298 Lipsey Drive • Charlotte, MI 48813
Phone: (517) 541-0303 • 1 (800) 292-1225 • Fax: (517) 541-0329

Bottom Box #2

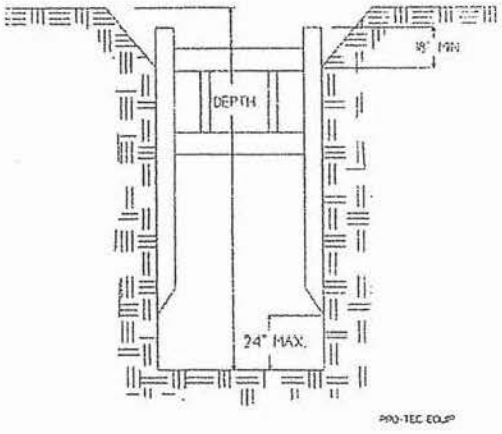
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TRENCH SHIELD CERTIFICATION

A COPY OF THIS SHEET MUST ACCOMPANY EACH CORRESPONDING TRENCH SHIELD AT EVERY JOB SITE

MODEL NUMBER	WEIGHT	SERIAL NUMBER	SIZE
PRO8 - 1020D	12899	28328	10' HIGH X 20' LONG

SOIL	MAX DEPTH	PSF	SOIL DESCRIPTION
TYPE A	75 FEET	1860	Stiff Cohesive Soil, 25 PSF per foot, clay, silty clay, clay loam with unconfined compressive strength of 1.5 ton per square foot or greater. See note 7.
TYPE B	41 FEET	1860	Medium Cohesive to granular soil, 45 PSF per foot of depth. Clay with unconfined compressive strength greater than 0.5 TSF but less than 1.5 TSF. Cohesionless gravel, silt, silt loam or sandy loam. See note 8.
TYPE C	31 FEET	1860	Soft Cohesive to Saturated Soil, 60 PSF per foot of depth. Clay with unconfined compressive strength less than 0.5 TSF, saturated sand, clay or fractured rock that is not stable. See note 9.



[redacted]

LIMITATIONS

1) Soil above shield must be sloped according to OSHA Subpart P. Slope must begin no less than 18" below the top of shield.
2) Shield may be suspended no more than 2 feet above bottom of the trench and only if there is no possible loss of soil from behind or below bottom of shield.
3) A minimum of 2 spreader pipes are required on each end with manufacturer approved pins and keepers.
4) Repairs and modifications must first be approved by manufacturer or registered professional engineer.
5) Shields may be stacked as long as each is rated to the depth it is used and manufacturer approved stack connections are utilized to prevent lateral movement of the shields.
6) Surcharge loads have not been included in the above depth ratings. The allowable working depth of the shield must be reduced to account for any surcharge loading which occurs within the influence line of the shield.
7) Not Type A if fissured. Subject to vibration, previously disturbed or part of a sloped layered system where layers dip into excavation on a slope of four horizontals to one vertical (4H:1 V) or greater.
8) Previously disturbed soils may be Type B unless they would be classed as Type C. Soil that meets requirements of Type A but is subject to vibration or fissured may be Type B. Dry rock that is not stable or soil that is part of a sloped layered system where layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V) are Type B if material would otherwise be classified as Type B.
9) Soil in a sloped layered system where layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or steeper may be Type C. Saturated soil or soils from which water is freely seeping but is not standing in the trench. .Conditions more severe would require dewatering or the sealing of four sides of the excavation and pumping the trench. Such severe conditions would require the services of a soils engineer to establish the design pressure. Consult the manufacturer for pressures exceeding tabulated values.
10) PRO-TEC trench shields are to be used in accordance with Federal, state and Local laws. Refer to Occupational Safety and Health Administration (OSHA) rules and regulations Vol. 54, No. 209, 10/31/89, Part 1926, Subpart P.

Usage of trench shields other than specified could cause failure or cave-ins resulting in serious injury or death.

Phone (517) 541-0303 • 1-800-292-1225 • Fax (517) 541-0329
Mailing Address: P.O. Box 130 • Charlotte, MI 48813 • Shipping Address: 1298 Lipsey Drive • Charlotte, MI 48813

Bottom Box #3

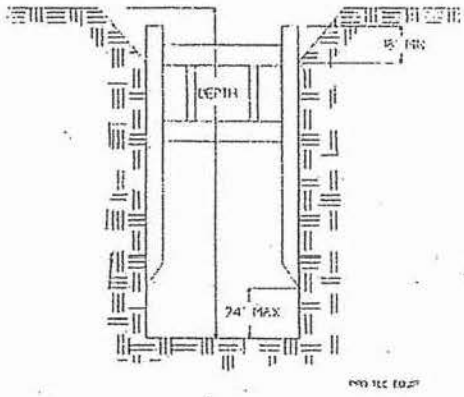
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TRENCH SHIELD CERTIFICATION

A COPY OF THIS SHEET MUST ACCOMPANY EACH CORRESPONDING TRENCH SHIELD AT EVERY JOB SITE

MODEL NUMBER	WEIGHT	SERIAL NUMBER	SIZE
PRO8 - 1020D	13,012	19457	10' HIGH X 20' LONG

SOIL	MAX DEPTH	PSF	SOIL DESCRIPTION
TYPE A	75 FEET	1860	Stiff Cohesive Soil, 25 PSF per foot, clay, silty clay, clay loam with unconfined compressive strength of 1.5 ton per square foot or greater. See note 7.
TYPE B	41 FEET	1860	Medium Cohesive to granular soil, 45 PSF per foot of depth. Clay with unconfined compressive strength greater than 0.5 TSF but less than 1.5 TSF. Cohesionless gravel, silt, silt loam or sandy loam. See note 8.
TYPE C	31 FEET	1860	Soft Cohesive to Saturated Soil, 60 PSF per foot of depth. Clay with unconfined compressive strength less than 0.5 TSF, saturated sand, clay or fractured rock that is not stable. See note 9.



[redacted]

LIMITATIONS

1) Soil above shield must be sloped according to OSHA Subpart P. Slope must begin no less than 18" below the top of shield.
2) Shield may be suspended no more than 2 feet above bottom of the trench and only if there is no possible loss of soil from behind or below bottom of shield.
3) A minimum of 2 spreader pipes are required on each end with manufacturer approved pins and keepers.
4) Repairs and modifications must first be approved by manufacturer or registered professional engineer.
5) Shields may be stacked as long as each is rated to the depth it is used and manufacturer approved stack connections are utilized to prevent lateral movement of the shields.
6) Surcharge loads have not been included in the above depth ratings. The allowable working depth of the shield must be reduced to account for any surcharge loading which occurs within the influence line of the shield.
7) Not Type A if fissured. Subject to vibration, previously disturbed or part of a sloped layered system where layers dip into excavation on a slope of four horizontals to one vertical (4H:1 V) or greater.
8) Previously disturbed soils may be Type B unless they would be classed as Type C. Soil that meets requirements of Type A but is subject to vibration or fissured may be Type B. Dry rock that is not stable or soil that is part of a sloped layered system where layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V) are Type B if material would otherwise be classified as Type B.
9) Soil in a sloped layered system where layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or steeper may be Type C. Saturated soil or soils from which water is freely seeping but is not standing in the trench. Conditions more severe would require dewatering or the sealing of four sides of the excavation and pumping the trench. Such severe conditions would require the services of a soils engineer to establish the design pressure. Consult the manufacturer for pressures exceeding tabulated values.
10) PRO-TEC trench shields are to be used in accordance with Federal, state and Local laws. Refer to Occupational Safety and Health Administration (OSHA) rules and regulations Vol. 54, No. 209, 10/31/89, Part 1926, Subpart P.

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Mailing Address: P.O. Box 130 • Charlotte, MI 48813 • Shipping Address: 1298 Lipsey Drive • Charlotte, MI 48813

STACKING Box #1

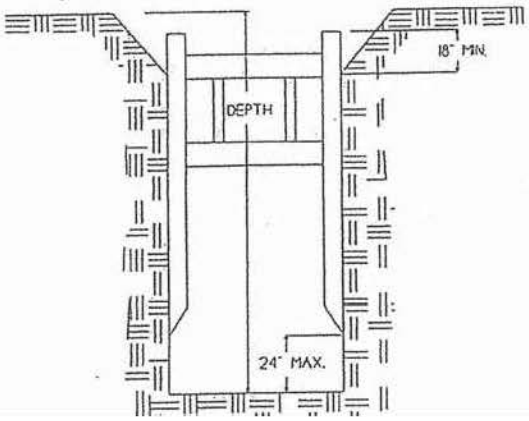
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TRENCH SHIELD CERTIFICATION

A COPY OF THIS SHEET MUST ACCOMPANY EACH CORRESPONDING TRENCH SHIELD AT EVERY JOB SITE.

MODEL NUMBER	SERIAL NUMBER	SIZE
PRO6-1020D	13484	10' HIGH X 20' LONG

SOIL	MAX. DEPTH	PSF	SOIL DESCRIPTION
TYPE A	48 FEET	1200	Stiff Cohesive Soil, 25 PSF per foot, clay, silty clay, clay loam with unconfined compressive strength of 1.5 ton per square foot or greater. See note 7.
TYPE B	27 FEET	1200	Medium Cohesive to granular soil, 45 PSF per foot of depth. Clay with unconfined compressive strength greater than 0.5 TSF but less than 1.5 TSF. Cohesionless gravel, silt, sill loam or sandy loam. See note 8.
TYPE C	20 FEET	1200	Soft Cohesive to Saturated Soil, 60 PSF per foot of depth. Clay with unconfined compressive strength less than 0.5 TSF, saturated sand, clay or fractured rock that is not stable. See note 9.



LIMITATIONS

1) Soil above shield must be sloped according to OSHA Subpart P. Slope must begin no less than 18" below the top of shield.
2) Shield may be suspended no more than 2 feet above bottom of the trench and only if there is no possible loss of soil from behind or below bottom of shield.
3) A minimum of 2 spreader pipes are required on each end with manufacturer approved pins and keepers.
4) Repairs and modifications must first be approved by manufacturer or registered professional engineer.
5) Shields may be stacked as long as each is rated to the depth it is used and manufacturer approved stack connections are utilized to prevent lateral movement of the shields.
6) Surcharge loads have not been included in the above depth ratings. The allowable working depth of the shield must be reduced to account for any surcharge loading which occurs within the influence line of the shield.
7) Not Type A if fissured, subject to vibration, previously disturbed or part of a sloped layered system where layers dip into excavation on a slope of four horizontals to one vertical (4H:1V) or greater.
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   * Conditions more severe would require dewatering or the sealing of four sides of the excavation and pumping the trench. Such severe conditions would require the services of a soils engineer to establish the design pressure. Consult the manufacturer for pressures exceeding tabulated values.
10) PRO-TEC trench shields are to be used in accordance with Federal, state and Local laws. Refer to Occupational Safety and Health Administration (OSHA) rules and regulations Vol. 54, No. 209, 10/31/89, Part 1926, Subpart P.

[redacted]

Usage of trench shields other than specified could cause failure or cave-ins resulting in serious injury or death.

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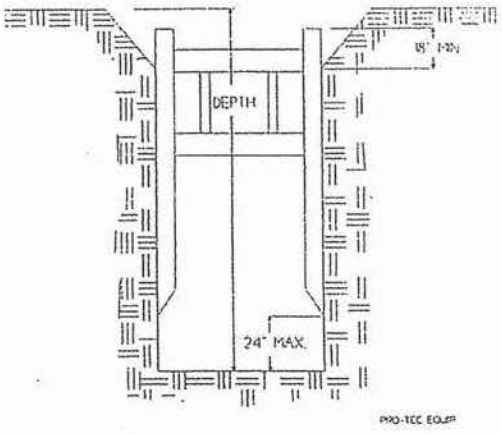
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TRENCH SHIELD CERTIFICATION

A COPY OF THIS SHEET MUST ACCOMPANY EACH CORRESPONDING TRENCH SHIELD AT EVERY JOB SITE

MODEL NUMBER	WEIGHT	SERIAL NUMBER	SIZE
PRO6 - 1020D	12239	28327	10' HIGH X 20' LONG

SOIL	MAX DEPTH	PSF	SOIL DESCRIPTION
TYPE A	48 FEET	1200	Stiff Cohesive Soil, 25 PSF per foot, clay, silty clay, clay loam with unconfined compressive strength of 1.5 ton per square foot or greater. See note 7.
TYPE B	27 FEET	1200	Medium Cohesive to granular soil, 45 PSF per foot of depth. Clay with unconfined compressive strength greater than 0.5 TSF but less than 1.5 TSF. Cohesionless gravel, silt, silt loam or sandy loam. See note 8.
TYPE C	20 FEET	1200	Soft Cohesive to Saturated Soil, 60 PSF per foot of depth. Clay with unconfined compressive strength less than 0.5 TSF, saturated sand, clay or fractured rock that is not stable. See note 9.



[redacted]

LIMITATIONS

1) Soil above shield must be sloped according to OSHA Subpart P. Slope must begin no less than 18" below the top of shield.
2) Shield may be suspended no more than 2 feet above bottom of the trench and only if there is no possible loss of soil from behind or below bottom of shield.
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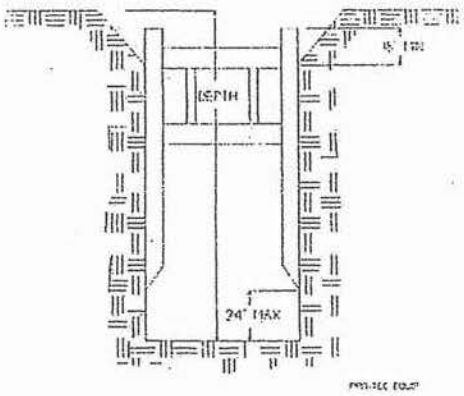
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TRENCH SHIELD CERTIFICATION

A COPY OF THIS SHEET MUST ACCOMPANY EACH CORRESPONDING TRENCH SHIELD AT EVERY JOB SITE

MODEL NUMBER	WEIGHT	SERIAL NUMBER	SIZE
PRO6 - 1020D	11300	16991	10' HIGH X 20' LONG

SOIL	MAX DEPTH	PSF	SOIL DESCRIPTION
TYPE A	48 FEET	1200	Stiff Cohesive Soil, 25 PSF per foot, clay, silty clay, clay loam with unconfined compressive strength of 1.5 ton per square foot or greater. See note 7.
TYPE B	27 FEET	1200	Medium Cohesive to granular soil, 45 PSF per foot of depth. Clay with unconfined compressive strength greater than 0.5 TSF but less than 1.5 TSF. Cohesionless gravel, silt, silt loam or sandy loam. See note 8.
TYPE C	20 FEET	1200	Soft Cohesive to Saturated Soil, 60 PSF per foot of depth. Clay with unconfined compressive strength less than 0.5 TSF, saturated sand, clay or fractured rock that is not stable. See note 9.



[redacted]

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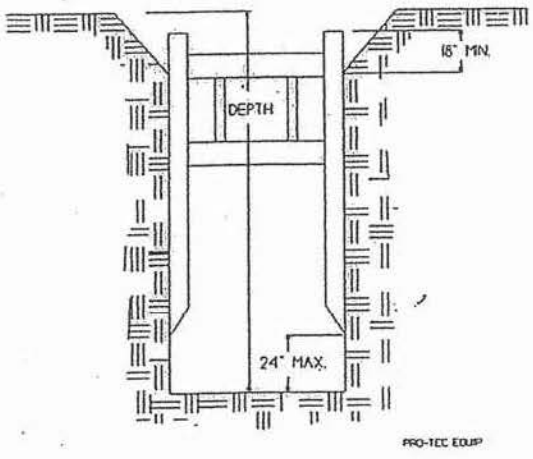
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TRENCH SHIELD CERTIFICATION

A COPY OF THIS SHEET MUST ACCOMPANY EACH CORRESPONDING TRENCH SHIELD AT EVERY JOB SITE.

MODEL NUMBER	SERIAL NUMBER	SIZE
PRO4-620D	14361	6' HIGH X 20' LONG

SOIL	MAX. DEPTH	PSF	SOIL DESCRIPTION
TYPE A	40 FEET	1111	Stiff Cohesive Soil, 25 PSF per foot, clay, silty clay, clay loam with unconfined compressive strength of 1.5 ton per square foot or greater. See note 7.
TYPE B	24 FEET	1111	Medium Cohesive to granular soil, 45 PSF per foot of depth. Clay with unconfined compressive strength greater than 0.5 TSF but less than 1.5 TSF. Cohesionless gravel, silt, silt loam or sandy loam. See note 8.
TYPE C	19 FEET	1111	Soft Cohesive to Saturated Soil, 60 PSF per foot of depth. Clay with unconfined compressive strength less than 0.5 TSF, saturated sand, clay or fractured rock that is not stable. See note 9.



[redacted]

LIMITATIONS

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APPENDIX IV
GEOTECHNICAL REPORT

Geotechnical Report

Task Order Request #20-05
Sewer Improvements Project Number 7439
Chicago, Illinois

Prepared for
City of Chicago
Department of Water Management

Design Engineer Team:
T.Y. Lin International

May 9th, 2019

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Integrity | Quality | Reliability

May 9th, 2019

Mr. Joel Marhoul, P.E.
T.Y. Lin International
200 S. Wacker Drive #1400
Chicago, IL 60606

Geotechnical Analysis Report
Chicago Department of Water Management
Task Order Request #20-05, Sewer Improvements Project Number 7439
Various intersections near N. Rodgers Avenue & W. Howard Street, Chicago, IL

Dear Mr. Marhoul,

This report presents the results of the subsurface exploration and geotechnical analysis for the above referenced project. The site investigation included advancing four (4) soil borings to depths between 30 to 35 feet below the existing surface and six (6) pavement cores at the locations of the proposed improvements for the above mentioned project. GSG secured the required drilling permits from the City of Chicago Department of Transportation and contacted DIGGER to clear the underground utilities prior to performing the field drilling activities.

Should you have any questions or require additional information, please call us at 630-994-2600.

Sincerely,

Matthew J. Chipko, P.E.
Project Engineer

Ala E Sassila, Ph.D., P.E.
Principal

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 Project Description 1

1.2 Objective and Scope 2

2.0 SITE SUBSURFACE EXPLORATION PROGRAM 3

2.1 Subsurface Exploration Program 3

2.2 Laboratory Testing Program 4

2.3 Subsurface Conditions 4

2.4 Pavement Core Conditions 5

2.5 Groundwater Conditions 5

3.0 ANALYSES AND RECOMMENDATIONS 7

3.1 Derivation of Soil Parameters for Design 7

3.2 Bearing Capacity 8

3.3 Trench Stability 8

3.4 Temporary Earth Retention System 8

3.5 Excavation Base Stability 9

3.6 Groundwater Consideration 10

3.7 Construction Consideration 10

4.0 LIMITATIONS 11

Exhibits

Exhibit 1 Site Location Map
Exhibit 2 Boring Location Plan

Appendices

Appendix A Soil Boring Logs -
Appendix B Recommended Geotechnical Design Parameters (Table B-1)
Appendix C Lateral Pressure Computation
Appendix D Pavement Core Summary

Geotechnical Report
Task Order Request #20-05
Sewer Improvements Project Number 7439
Various intersections near N. Rodgers Avenue & W. Howard Street, Chicago, Illinois

1.0 INTRODUCTION

GSG Consultants, Inc. (GSG) completed a geotechnical investigation for the sewer improvement project at various intersections near N. Rodgers Avenue and W. Howard Street in Chicago, Illinois. The exact locations for the project are shown in **Exhibit 1 – Site Location Map**. The purpose of the investigation was to explore the subsurface conditions, to determine engineering properties of the subsurface soil, and develop design and construction recommendations for the project.

1.1 Project Description

The proposed improvements are near the following locations: N. Rodgers Avenue between N. Ashland Avenue and W. Howard Street; W. Birchwood Avenue from N. Ashland Avenue extending approximately 250 feet east of N. Greenview Avenue; N. Bosworth Avenue from W. Howard Street to W. Jonquil Terrace; and N. Greenview Avenue from N. Rodgers Avenue extending approximately 355 feet north of that intersection.

The improvements along N Rodgers Avenue will include a new 36-inch diameter sewer that will tie into a tumbling basin and Type A manhole at the intersection with N. Ashland Avenue and a Type B manhole near the intersections with W. Howard Street and N. Greenwood Avenue. The improvements along N. Greenview Avenue will include a new 24-inch diameter sewer that will tie into a Type B manhole at the intersection with W. Howard Street and at the intersection with W. Birchwood Avenue. Improvements along W. Birchwood Avenue will include a new 24-inch diameter sewer that will tie into a Type B manhole at the intersection with N. Greenview Avenue and a Type A manhole 300 feet east of the intersection. The improvements along N. Bosworth Avenue will include a new 24-inch sewer that will tie into Type B manholes at the intersections with W. Howard Street and W. Janquil Terrace. Improvements along N. Greenview Avenue will include a new 24-inch sewer that will tie into a Type B manhole at the intersection with N. Rodgers Avenue and a Type A manhole 330 feet north of the intersection. **Exhibit 1-Site Location Map** shows the overall project location on a USGS map.

According to the preliminary design plans provided by T.Y. Lin International (TY Lin), the estimated ground elevations and invert elevations within the project area are shown in **Table 1 – Boring Summary.**

1.2 Objective and Scope

The objective and scope of the subsurface exploration and geotechnical analysis were to characterize the subsurface soil conditions in order to provide information regarding the physical characteristics and engineering properties of the subsurface soils, and to provide geotechnical recommendations regarding the design and construction of the proposed sewers. GSG advanced four (4) soil borings, B-1 through B-4 and six (6) pavement cores adjacent to the borings near the intersections in the vicinity of the proposed improvements, as well as two (2) pavement cores on N. Greenview Avenue near the intersection with W. Howard Street and on W. Birchwood Avenue near the intersection with N. Greenview Avenue.

2.0 SITE SUBSURFACE EXPLORATION PROGRAM

This section describes the subsurface exploration program and laboratory testing program completed as part of this project.

2.1 Subsurface Exploration Program

GSG conducted drilling activities between March 7th and March 13th, 2019. Prior to performing the field activities, GSG secured permits from the Chicago Department of Transportation and contacted DIGGER to locate underground utilities within the project area. The planned locations of the soil borings were provided by the Chicago Department of Water Management (CDWM). GSG adjusted the soil boring locations based on CDOT requirements, field conditions, the presence of utilities along the road, and boring location accessibility for the drilling equipment. **Exhibit 2-Boring Location Plan** shows the as-drilled locations of the borings and pavement cores completed as part of the site investigation. The final depths of the soil borings were determined based on the proposed invert elevations of the improvements and the subsurface soil conditions encountered while drilling. According to the CDWM requirement, soil borings should be extended to a minimum depth of 5 feet below the proposed invert of a sewer/structure, and to a minimum depth of 8 feet below the proposed invert of a tumbling basin or connecting structures. The final depths for the borings are determined based on the subsurface soil conditions encountered during the drilling activities. If soft clay or sand below the water table is encountered during the drilling activities, the boring is to be extended to a minimum of 5 feet into stiff clay. **Table 1** provides the summary of the borings completed for this project.

Table 1 – Boring Summary

Boring ID	Location	Nearest Intersection	Ground Elevation (CCD)	Invert Elevation (CCD)	Depth (ft)
B-1	N. Ashland Avenue	104 feet north of N. Rodgers Ave.	12.1	-1.79	35
B-2	N. Rodgers Avenue	91 feet south of W. Howard St.	11.2	-0.33	30
B-3	N. Greenview Avenue	24 feet north of N. Rodgers Ave.	11.1	0.33	30
B-4	N. Bosworth Avenue	33 feet south of W. Jonquil Terrace	11.1	3.0	30

GSG's field representative visually classified the soils according to the Unified Soil Classification System (ASTM 2487), performed calibrated RIMAC tests and pocket penetrometer tests on all cohesive soil samples to estimate the unconfined compressive strength, and obtained relatively undisturbed samples of the subsurface soil for laboratory testing. The results of the pocket penetrometer tests are shown on the soil boring logs. Soil samples obtained from the borings were placed in 2-inch geotechnical glass jars to reduce moisture loss and disturbance. The boreholes were patched with concrete mix prior to leaving the site.

GSG also measured the existing pavement section during the soil boring activities. The sub-base materials were also measured and visually inspected in the field to determine the composition.

2.2 Laboratory Testing Program

Soil samples collected during drilling activities were tested in the laboratory to verify field classifications and evaluate the engineering properties of the soil. The laboratory testing program included moisture contents (ASTM D2216). The soil tests were performed in accordance with applicable ASTM standards. The results of the laboratory testing program are shown on the soil boring logs in **Appendix A**.

2.3 Subsurface Conditions

This section provides a brief description of the subsurface conditions encountered at the soil boring locations. Generally the pavement section consisted of asphalt, over concrete and aggregate base course materials. The specific pavement conditions at each location are summarized in **Table 2**. Below the pavement section, each boring encountered brown and black sand fill to depths between 4.5 feet to 6 feet below grade. Following the fill sections, each boring encountered brown and gray loose to medium dense sand or sand with gravel to depths between 8.5 and 11 feet, then gray, loose to dense sand to depths between 15 feet and of 19 feet below grade. The granular layers were underlain by gray, very soft to medium stiff silty clay to the boring termination depths between 30 and 35 feet. Cobbles were noted in borings B-2 and B-3 at depths of about 8 to 10 feet. The native clay had unconfined compressive strengths ranging from 0.21 tsf to 0.83 tsf. The native sand had SPT N-values ranging between 7 and 60 blows per foot.

The soil stratifications are shown in detail in the soil boring logs. The stratifications shown in the boring logs represent the conditions only at the actual boring locations, and shows the approximate boundary between subsurface materials; however the actual transition may be gradual.

2.4 Pavement Conditions

Measurement of the pavement was taken after drilling through the existing pavement section at each of the boring locations, except at borings B-1 and B-4, where pavement cores were collected separately at the locations shown in **Exhibit 2**. The sub-base materials were also measured and visually inspected in the field to determine the composition. The pavement condition at each boring is summarized in **Table 2**. The base course materials encountered at borings B-1 and B-2 were sand and gravel base course; base course materials were not encountered at borings B-3 or B-4. Pavement cores were collected at or adjacent to each boring location, as well as at two (2) additional locations - P-5 and P-6. The pavement cores were completed within the boreholes performed for this subsurface investigation. The location of these borings and pavement cores are shown in **Exhibit 2-Boring Location Plan**.

Table 2 – Pavement Summary

Boring ID	Location	Asphalt Pavement Thickness (in)	Concrete Pavement Thickness (in)	Base Course Thickness (in)
B-1/P-1	N. Ashland Avenue	3.0	7.0	N/A
B-2/P-2	N. Rodgers Avenue	4.0	7.0	3.0
B-3/P-3	N. Greenview Avenue	3.5	5.5	N/A
B-4/P-4	N. Bosworth Avenue	3.0	4.0	N/A
P-5	N. Greenview Avenue	4.0	10.0	N/A
P-6	W. Birchwood Avenue	1.0	9.0	N/A

The core locations were backfilled with fine graded aggregate to the bottom of the existing pavement section before being surface patched with concrete.

2.5 Groundwater Conditions

GSG measured the water levels during and immediately after the drilling activities. Groundwater was noted in all of the borings while drilling at depths between 6 and 8.5 feet

below grade. It was not observed after drilling was completed. Based on the subsurface investigation, the long term groundwater elevation is estimated to be between -2.38 and 1.62 feet CCD based on the change in the color of the soils from brown to gray. The brown color of the soil is typically due to oxidation which occurs above water table. In general, it should be also noted that groundwater level may fluctuate based on seasonal precipitation, evaporation, surface run-off and other factors.

3.0 ANALYSES AND RECOMMENDATIONS

This section provides GSG's geotechnical analysis and recommendations for the design of the proposed sewer improvements based on the results of the field exploration, and laboratory testing. Subsurface conditions in unexplored locations may vary from those encountered at the boring locations. If there are any significant changes to the project characteristics or if significantly different subsurface conditions are encountered during construction, GSG should be consulted so that the recommendations of this report can be reviewed.

3.1 Derivation of Soil Parameters for Design

GSG determined the geotechnical parameters to be used for the project design based on the results of field and laboratory test data on the borings completed, as well as our experience. Unit weights, friction angles and shear strength parameters for cohesionless soils were estimated using corrected standard penetration test (SPT) using published correlations for N values results for the cohesionless soils and in-situ and laboratory test results for cohesive soils. The SPT values were corrected for hammer efficiency. The hammer efficiency correction factor considers the use of a safety hammer/rope/cat-head system, generally estimated to be 60% efficient. Thus, correlations should be based upon what is currently termed as N_{60} data. The efficiency of the automatic hammer used for this exploration was estimated to be approximately 98% for the GeoProbe 7822 DT drill rig and approximately 89% for the Diedrich D-50 drill rig based on most recent efficiency testing of the drill rigs used for this project. The correction for hammer efficiency is a direct ratio of relative efficiencies as follows:

$$N_{60} = N_{field} * (98/60) \quad \text{GeoProbe 7822 DT}$$

$$N_{60} = N_{field} * (89/60) \quad \text{Diedrich D-50}$$

* Where the N_{field} value is the field recorded blow counts during drilling.

Recommended geotechnical parameters for the subsurface soils within the boring area to be used for design of the sewer extensions are presented in **Table B, Appendix B: Recommended Geotechnical Design Parameters**. It should be noted that because of the variable nature of soil stratigraphy, soil types and properties along the project alignment or at locations away from the borings may vary.

3.2 Bearing Capacity

The subsurface investigation indicated loose to dense native sand or sand with gravel along the proposed invert elevations for each of the improvements. These improvements should be designed using the bearing capacity values provided in **Table 3**.

Table 3 – Bearing Capacity Summary

Borings Used	Soil Type	Improvement Location	Structure Type	Invert Elevation (CCD)	Recommended Allowable Bearing Capacity (psf)
B-1	Med. Dense Sand w/ gravel	N. Ashland Avenue & N. Rodgers Avenue	Tumbling Basin	-1.79	3,000
B-2	Med. Dense Sand	N. Rodgers Avenue & W. Howard Street	Sewer	-0.33	3,000
B-3	Med. Dense Sand	N. Greenview Avenue & W. Howard Street	Sewer	0.33	3,000
B-4	Loose to Med. Dense Sand w/ gravel	N Bosworth Avenue& W. Jonquil Terrace	Sewer	3.00	3,000

3.3 Trench Stability

The contractor is responsible for designing, constructing and maintaining safe excavations. The excavations should not cause any distress to existing underground utilities and adjacent structures. Excavation near existing structures and underground utilities should be performed with extreme care to avoid undermining existing structures. Excavations should not extend below the level of adjacent existing foundations or utilities unless underpinning or other support is installed. All excavations that extend more than 4 feet should be sloped or braced to prevent excavation instability. The excavation sloping and bracing should be designed in accordance with the Occupational Safety and Health Administration (OSHA) 29 CFR, Part 1926, regulations and requirements. **Table B-1** includes recommended OSHA soil types for trench design based on the results of the subsurface investigation.

3.4 Temporary Earth Retention System

Temporary Earth Retention Systems will be required for the construction of the proposed sewers. Trench/utility boxes can typically be used when bearing on dry medium dense or

better soils, however, saturated medium dense to dense sands were encountered near the proposed invert elevations. For cases where the proposed sewer excavation is anticipated to extend to within the saturated sands depth, temporary sheet piling should be considered and driven to depths suggested in **Section 3.5 – Excavation Base Stability**.

Based on the subsurface soil conditions encountered within the borings, temporary sheet piling should be considered for the installation of the sewers. This sheet piling retaining system should be designed in accordance with the IDOT Bridge Design Manual, Section 3.13.1, *Temporary Sheet Piling Design, Temporary Soil Retention Systems and Braced Excavations and the IDOT Design Guide.* The soil parameters and the pressure distribution for the practical design of struts in open cuts for sands for short-term and long-term conditions are provided in **Appendix C – Lateral Pressure Computation.** For the purposes of this investigation, all temporary earth retention systems should be designed using **Chart C-1, Appendix C.** If the project requires any long term earth retention system, **Chart C-2** should be utilized.

If sand is used to fill the annular space between the trench box and the excavation wall, an active earth pressure coefficient of 0.33 and an in-situ unit weight of 120 pcf should be used in calculating the lateral earth pressures.

Lateral pressure resulting from construction equipment, excavated materials, traffic loads, or other surcharge should be taken into account by adding the equivalent uniformly distributed surcharge to the design lateral pressure. The minimum recommended surcharge load for traffic is 250 psf. In general, stockpiles of excavated materials and equipment should not be placed near the top of the excavation.

3.5 Excavation Base Stability

In open-cuts, it is necessary to consider the possibility of the base of the excavation failure by heaving, due to the removal of the weight of excavated soil. Heaving typically occurs in very soft or soft fat clays when the excavation depth is sufficiently deep enough to cause the surrounding soil to displace vertically due to a bearing capacity failure of the soil beneath the excavation bottom, with a corresponding upward movement of the soils in the bottom of the excavation. In fat and lean clays, heave normally does not occur unless the ratio of Critical Height to Depth of Cut approaches one. In very sandy and silty lean clays, and granular soils, heave can occur if an artificially large head of water is created due to installation of impervious

sheeting while bracing the cut. This could be mitigated if groundwater is lowered below the excavation by dewatering the area.

Base stability was evaluated for the improvements within the project area using the subsurface soils encountered at borings B-1 through B-4, which noted medium dense to dense, wet sands at the invert elevations of -1.79 CCD, -0.33 CCD, 0.33 CCD, and 3.0 CCD, respectively.

Based on the invert elevations provided in the design plans the anticipated temporary sheet piling should be driven to at least 7 feet into the soft to medium stiff clay. It is also recommended that the contractor install a minimum of 12 inches of CA-1 graded stone at the base of the excavation beneath the sewer pipe bedding to provide a stable base for construction work in accordance with CDWM requirements. The bedding beneath the pipe must have a minimum thickness of 6 inches and must extend up to the spring line of the pipe on both sides.

Based on the invert elevations provided in the design plans and the recommended sheet piling the anticipated bottoms of the proposed excavations were evaluated. The excavation base stabilities at the intersections included in the project corridor appear to be adequate with a factor of safety greater than 1.5; therefore, no heave concern is anticipated.

3.6 Groundwater Consideration

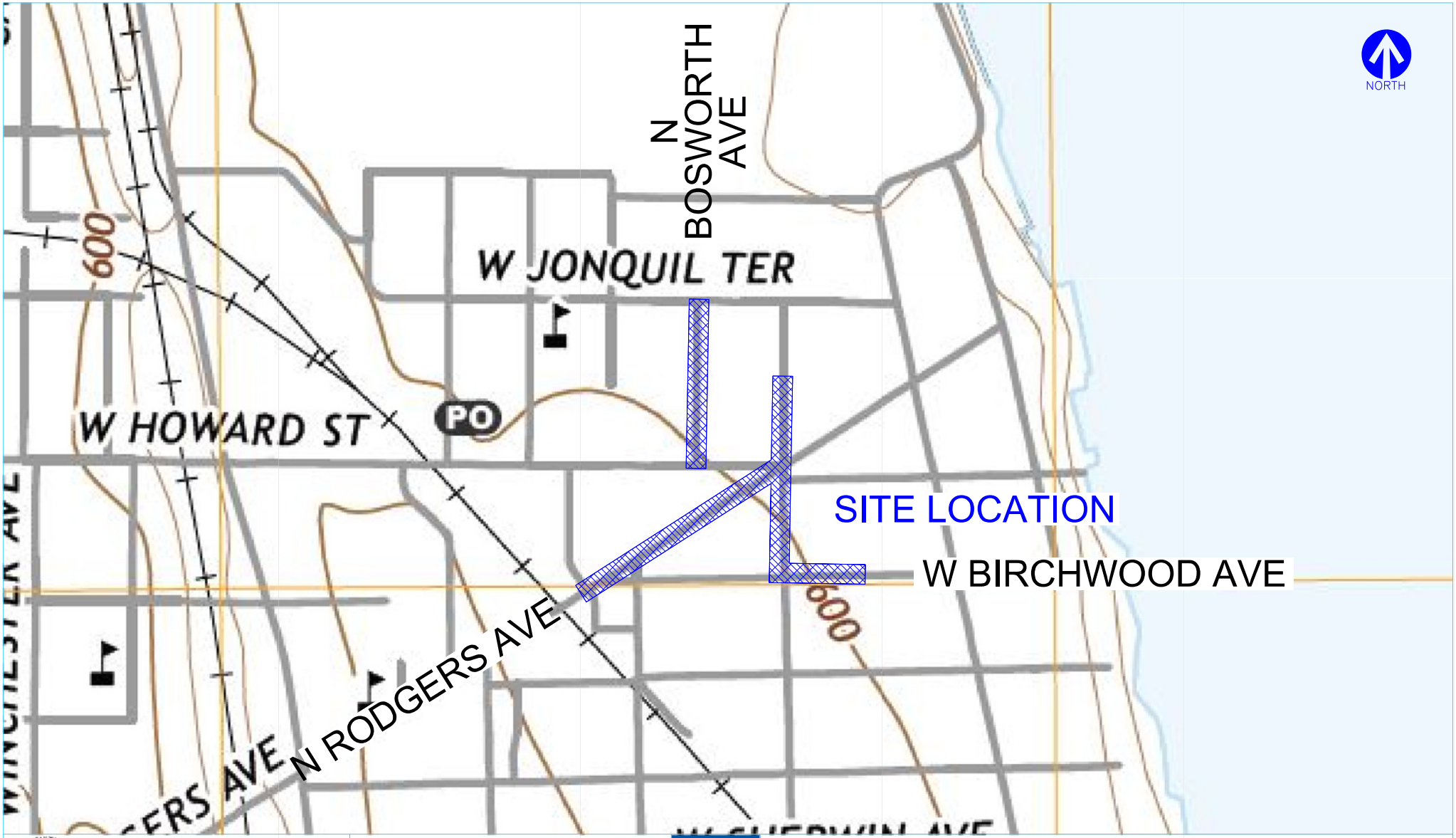
Due to the granular material within the borings and presence of a relatively highwater table, it is recommended to install dewatering system consisting of well points along the excavation in order to lower the water table to a depth below the pipe invert. Design and installation of a dewatering system is normally completed by a specialty contractor. As stated above, it is recommended to place a minimum of 1 foot of open grade stone at the bottom of the excavation in order to provide a stable work platform.

3.7 Construction Consideration

All construction work should be performed in accordance with the CDWM Standard Specifications and Procedures, and the project design plans and special provisions. The design engineer should approve any deviation from the above requirements.

4.0 LIMITATIONS

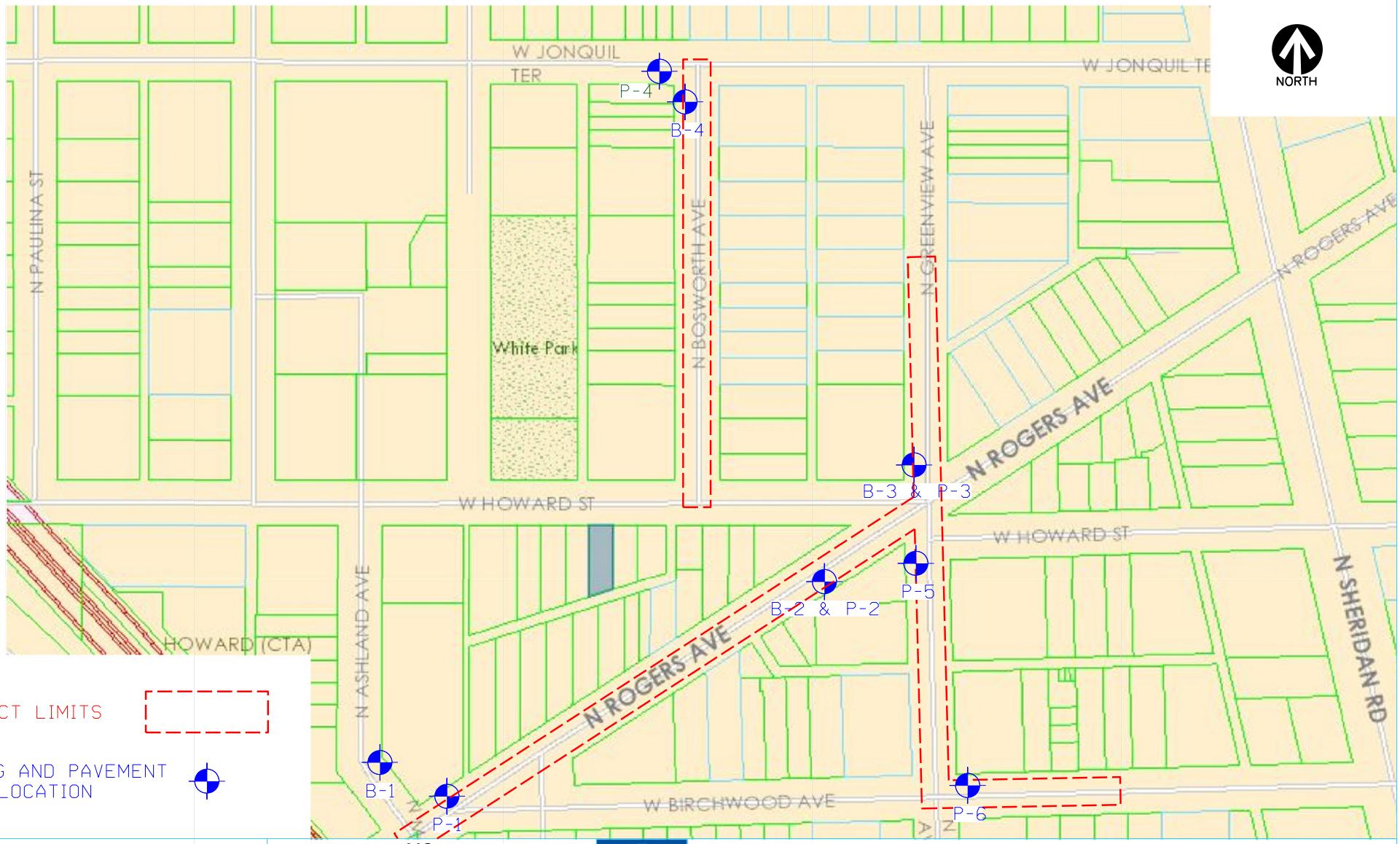
This report has been prepared for the exclusive use of CDWM and the project Design Engineer (T.Y. Lin International). No warranty, expressed or implied, is presented in this report with respect to any other condition related to this project. The recommendations provided in the report are specific to the project described herein, and are based on the information obtained from the soil borings located within the project limits. The analyses performed and the recommendations provided in this report are based on subsurface conditions determined at the location of the borings. This report does not reflect all variations that may occur between boring locations or at some other time, the nature and extent of which may not become evident until during the time of construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and review the recommendations presented in the report.



GSG CONSULTANTS, INC.
623 Cooper Court • Schaumburg, IL 60173
Tel: 630.994.2600 • Fax: 312.733.5612

DRAWN BY:	MC
CHECKED BY:	AS
DATE:	03/20/2019
SCALE:	N.T.S.

EXHIBIT 1 SITE LOCATION MAP
CHICAGO DEPARTMENT OF WATER MANAGEMENT - PN 7439
CHICAGO, ILLINOIS



GSG CONSULTANTS, INC.
623 Cooper Court • Schaumburg, IL 60173
Tel: 630.994.2600 • Fax: 312.733.5612

DRAWN BY:	MC
CHECKED BY:	AS
DATE:	03/20/2019
SCALE:	N.T.S.

EXHIBIT 2 BORING LOCATION PLAN
CHICAGO DEPARTMENT OF WATER MANAGEMENT - PN 7439
CHICAGO, ILLINOIS

APPENDIX A

SOIL BORING LOGS

GSG CONSULTANTS
623 COOPER COURT
SCHAUMBURG IL/60173
Telephone: 630.994.2600

BORING NUMBER B-1

CLIENT TY Lin International
PROJECT NAME TOR 20-05
PROJECT NUMBER PN: 7439
PROJECT LOCATION Chicago, IL
DATE STARTED 3/7/19 **COMPLETED** 3/7/19
GROUND ELEVATION 12.12 ft CCD **HOLE SIZE** 3 1/4"
DRILLING CONTRACTOR GSG Drilling
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING 8.50 ft / Elev 3.62 ft
LOGGED BY TEK **CHECKED BY** MC
AT END OF DRILLING --- N/A
NOTES N. Ashland Ave. & 104' NW of N. Rodgers Ave.
AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	UNCONFINED COMPRESSION (tsf)
0		3 inches of Asphalt 7 inches of Concrete FILL: SAND, trace gravel - Brown - Moist	SS 1	0	6-5-6 (11)	
			SS 2	78	3-4-6 (10)	
5		SAND, with gravel (SPG) - Brown - Medium Dense - Moist	SS 3	78	7-8-10 (18)	
		Top of proposed sewer at 2.21 CCD SAND, with gravel (SPG) - Gray - Medium Dense to Dense - Moist to Wet	SS 4	56	7-17-19 (36)	
10			SS 5	0	13-19-19 (38)	
		Proposed 36 inch sewer invert elevation at -0.79 CCD Proposed tumbling basin invert elevation at -1.79 CCD	SS 6	67	6-5-6 (11)	
15						
		CLAY, trace gravel (CL) - Gray - Very Soft to Medium Stiff - Moist to Very Moist	SS 7	83	2-1-1 (2)	0.21
20						
			SS 8	89	2-3-3 (6)	0.62
25						
			SS 9	100	2-3-3 (6)	0.42
30						
			SS 10	100	2-2-3 (5)	0.42
35						

▲ SPT N VALUE
20 40 60 80
● Moisture Content
10 20 30 40
☐ Unconfined Compression (tsf)
2 4 6 8

Bottom of borehole at 35.0 feet.

GEOTECH BH PLOTS - GINT STD US.GDT - 5/8/19 13:56 - \\GSGFS02\PROJECTS - ENGINEERING\TYLIN\CDWM\TOR 20-05\GEOTECHNICAL\FIELD TESTING\PN 7439\PN 7439.GPJ

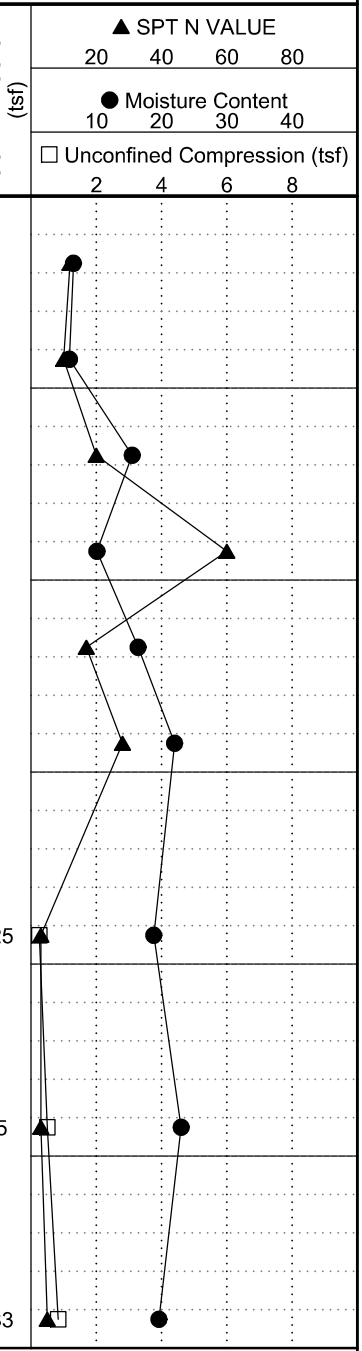
GSG CONSULTANTS
623 COOPER COURT
SCHAUMBURG IL/60173
Telephone: 630.994.2600

BORING NUMBER B-2

CLIENT TY Lin International
PROJECT NAME TOR 20-05
PROJECT NUMBER PN: 7439
PROJECT LOCATION Chicago, IL
DATE STARTED 3/7/19 **COMPLETED** 3/7/19
GROUND ELEVATION 11.12 ft CCD **HOLE SIZE** 3 1/4"
DRILLING CONTRACTOR GSG Drilling
GROUND WATER LEVELS:
DRILLING METHOD HSA
▽ **AT TIME OF DRILLING** 8.50 ft / Elev 2.62 ft
LOGGED BY TEK **CHECKED BY** MC
AT END OF DRILLING --- N/A
NOTES N. Rodgers Ave. & 91' SW of Howard St.
AFTER DRILLING --- N/A

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	UNCONFINED COMPRESSION (tsf)
0	4 inches of Asphalt 7 inches of Concrete 3 inches of Sand & Gravel Base Course FILL: SAND - Brown - Moist	SS 1	67	5-5-7 (12)	
		SS 2	78	4-4-6 (10)	
5	SAND, with gravel (SPG) - Brown - Medium Dense to Very Dense - Moist to Wet	SS 3	67	7-8-12 (20)	
	Top of proposed sewer at 2.67 CCD ▽ Cobbles at 8.5 to 10 ft	SS 4	78	10-10-50 (60)	
10	SAND, trace gravel (SP) - Gray - Medium Dense - Wet	SS 5	44	9-8-9 (17)	
	Proposed 36 inch sewer invert elevation at -0.33 CCD	SS 6	56	7-12-16 (28)	
15					
20	CLAY, trace gravel (CL) - Gray - Very Soft to Medium Stiff - Moist	SS 7	50	4-1-2 (3)	0.25
25		SS 8	67	1-1-2 (3)	0.5
30		SS 9	78	2-3-2 (5)	0.83

Bottom of borehole at 30.0 feet.



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GSG CONSULTANTS
623 COOPER COURT
SCHAUMBURG IL/60173
Telephone: 630.994.2600

BORING NUMBER B-3

CLIENT TY Lin International
PROJECT NAME TOR 20-05
PROJECT NUMBER PN: 7439
PROJECT LOCATION Chicago, IL
DATE STARTED 3/13/19 **COMPLETED** 3/13/19
GROUND ELEVATION 11.12 ft CCD **HOLE SIZE** 2 1/4"
DRILLING CONTRACTOR GSG Drilling
GROUND WATER LEVELS:
DRILLING METHOD HSA
▽ **AT TIME OF DRILLING** 8.50 ft / Elev 2.62 ft
LOGGED BY TEK **CHECKED BY** MC
AT END OF DRILLING --- N/A
NOTES N. Greenview Ave. & 24' N of N. Rodgers Ave.
AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	UNCONFINED COMPRESSION (tsf)
0		3.5 inches of Asphalt 5.5 inches of Concrete FILL: SAND, trace gravel - Brown - Moist	SS 1	33	2-1-3 (4)	
			SS 2	67	1-3-8 (11)	
5		SAND, with gravel (SPG) - Brown and Gray - Medium Dense to Dense - Moist to Wet	SS 3	33	5-8-10 (18)	
		▽	SS 4	67	6-16-19 (35)	
10		Top of proposed sewer at 2.33 CCD Cobbles at 9.5 ft Proposed 24 inch sewer invert elevation at 0.33 CCD	SS 5	100	4-11-14 (25)	
15		SAND, with gravel (SPG) - Gray - Dense - Wet	SS 6	67	15-15-20 (35)	
20		CLAY, trace gravel (CL) - Gray - Very Soft - Moist to Very Moist	SS 7	100	1-1-1 (2)	0.25
25			SS 8	78	1-1-1 (2)	0.25
30			SS 9	89	1-1-2 (3)	0.25

▲ SPT N VALUE
20 40 60 80
● Moisture Content
10 20 30 40
☐ Unconfined Compression (tsf)
2 4 6 8

Bottom of borehole at 30.0 feet.

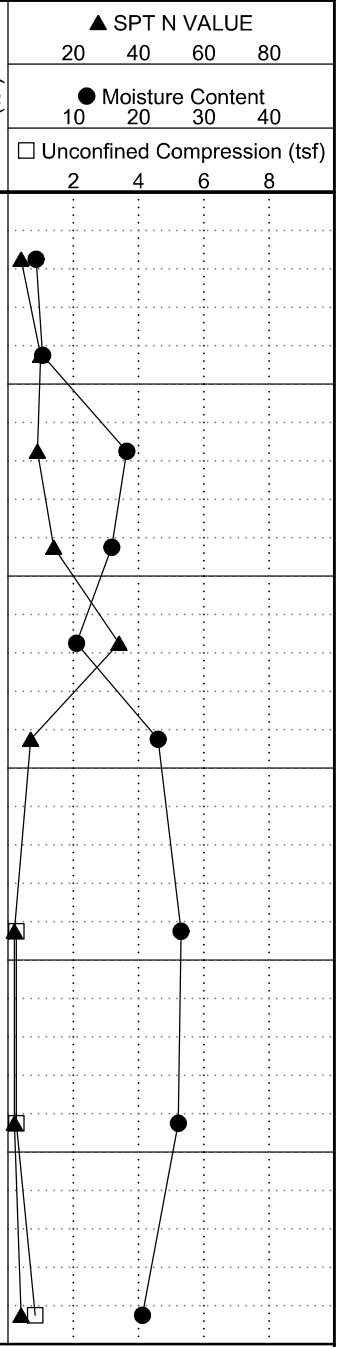
GEOTECH BH PLOTS - GINT STD US.GDT - 5/8/19 11:30 - \\GSGFS02\PROJECTS - ENGINEERING\TYLIN\CDWM\TOR 20-05\GEOTECHNICAL\FIELD TESTING\PN 7439\PN 7439.GPJ

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SCHAUMBURG IL/60173
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BORING NUMBER B-4

CLIENT TY Lin International
PROJECT NAME TOR 20-05
PROJECT NUMBER PN: 7439
PROJECT LOCATION Chicago, IL
DATE STARTED 3/13/19 **COMPLETED** 3/13/19
GROUND ELEVATION 11.12 ft CCD **HOLE SIZE** 2 1/4"
DRILLING CONTRACTOR GSG Drilling
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING 6.00 ft / Elev 5.12 ft
LOGGED BY TEK **CHECKED BY** MC
AT END OF DRILLING --- N/A
NOTES N. Bosworth Ave. & 33' S of W. Jonquil Terrace
AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	UNCONFINED COMPRESSION (tsf)
0		3 inches of Asphalt 4 inches of Concrete FILL: SAND, trace gravel - Brown and Black - Dry to Moist	SS 1	33	2-2-2 (4)	
			SS 2	56	2-4-6 (10)	
5		SAND, with gravel (SPG) - Brown and Gray - Loose to Medium Dense - Moist to Wet				
		Top of proposed sewer at 5.0 CCD	SS 3	33	3-4-5 (9)	
		Proposed 24 inch sewer invert elevation at 3.0 CCD	SS 4	44	15-6-8 (14)	
10		SAND, trace gravel (SP) - Gray - Loose to Dense - Moist to Wet	SS 5	56	16-18-16 (34)	
			SS 6	17	12-4-3 (7)	
15		CLAY, trace gravel (CL) - Gray - Very Soft to Medium Stiff - Moist to Very Moist				
			SS 7	100	1-1-1 (2)	0.25
20						
			SS 8	100	1-1-1 (2)	0.25
25						
			SS 9	100	1-1-3 (4)	0.83
30		Bottom of borehole at 30.0 feet.				



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Unified Soil Classification

Soil Classification is based on the Unified Soil Classification System and ASTM Designations D-2487 and D-2488. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: clays, if they are plastic, and silts if they are slightly Plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the basis of their relative in-place density and fine grained soils on the basis of their consistency. Example: Lean clay with sand, trace gravel, stiff (CL); silty sand, trace gravel, medium dense (SM).

Drilling & Sampling Symbols

SS : Split Spoon
ST : Thin-Walled Tube
HA: Hand Auger
AU: Auger Sample
HS: Hand Sample

Water Level (ft)
▽ While Drilling
▽ After Drilling
▼ 24-hour

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch OD split spoon, except where noted.

Major Divisions			Group Symbols	Typical Names
Coarse Grained Soils (More than Half of material is larger than No. 200 sieve size)	Gravels (More than hall of coarse fraction is larger than No. 4 sieve size)	Clean Gravels (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
		Gravels with fines (Appreciable amount of fines)	GM d / u	Silty gravels, gravel-sand-clay mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than hall of coarse fraction is smaller than No. 4 sieve size)	Clean Sands (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands, gravelly sands, little or no fines
		Sands with fines (Appreciable amount of fines)	SM d / u	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine Grained Soils More than half of material is smaller than No. 200 sieve size)	Silts and Clays (liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or claye fine sands or clayey silts with slight plasticity
			CL	Inorganic clay of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays (liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
	Highly Organic Soils		Pt	Peat and other highly organic soils

Consistency of Cohesive Soil

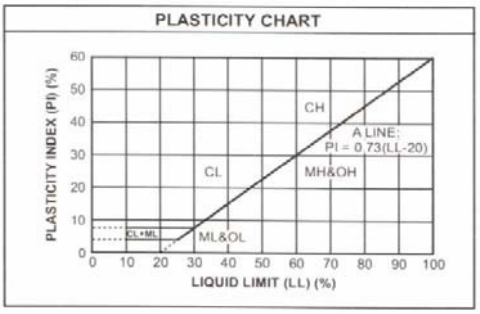
Unconfined Compressive strength, Qu, tsf			N-Blows/ft.		Consistency
	<	0.25	Below 2	<	Very Soft
0.25	-	0.50	2-4	-	Soft
0.50	-	1.0	4-8	-	Medium Stiff
1.0	-	2.0	8-15	-	Stiff
2.0	-	4.0	15-30	-	Very Stiff
4.0	-	8.0	30-50	-	Hard
>	-	8.0	> 50	-	Very Hard

Relative Density of Coarse-Grained Soils

N-Blows/ft.	Relative Density
0-3	Very Loose
4-10	Loose
11-29	Medium Dense
30-49	Dense
50-80	Very Dense
>80	Extremely Dense

Description Term(s) of Components Present in Sample

Trace < 10%	Little 10-19%
Some 20-34%	And 35-50%



APPENDIX B

RECOMMENDED GEOTECHNICAL DESIGN PARAMETERS

Table B-1: Summary of Soil Parameters

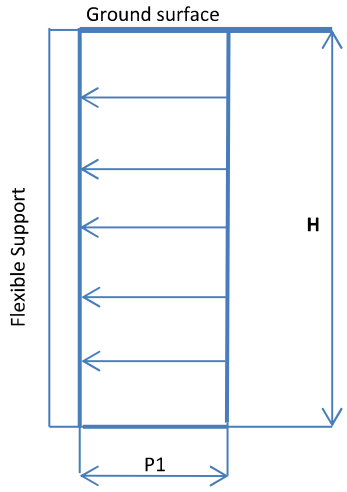
Depth (feet)	Soil Description	In situ Unit Weight γ (pcf)	Undrained		Drained		Active Earth Pressure Coefficient (K_a)	Passive Earth Pressure Coefficient (K_p)	At Rest Earth Pressure Coefficient (K_o)	OSHA Soil Type
			Cohesion c (psf)	Friction Angle ϕ (°)	Cohesion c (psf)	Friction Angle ϕ (°)				
0.5-6.5	Brown Sand Fill	133	0	38	0	38	0.23	4.29	0.38	Type C
6.5-8.5	Loose to Med. Dense Br/Gr Sand w/ gravel	136	0	39	0	39	0.22	4.51	0.36	Type C
8.5-18.5	Loose to Dense Gray Sand	134	0	38	0	38	0.23	4.33	0.38	Type C
8.5-18.5 (B-1 only)	Med. Dense to Dense Gray Sand w/ gravel	138	0	40	0	40	0.21	4.70	0.35	Type C
13.5-18.5 (B-3 only)	Dense Gray Sand w/ gravel	138	0	40	0	40	0.21	4.74	0.35	Type C
18.5-35	V. Soft to Med. Stiff Gray Silty Clay	120	400	0	0	20	0.49	2.04	0.66	Type C

APPENDIX C

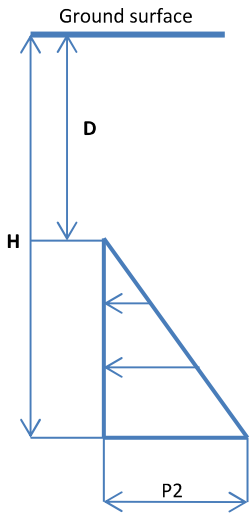
LATERAL PRESSURE COMPUTATION

CHART C-1: Lateral Earth Pressure Diagrams for Short-Term Conditions

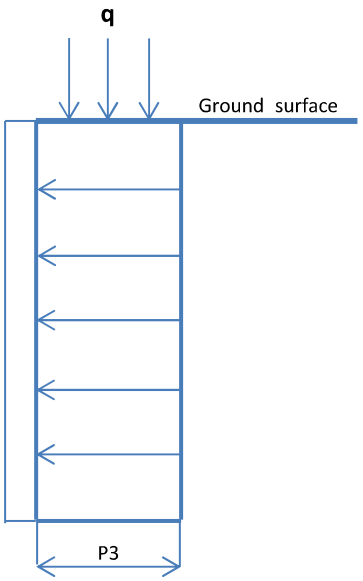
OPEN CUTS IN SANDY SOILS



(a) **Sand**



(b)Water Pressure



(c) Surcharge Pressure

Empirical Pressure Distributions

P1=Lateral earth pressure = $0.65*0.3\gamma H$, psf

P2=Water pressure = γ_w (H-D), psf

P3= Lateral earth pressure caused by surcharge = qK_a, psf (Use $K_a = 0.3$)

Where:

H=Total excavation depth, feet

D=Depth to water table, feet

γ = Effective unit weight of soil, pcf

γ_w = Unit weight of water, pcf

S_u = Undrained shear strength of the soil at the bottom of the excavation = $q_u/2$, psf

q_u= Unconfined compressive strength of the soil at the bottom of the excavation, psf

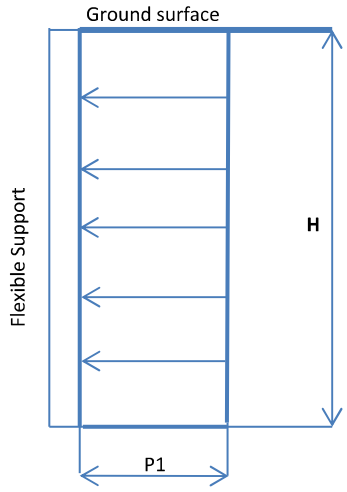
K_a= Coefficient of active earth pressure (refer to table below)

Notes:

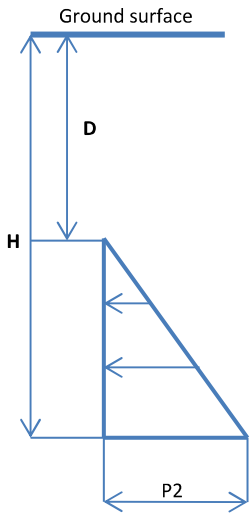
1. All pressures are additive
2. No safety factors included
3. For use only during short term construction

CHART C-2: Lateral Earth Pressure Diagrams for Long-Term Conditions

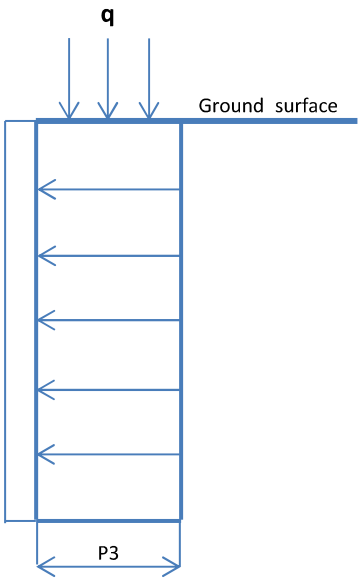
OPEN CUTS IN SANDY SOILS



(a) **Sand**



(b)Water Pressure



(c) Surcharge Pressure

Empirical Pressure Distributions

P1=Lateral earth pressure = $0.65*0.4\gamma H$, psf

P2=Water pressure = γ_w (H-D), psf

P3= Lateral earth pressure caused by surcharge = qK_a, psf (Use $K_a = 0.4$)

Where:

H=Total excavation depth, feet

D=Depth to water table, feet

γ = Effective unit weight of soil, pcf

γ_w = Unit weight of water, pcf

S_u = Undrained shear strength of the soil at the bottom of the excavation = $q_u/2$, psf

q_u= Unconfined compressive strength of the soil at the bottom of the excavation, psf

K_a= Coefficient of active earth pressure (refer to table below)

Notes:

1. All pressures are additive
2. No safety factors included
3. For use only during long term construction

APPENDIX D

PAVEMENT CORE

SUMMARY



P-1 –Pavement Core

Asphalt Thickness (in.)	Concrete Thickness (in.)	Total Thickness (in.)	Aggregate Subbase Composition
3.5	7.5	11.0	N/A

*Pictures of the core measurements may differ from measured values



P-2 –Pavement Core

Asphalt Thickness (in.)	Concrete Thickness (in.)	Total Thickness (in.)	Aggregate Subbase Composition
4.0	6.5	10.5	Sand and Gravel

*Pictures of the core measurements may differ from measured values



P-3 –Pavement Core

Asphalt Thickness (in.)	Concrete Thickness (in.)	Total Thickness (in.)	Aggregate Subbase Composition
3.5	5.5	9.0	N/A

*Pictures of the core measurements may differ from measured values



P-4 –Pavement Core

Asphalt Thickness (in.)	Concrete Thickness (in.)	Total Thickness (in.)	Aggregate Subbase Composition
2.5	5.5	8.0	N/A

*Pictures of the core measurements may differ from measured values



P-5 –Pavement Core

Asphalt Thickness (in.)	Concrete Thickness (in.)	Total Thickness (in.)	Aggregate Subbase Composition
4.0	10.0	14.0	Sand and Gravel

*Pictures of the core measurements may differ from measured values



P-6 –Pavement Core

Asphalt Thickness (in.)	Concrete Thickness (in.)	Total Thickness (in.)	Aggregate Subbase Composition
1.0	9.0	10.0	Sand and Gravel

*Pictures of the core measurements may differ from measured values

APPENDIX V
USE OF AMERICAN IRON AND STEEL

Excerpt from P.L. 113-76

USE OF AMERICAN IRON AND STEEL

SEC. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term ''iron and steel products'' means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the ''Administrator'') finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 20 2014

OFFICE OF WATER

MEMORANDUM

SUBJECT: Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014

FROM: For Andrew D. Sawyers, Director
Office of Wastewater Management (4201M)

Peter C. Grevatt, Director
Office of Ground Water and Drinking Water (4601M)

TO: Water Management Division Directors
Regions I - X

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Federal Fiscal Year 2014.

Section 436 also sets forth certain circumstances under which EPA may waive the AIS requirement. Furthermore, the Act specifically exempts projects where engineering plans and specifications were approved by a State agency prior to January 17, 2014.

The approach described below explains how EPA will implement the AIS requirement. The first section is in the form of questions and answers that address the types of projects that must comply with the AIS requirement, the types of products covered by the AIS requirement, and compliance. The second section is a step-by-step process for requesting waivers and the circumstances under which waivers may be granted.

Implementation

The Act states:

Sec. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term ''iron and steel products'' means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the ''Administrator'') finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out

the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

The following questions and answers provide guidance for implementing and complying with the AIS requirements:

Project Coverage

1) What classes of projects are covered by the AIS requirement?

All treatment works projects funded by a CWSRF assistance agreement, and all public water system projects funded by a DWSRF assistance agreement, from the date of enactment through the end of Federal Fiscal Year 2014, are covered. The AIS requirements apply to the entirety of the project, no matter when construction begins or ends. Additionally, the AIS requirements apply to all parts of the project, no matter the source of funding.

2) Does the AIS requirement apply to nonpoint source projects or national estuary projects?

No. Congress did not include an AIS requirement for nonpoint source and national estuary projects unless the project can also be classified as a 'treatment works' as defined by section 212 of the Clean Water Act.

3) Are any projects for the construction, alteration, maintenance, or repair of a public water system or treatment works excluded from the AIS requirement?

Any project, whether a treatment works project or a public water system project, for which engineering plans and specifications were approved by the responsible state agency prior to January 17, 2014, is excluded from the AIS requirements.

4) What if the project does not have approved engineering plans and specifications but has signed an assistance agreement with a CWSRF or DWSRF program prior to January 17, 2014?

The AIS requirements do not apply to any project for which an assistance agreement was signed prior to January 17, 2014.

5) What if the project does not have approved engineering plans and specifications, but bids were advertised prior to January 17, 2014 and an assistance agreement was signed after January 17, 2014?

If the project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the approval date for purposes of the exemption in section 436(f).

6) What if the assistance agreement that was signed prior to January 17, 2014, only funded a part of the overall project, where the remainder of the project will be funded later with another SRF loan?

If the original assistance agreement funded any construction of the project, the date of the original assistance agreement counts for purposes of the exemption. If the original assistance agreement was only for planning and design, the date of that assistance agreement will count for purposes of the exemption only if there is a written commitment or expectation on the part of the assistance recipient to fund the remainder of the project with SRF funds.

7) What if the assistance agreement that was signed prior to January 17, 2014, funded the first phase of a multi-phase project, where the remaining phases will be funded by SRF assistance in the future?

In such a case, the phases of the project will be considered a single project if all construction necessary to complete the building or work, regardless of the number of contracts or assistance agreements involved, are closely related in purpose, time and place. However, there are many situations in which major construction activities are clearly undertaken in phases that are distinct in purpose, time, or place. In the case of distinct phases, projects with engineering plans and specifications approval or assistance agreements signed prior to January 17, 2014 would be excluded from AIS requirements while those approved/signed on January 17, 2014, or later would be covered by the AIS requirements.

8) What if a project has split funding from a non-SRF source?

Many States intend to fund projects with "split" funding, from the SRF program and from State or other programs. Based on the Act language in section 436, which requires that American iron and steel products be used in any project for the construction, alteration, maintenance, or repair of a public water system or treatment works receiving SRF funding between and including January 17, 2014 and September 30, 2014, any project that is funded in whole or in part with such funds must comply with the AIS requirement. A "project" consists of all construction necessary to complete the building or work regardless of the number of contracts or assistance agreements involved so long as all contracts and assistance agreements awarded are closely related in purpose, time and place. This precludes the intentional splitting of SRF projects into separate and smaller contracts or assistance agreements to avoid AIS coverage on some portion of a larger

project, particularly where the activities are integrally and proximately related to the whole. However, there are many situations in which major construction activities are clearly undertaken in separate phases that are distinct in purpose, time, or place, in which case, separate contracts or assistance agreement for SRF and State or other funding would carry separate requirements.

9) What about refinancing?

If a project began construction, financed from a non-SRF source, prior to January 17, 2014, but is refinanced through an SRF assistance agreement executed on or after January 17, 2014 and prior to October 1, 2014, AIS requirements will apply to all construction that occurs on or after January 17, 2014, through completion of construction, unless, as is likely, engineering plans and specifications were approved by a responsible state agency prior to January 17, 2014. There is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to January 17, 2014.

10) Do the AIS requirements apply to any other EPA programs, besides the SRF program, such as the Tribal Set-aside grants or grants to the Territories and DC?

No, the AIS requirement only applies to funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12)

<u>Covered Iron and Steel Products</u>

11) What is an iron or steel product?

For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

Lined or unlined pipes or fittings;
Manhole Covers;
Municipal Castings (defined in more detail below);
Hydrants;
Tanks;
Flanges;
Pipe clamps and restraints;
Valves;
Structural steel (defined in more detail below);
Reinforced precast concrete; and
Construction materials (defined in more detail below).

12) What does the term 'primarily iron or steel' mean?

'Primarily iron or steel' places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs.

13) Can you provide an example of how to perform a cost determination?

For example, the iron portion of a fire hydrant would likely be the bonnet, body and shoe, and the cost then would include the pouring and casting to create those components. The other material costs would include non-iron and steel internal workings of the fire hydrant (i.e., stem, coupling, valve, seals, etc). However, the assembly of the internal workings into the hydrant body would not be included in this cost calculation. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required. An exception to this definition is reinforced precast concrete, which is addressed in a later question.

14) If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US?

The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

15) What is the definition of steel?

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

16) What does 'produced in the United States' mean?

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the

material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

17) Are the raw materials used in the production of iron or steel required to come from US sources?

No. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

18) If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?

No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

19) What is the definition of 'municipal castings'?

Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

Access Hatches;
Ballast Screen;
Benches (Iron or Steel);
Bollards;
Cast Bases;
Cast Iron Hinged Hatches, Square and Rectangular;
Cast Iron Riser Rings;
Catch Basin Inlet;
Cleanout/Monument Boxes;
Construction Covers and Frames;
Curb and Corner Guards;
Curb Openings;
Detectable Warning Plates;
Downspout Shoes (Boot, Inlet);
Drainage Grates, Frames and Curb Inlets;
Inlets;
Junction Boxes;
Lampposts;
Manhole Covers, Rings and Frames, Risers;

Meter Boxes;
Service Boxes;
Steel Hinged Hatches, Square and Rectangular;
Steel Riser Rings;
Trash receptacles;
Tree Grates;
Tree Guards;
Trench Grates; and
Valve Boxes, Covers and Risers.

20) What is 'structural steel'?

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

21) What is a 'construction material' for purposes of the AIS requirement?

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

22) What is not considered a 'construction material' for purposes of the AIS requirement?

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates, motorized screens (such as traveling screens), blowers/aeration equipment, compressors, meters, sensors, controls and switches, supervisory control and

data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters, heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.

23) If the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?

No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

24) What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the US.

Compliance

25) How should an assistance recipient document compliance with the AIS requirement?

In order to ensure compliance with the AIS requirement, specific AIS contract language must be included in each contract, starting with the assistance agreement, all the way down to the purchase agreements. Sample language for assistance agreements and contracts can be found in Appendix 3 and 4.

EPA recommends the use of a step certification process, similar to one used by the Federal Highway Administration. The step certification process is a method to ensure that producers adhere to the AIS requirement and assistance recipients can verify that products comply with the AIS requirement. The process also establishes accountability and better enables States to take enforcement actions against violators.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer,

processor, etc) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. Typically, it includes the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. Attached, as Appendix 5, are sample certifications. These certifications should be collected and maintained by assistance recipients.

Alternatively, the final manufacturer that delivers the iron or steel product to the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it may not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information. Step certification is the best practice.

26) How should a State ensure assistance recipients are complying with the AIS requirement?

In order to ensure compliance with the AIS requirement, States SRF programs must include specific AIS contract language in the assistance agreement. Sample language for assistance agreements can be found in Appendix 3.

States should also, as a best practice, conduct site visits of projects during construction and review documentation demonstrating proof of compliance which the assistance recipient has gathered.

27) What happens if a State or EPA finds a non-compliant iron and/or steel product permanently incorporated in the project?

If a potentially non-compliant product is identified, the State should notify the assistance recipient of the apparent unauthorized use of the non-domestic component, including a proposed corrective action, and should be given the opportunity to reply. If unauthorized use is confirmed, the State can take one or more of the following actions: request a waiver where appropriate; require the removal of the non-domestic item; or withhold payment for all or part of the project. Only EPA can issue waivers to authorize the use of a non-domestic item. EPA may use remedies available to it under the Clean Water Act, the Safe Drinking Water Act, and 40 CFR part 31 grant regulations, in the event of a violation of a grant term and condition.

It is recommended that the State work collaboratively with EPA to determine the appropriate corrective action, especially in cases where the State is the one who identifies the item in noncompliance or there is a disagreement with the assistance recipient.

If fraud, waste, abuse, or any violation of the law is suspected, the Office of Inspector General (OIG) should be contacted immediately. The OIG can be reached at 1-

888-546-8740 or OIG_Hotline@epa.gov. More information can be found at this website: http://www.epa.gov/oig/hotline.htm.

28) How do international trade agreements affect the implementation of the AIS requirements?

The AIS provision applies in a manner consistent with United States obligations under international agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to such agreements. In general, SRF assistance recipients are not signatories to such agreements, so these agreements have no impact on this AIS provision. In the few instances where such an agreement applies to a municipality, that municipality is under the obligation to determine its applicability and requirements and document the actions taken to comply for the State.

Waiver Process

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described below will allow States, on behalf of the assistance recipients, to apply for waivers of the AIS requirement directly to EPA Headquarters. Only waiver requests received from states will be considered. Pursuant to the Act, EPA has the responsibility to make findings as to the issuance of waivers to the AIS requirements.

Definitions

The following terms are critical to the interpretation and implementation of the AIS requirements and apply to the process described in this memorandum:

Reasonably Available Quantity: The quantity of iron or steel products is available or will be available at the time needed and place needed, and in the proper form or specification as specified in the project plans and design.

Satisfactory Quality: The quality of iron or steel products, as specified in the project plans and designs.

Assistance Recipient: A borrower or grantee that receives funding from a State CWSRF or DWSRF program.

Step-By-Step Waiver Process

Application by Assistance Recipient

Each local entity that receives SRF water infrastructure financial assistance is required by section 436 of the Act to use American made iron and steel products in the construction of its project. However, the recipient may request a waiver. Until a waiver is granted by EPA, the AIS requirement stands, except as noted above with respect to municipalities covered by international agreements.

The waiver process begins with the SRF assistance recipient. In order to fulfill the AIS requirement, the assistance recipient must in good faith design the project (where applicable) and solicit bids for construction with American made iron and steel products. It is essential that the assistance recipient include the AIS terms in any request for proposals or solicitations for bids, and in all contracts (see Appendix 3 for sample construction contract language). The assistance recipient may receive a waiver at any point before, during, or after the bid process, if one or more of three conditions is met:

1. Applying the American Iron and Steel requirements of the Act would be inconsistent with the public interest;
2. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Proper and sufficient documentation must be provided by the assistance recipient. A checklist detailing the types of information required for a waiver to be processed is attached as Appendix 1.

Additionally, it is strongly encouraged that assistance recipients hold pre-bid conferences with potential bidders. A pre-bid conference can help to identify iron and steel products needed to complete the project as described in the plans and specifications that may not be available from domestic sources. It may also identify the need to seek a waiver prior to bid, and can help inform the recipient on compliance options.

In order to apply for a project waiver, the assistance recipient should email the request in the form of a Word document (.doc) to the State SRF program. It is strongly recommended that the State designate a single person for all AIS communications. The State SRF designee will review the application for the waiver and determine whether the necessary information has been included. Once the waiver application is complete, the State designee will forward the application to either of two email addresses. For CWSRF waiver requests, please send the application to: cwsrfwaiver@epa.gov. For DWSRF waiver requests, please send the application to: dwsrfwaiver@epa.gov.

Evaluation by EPA

After receiving an application for waiver of the AIS requirements, EPA Headquarters will publish the request on its website for 15 days and receive informal comment. EPA Headquarters will then use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

In the event that EPA finds that adequate documentation and justification has been submitted, the Administrator may grant a waiver to the assistance recipient. EPA will notify the State designee that a waiver request has been approved or denied as soon as such a decision has been made. Granting such a waiver is a three-step process:

1. Posting – After receiving an application for a waiver, EPA is required to publish the application and all material submitted with the application on EPA's website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to EPA. The website can be found at: http://water.epa.gov/grants_funding/aisrequirement.cfm

2. Evaluation – After receiving an application for waiver of the AIS requirements, EPA Headquarters will use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

3. Signature of waiver approval by the Administrator or another agency official with delegated authority – As soon as the waiver is signed and dated, EPA will notify the State SRF program, and post the signed waiver on our website. The assistance recipient should keep a copy of the signed waiver in its project files.

Public Interest Waivers

EPA has the authority to issue public interest waivers. Evaluation of a public interest waiver request may be more complicated than that of other waiver requests so they may take more time than other waiver requests for a decision to be made. An example of a public interest waiver that might be issued could be for a community that has standardized on a particular type or manufacturer of a valve because of its performance to meet their specifications. Switching to an alternative valve may require staff to be trained on the new equipment and additional spare parts would need to be purchased and stocked, existing valves may need to be unnecessarily replaced, and portions of the system may need to be redesigned. Therefore, requiring the community to install an alternative valve would be inconsistent with public interest.

EPA also has the authority to issue a public interest waiver that covers categories of products that might apply to all projects.

EPA reserves the right to issue national waivers that may apply to particular classes of assistance recipients, particular classes of projects, or particular categories of iron or steel products. EPA may develop national or (US geographic) regional categorical waivers through the identification of similar circumstances in the detailed justifications presented to EPA in a waiver request or requests. EPA may issue a national waiver based on policy decisions regarding the public's interest or a determination that a particular item is not produced domestically in reasonably available quantities or of a sufficient quality. In such cases, EPA may determine it is necessary to issue a national waiver.

If you have any questions concerning the contents of this memorandum, you may contact us, or have your staff contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at dorfman.jordan@epa.gov or (202) 564-0614 or Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Attachments

Appendix 1: Information Checklist for Waiver Request

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA. EPA recommends that States review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	✓	Notes
General • Waiver request includes the following information: — Description of the foreign and domestic construction materials — Unit of measure — Quantity — Price — Time of delivery or availability — Location of the construction project — Name and address of the proposed supplier — A detailed justification for the use of foreign construction materials • Waiver request was submitted according to the instructions in the memorandum • Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime contractor		
Cost Waiver Requests • Waiver request includes the following information: — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products — Relevant excerpts from the bid documents used by the contractors to complete the comparison — Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers		
Availability Waiver Requests • Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested: — Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials — Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers. — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials • Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic construction materials for which the waiver is sought • Has the State received other waiver requests for the materials described in this waiver request, for comparable projects?		

Appendix 2: HQ Review Checklist for Waiver Request

Instructions: To be completed by EPA. Review all waiver requests using the questions in the checklist, and mark the appropriate box as Yes, No or N/A. Marks that fall inside the shaded boxes may be grounds for denying the waiver. If none of your review markings fall into a shaded box, the waiver is eligible for approval if it indicates that one or more of the following conditions applies to the domestic product for which the waiver is sought:

1. The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.
2. The inclusion of iron and/or steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Review Items	Yes	No	N/A	Comments
Cost Waiver Requests • Does the waiver request include the following information? — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products				
— Relevant excerpts from the bid documents used by the contractors to complete the comparison — A sufficient number of bid documents or pricing information from domestic sources to constitute a reasonable survey of the market				
• Does the Total Domestic Project exceed the Total Foreign Project Cost by more than 25%?				
Availability Waiver Requests • Does the waiver request include supporting documentation sufficient to show the availability, quantity, and/or quality of the iron and/or steel product for which the waiver is requested? — Supplier information or other documentation indicating availability/delivery date for materials — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of materials				
• Does supporting documentation provide sufficient evidence that the contractors made a reasonable effort to locate domestic suppliers of materials, such as a description of the process for identifying suppliers and a list of contacted suppliers?				
• Based on the materials delivery/availability date indicated in the supporting documentation, will the materials be unavailable when they are needed according to the project schedule? (By item, list schedule date and domestic delivery quote date or other relevant information)				
• Is EPA aware of any other evidence indicating the non-availability of the materials for which the waiver is requested? Examples include: — Multiple waiver requests for the materials described in this waiver request, for comparable projects in the same State — Multiple waiver requests for the materials described in this waiver request, for comparable projects in other States — Correspondence with construction trade associations indicating the non-availability of the materials				
• Are the available domestic materials indicated in the bid documents of inadequate quality compared those required by the project plans, specifications, and/or permits?				

Appendix 3: Example Loan Agreement Language

ALL ASSISTANCE AGREEMENT MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN SRF ASSISTANCE AGREEMENTS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE LAW:

Comply with all federal requirements applicable to the Loan (including those imposed by the 2014 Appropriations Act and related SRF Policy Guidelines) which the Participant understands includes, among other, requirements that all of the iron and steel products used in the Project are to be produced in the United States ("American Iron and Steel Requirement") unless (i) the Participant has requested and obtained a waiver from the Agency pertaining to the Project or (ii) the Finance Authority has otherwise advised the Participant in writing that the American Iron and Steel Requirement is not applicable to the Project.

Comply with all record keeping and reporting requirements under the Clean Water Act/Safe Drinking Water Act, including any reports required by a Federal agency or the Finance Authority such as performance indicators of program deliverables, information on costs and project progress. The Participant understands that (i) each contract and subcontract related to the Project is subject to audit by appropriate federal and state entities and (ii) failure to comply with the Clean Water Act/Safe Drinking Water Act and this Agreement may be a default hereunder that results in a repayment of the Loan in advance of the maturity of the Bonds and/or other remedial actions.

Appendix 4: Sample Construction Contract Language

ALL CONTRACTS MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN ALL CONTRACTS IN PROJECTS THAT USE SRF FUNDS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE OR LOCAL LAW:

The Contractor acknowledges to and for the benefit of the City of _____ ("Purchaser") and the _____ (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

Appendix 5: Sample Certifications

The following information is provided as a sample letter of **step** certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Step Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

The following information is provided as a sample letter of certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

MEMORANDUM

SUBJECT: De Minimis waiver of Section 436 of P.L. 113-76, Consolidated Appropriations Act (CAA), 2014

FROM: Nancy N. Stoner, Acting Assistant Administrator
Office of Water

TO: Water Management Division Directors
Regions I - X

The EPA is hereby granting a nationwide waiver of the "American Iron and Steel (AIS)" requirements of P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), section 436 under the authority of Section 436(b)(1) (public interest waiver) for de minimis incidental components of eligible water infrastructure projects. This action permits the use of products when they occur in de minimis incidental components of such projects funded by the Act that may otherwise be prohibited under section 436(a). Funds used for such de minimis incidental components cumulatively may comprise no more than a total of 5 percent of the total cost of the materials used in and incorporated into a project; the cost of an individual item may not exceed 1 percent of the total cost of the materials used in and incorporated into a project.

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel" (AIS) requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use specific domestic iron and steel products that are produced in the United States if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Fiscal Year 2014, unless the agency determines it necessary to waive this requirement based on findings set forth in Section 436(b). The Act states, "[the requirements] shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency…finds that— (1) applying subsection (a) would be inconsistent with the public interest" 436(b)(1).

In implementing section 436 of the Act, EPA must ensure that the section's requirements are applied consistent with congressional intent in adopting this section and in the broader context of the purposes, objectives, and other provisions applicable to projects funded under the SRF. Water infrastructure projects typically contain a relatively small number of high-cost components incorporated into the project. In bid solicitations for a project, these high-cost components are generally described in detail via project specific technical specifications. For

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these major components, utility owners and their contractors are generally familiar with the conditions of availability, the potential alternatives for each detailed specification, the approximate cost, and the country of manufacture of the available components.

Every water infrastructure project also involves the use of thousands of miscellaneous, generally low-cost components that are essential for, but incidental to, the construction and are incorporated into the physical structure of the project. For many of these incidental components, the country of manufacture and the availability of alternatives is not always readily or reasonably identifiable prior to procurement in the normal course of business; for other incidental components, the country of manufacture may be known but the miscellaneous character in conjunction with the low cost, individually and (in total) as typically procured in bulk, mark them as properly incidental. Examples of incidental components could include small washers, screws, fasteners (i.e., nuts and bolts), miscellaneous wire, corner bead, ancillary tube, etc. Examples of items that are clearly not incidental include significant process fittings (i.e., tees, elbows, flanges, and brackets), distribution system fittings and valves, force main valves, pipes for sewer collection and/or water distribution, treatment and storage tanks, large structural support structures, etc.

EPA undertook multiple inquiries to identify the approximate scope of de minimis incidental components within water infrastructure projects during the implementation of the American Reinvestment and Recovery Act (ARRA) and its requirements (Buy American provisions, specifically). The inquiries and research conducted in 2009 applies suitably for the case today. In 2009, EPA consulted informally with many major associations representing equipment manufacturers and suppliers, construction contractors, consulting engineers, and water and wastewater utilities, and performed targeted interviews with several well-established water infrastructure contractors and firms who work in a variety of project sizes, and regional and demographic settings to ask the following questions:

- What percentage of total project costs were consumables or incidental costs?
- What percentage of materials costs were consumables or incidental costs?
- Did these percentages vary by type of project (drinking water vs. wastewater treatment plant vs. pipe)?

The responses were consistent across the variety of settings and project types, and indicated that the percentage of total costs for drinking water or wastewater infrastructure projects represented by these incidental components is generally not in excess of 5 percent of the total cost of the materials used in and incorporated into a project. In drafting this waiver, EPA has considered the de minimis proportion of project costs generally represented by each individual type of these incidental components within the many types of such components comprising those percentages, the fact that these types of incidental components are obtained by contractors in many different ways from many different sources, and the disproportionate cost and delay that would be imposed on projects if EPA did not issue this waiver.

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Assistance recipients who wish to use this waiver should in consultation with their contractors determine the items to be covered by this waiver, must retain relevant documentation (i.e., invoices) as to those items in their project files, and must summarize in reports to the State the types and/or categories of items to which this waiver is applied, the total cost of incidental components covered by the waiver for each type or category, and the calculations by which they determined the total cost of materials used in and incorporated into the project.

If you have any questions concerning the contents of this memorandum, please contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at dorfman.jordan@epa.gov or (202) 564-0614 or Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

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