

STANDARD SPECIFICATIONS

FOR THE CONSTRUCTION OF
PUBLIC FACILITIES IN THE
TOWN OF LOWELL



Passed and adopted by the Lowell Town Council

on 09/14/2015
Date

Resolution Number 2015-12

TOWN OF LOWELL, LAKE COUNTY, INDIANA
TOWN COUNCIL
RESOLUTION NO. 2015- 12

**A RESOLUTION APPROVING STANDARD SPECIFICATIONS FOR THE
CONSTRUCTION OF PUBLIC FACILITIES IN THE TOWN OF LOWELL (2015)**

WHEREAS, the Town Council of the Town of Lowell, Lake County, Indiana (hereinafter the "Town Council"), is the duly elected legislative body of the Town of Lowell, Lake County, Indiana (hereinafter the "Town"), a unit of local government; and

WHEREAS, Indiana Code 36-7-1 *et seq.* and Indiana Code 36-9-1 *et seq.* provide that a Town Council may plan for and regulate the use, improvement, and maintenance of real property, and structures, as well as regulate the use, improvement, and maintenance of public works;

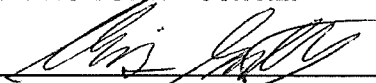
WHEREAS, the Town Council believes it would be helpful to have developmental standards for construction to be used in conjunction with the Town ordinances;

NOW, THEREFORE, BE IT RESOLVED BY THE TOWN COUNCIL OF THE TOWN OF LOWELL, LAKE COUNTY, INDIANA:

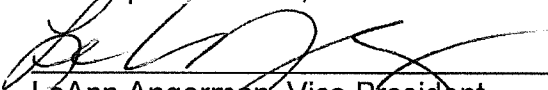
That the Town Council now approves the *Standard Specifications for the Construction of Public Facilities in the Town of Lowell (2015)* to be used in conjunction with the Town of Lowell Code of Ordinances, and which shall be reviewed and amended by the Town Council from time to time.

DULY PASSED, RESOLVED, AND ADOPTED by the Lowell Town Council of the Town of Lowell, Lake County, Indiana, this 14th day of September, 2015.

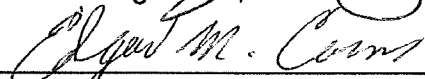
**TOWN OF LOWELL, LAKE COUNTY, INDIANA
BY ITS TOWN COUNCIL:**



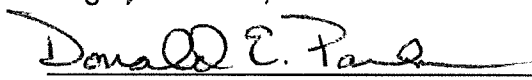
Christopher Salatas, President



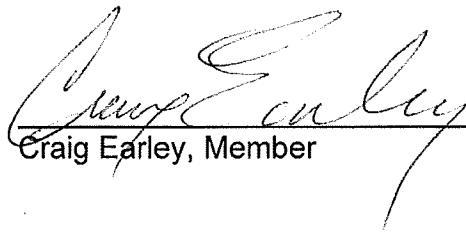
LeAnn Angerman, Vice President



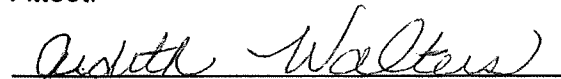
Edgar M. Corns, Member



Donald Parker, Member


Craig Earley, Member

Attest:


Judith Walters, Clerk-Treasurer

APPROVED BY THE EXECUTIVE this 14th day of September, 2015.



ATTEST:


Judith Walters, Clerk-Treasurer

Prepared for:

Town of Lowell

Prepared by:

SEH of Indiana (SEH®)
9200 Calumet Avenue, Suite N300
Munster, Indiana 46321

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Division 100
PUBLIC FACILITY CONSTRUCTION/DESIGN STANDARDS

Section 100 – General Information

Section 100.1 – Public Facility Construction/Design Standards

The following specifications shall be utilized for the design and/or construction of the following public facilities with the Town of Lowell:

- A. Roadway - Section 200
- B. Sanitary Sewer - Section 300
- C. Stormwater - Section 400
- D. Water Distribution System - Section 500
- E. Erosion Control – Section 600

Section 100.2 – Usage with the Lowell Municipal Code

These Specifications were adopted by the Lowell Town Council as of the date on the cover and shall be considered a supplement to the Town of Lowell Municipal Code. Specifically, users of these Specifications should also consult the following Divisions of the Municipal Code:

- 1. Title I: General Provisions
 - a. Chapter 10. General Provisions
 - b. Chapter 11. Fee Schedule
- 2. Title V: Public Works
 - a. Chapter 51. Sewers
 - b. Chapter 52. Waterworks
 - c. Chapter 53. Storm Water Management
- 3. Title XV: Land Usage
 - a. Chapter 150. Building and Construction Regulations
 - b. Chapter 151. Flood Hazard Areas
 - c. Chapter 154/155. Subdivision Regulations

Division 200
ROADWAY
CONSTRUCTION STANDARDS

Section 200 – General Requirements

Section 200.1 – General

The standards and requirements found in this article are for the materials and construction of street improvements within the Town of Lowell. Roadways and other public infrastructure shall be designed in accordance with Section 155 of the Town of Lowell Municipal Code. These details represent the minimum requirements acceptable to Lowell.

Section 200.2 – Surfacing Schedule

The placement of the final surface course shall not lag the placement of initial pavement courses by more than one year.

Section 200.3 – Geotechnical Report

A Geotechnical Report prepared by an approved Geotechnical Engineer shall be presented for review by the Director of Public Works or the Town Engineer prior to the construction of any pavements. The report shall be prepared in accordance with INDOT procedures and provide recommended subgrade treatments and verify that Lowell's standard pavement sections are adequate for the development based upon the in situ soils. It shall also discuss, at a minimum, groundwater depth, allowable bearing capacities for the construction of structures, soil characteristics and engineering properties, construction recommendations, etc.

Section 200.4 – Pavements Placed Adjacent to Existing Roadways

When new pavements are placed adjacent to existing roadways, the existing roadways shall be profile milled and surface wedged to create a uniform crown across the existing roadway and the newly constructed pavement.

Section 201 – Utility Locations

Section 201.1 – Locations

Utility infrastructure serving proposed developments shall be installed in the following locations:

- A. Sanitary – Sanitary infrastructure shall be installed in the roadway, generally in the center of a lane to avoid being located in the tire path and to allow for the maintenance of a travel lane while the sewer is being serviced.
- B. Water – Water infrastructure shall be installed within the road right-of-way, beneath the curb side of the sidewalks. Curb stops are to be located within 1-foot of the back of the sidewalk.
- C. Storm – Stormwater infrastructure shall be located within the road right-of-way such that required minimum distances to water infrastructure can be maintained.

- D. Natural Gas – natural gas infrastructure shall be installed within the road right-of-way, beneath the sidewalk and on the opposite side of the roadway as the water infrastructure.
- E. Electric – electric infrastructure shall be installed within utility easements in rear yards. All electric infrastructure in new developments shall be buried.
- F. Telephone/Cable Television – telephone and cable television infrastructure shall be installed in utility easements in rear yards. All telephone and cable television infrastructure in new developments shall be buried.

Section 202 – Pavements

Section 202.1 – Hot Mix Asphalt, HMA

HMA pavements shall be prepared and installed in accordance with Section 402 of the Indiana Department of Transportation Standard Specifications. Job Mix Formulas (JMF) shall be submitted to the Director of Public works or Town Engineer for approval prior to placing any HMA pavements. Mixture types for local streets and trails shall be a minimum of Type B. Mixture types for collector and arterial streets shall be a minimum of Type C. HMA pavement shall be constructed on prepared subgrade and base course. Compacted subbase shall be proof rolled as directed by the Director of Public Works or Town Engineer prior to the placement of HMA pavement. Field compaction testing may be required prior to and after construction at the option of the Director of Public Works or the Town Engineer.

Section 202.2 - Aggregate Base Course

Aggregate base course shall be installed in accordance with Section 301 of the Indiana Department of Transportation Standard Specification. Thickness shall be as detailed in Lowell's Standard Details.

Aggregate base course shall extend beneath all curbs and gutters.

Section 202.3 - Tack Coat

Tack coat shall be in accordance with Section 406 the Indiana Department of Transportation Standard Specifications. Tack coat shall be applied between all layers of HMA and on roadways being surfaced with new HMA.

Section 202.4 - Subgrade

Subgrade shall be prepared in accordance with Section 201 of the Indiana Department of Transportation Standard Specifications. The subgrade preparation method shall be determined by an approved Geotechnical Engineer through field and laboratory sampling and testing. Recommendations shall be recorded in the Geotechnical Report. The subgrade preparation method shall be approved by the Director of Public Works or Town Engineer prior to placing subbase materials. Subgrades shall be proof rolled prior to placement of subbase materials.

Section 202.5 - Geotextile Pavement Fabric

A geotextile fabric barrier shall be placed between the subgrade and subbase to prevent the migration of subgrade materials into subbase materials.

Section 203 - Concrete Curb, Gutter, Median

Section 203.1 - Concrete Curb, Gutter, Median

Concrete curb, gutter and median shall be placed in accordance with Section 604 of the Indiana Department of Transportation Standard Specifications. They shall be built to the line, grade and sections shown on the plans and shall be of the type shown on the Lowell Standard Details.

The minimum longitudinal grade of any street gutter shall not be less than 0.5%.

Section 204 - Sidewalks

Section 204.1 - Sidewalks

Sidewalks and accessible curb ramps shall be placed in accordance with Section 604 of the Indiana Department of Transportation Standard Specifications and the Indiana Department of Transportation Standard Details. They shall be built to the line, grade and sections shown on the plans and shall be of the type shown on the Lowell Standard Details.

Section 205 – Drive Approaches

Section 205.1 – Construction

Drive approaches shall be placed in accordance with Section 502 of the Indiana Department of Transportation Standard Specifications. Approaches and sidewalks within the approach shall be a minimum of 6-inches thick and shall be reinforced with 6-inch x 6-inch welded wire fabric. Approaches shall be placed on subgrade treatment Type IIIA (6-inches of coarse aggregate #53).

Approaches shall not be constructed integral with curb to allow for future reconstructing without disturbing the curb. Backs of curbs may be professionally saw cut, if necessary, to allow for a smoother transition with the drive provided that a minimum curb height of 1.5 inches remains.

Section 206 – Street Signs

Section 206.1 – Street Signs

Street signs and supports shall be designed in accordance with Section 802 of the Indiana Department of Transportation Standard Specifications, the Indiana Department of Transportation Standard Details and the Indiana Manual of Uniform Traffic Control Devices. They shall be placed by the Lowell Public Works Department as indicated on the approved plans. The Developer shall assume all costs for the street sign materials.

Section 207 – Pavement Markings

Section 207.1 – Pavement Markings

Pavement markings shall be installed in accordance with Section 808 of the Indiana Department of Transportation Standard Specifications, the Indiana Department of Transportation Standard Details and the Indiana Manual of Uniform Traffic Control Devices. They shall be placed as indicated on the approved plans.

Section 208 – Underdrain

Section 208.1 – Underdrain

Underdrain shall be installed in accordance with Section 808 of the Indiana Department of Transportation Standard Specifications. It shall be installed at least 40 feet on each side of sag inlets and shall be built to the line, grade and sections shown on the plans and shall be of the type shown on the Lowell Standard Details.

Section 209 – Streetlights

Section 209.1 – General Requirements

All developments which include the installation of new streets or the substantial improvement of existing streets shall provide a street lighting system. All electric lines providing service to the lighting system shall be located underground. The proposed street lighting system shall be provided as part of the overall engineering approval for the project.

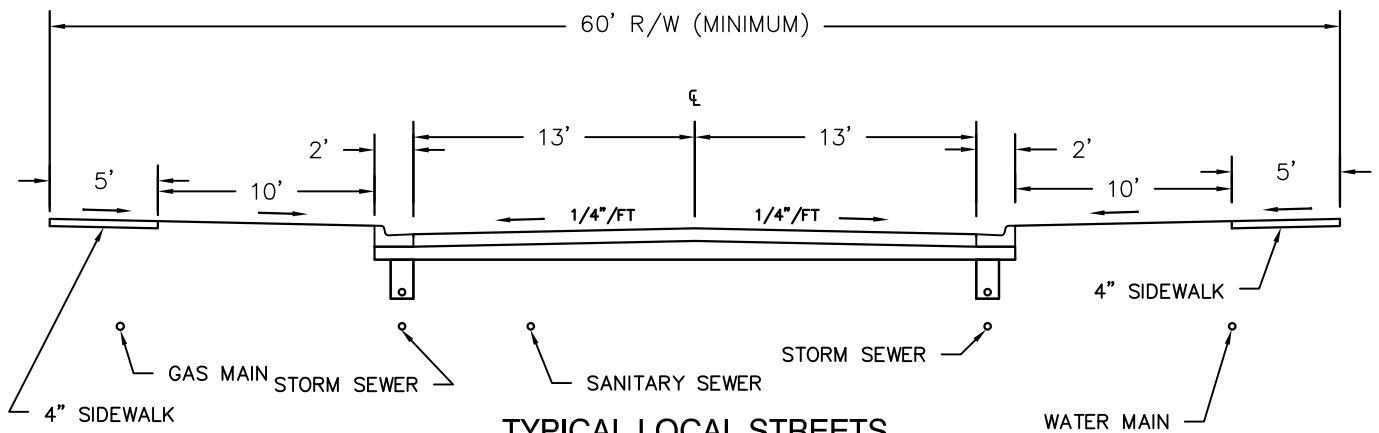
Section 209.2 - Location

Street lighting shall be provided at all street intersections; near or at the end of all dead end or cul-de-sac locations in excess of 200 feet; at the approximated midpoint of street segments in between intersections in excess of 500 feet; and/or other locations directed by the Director of Public Works or Town Engineer.

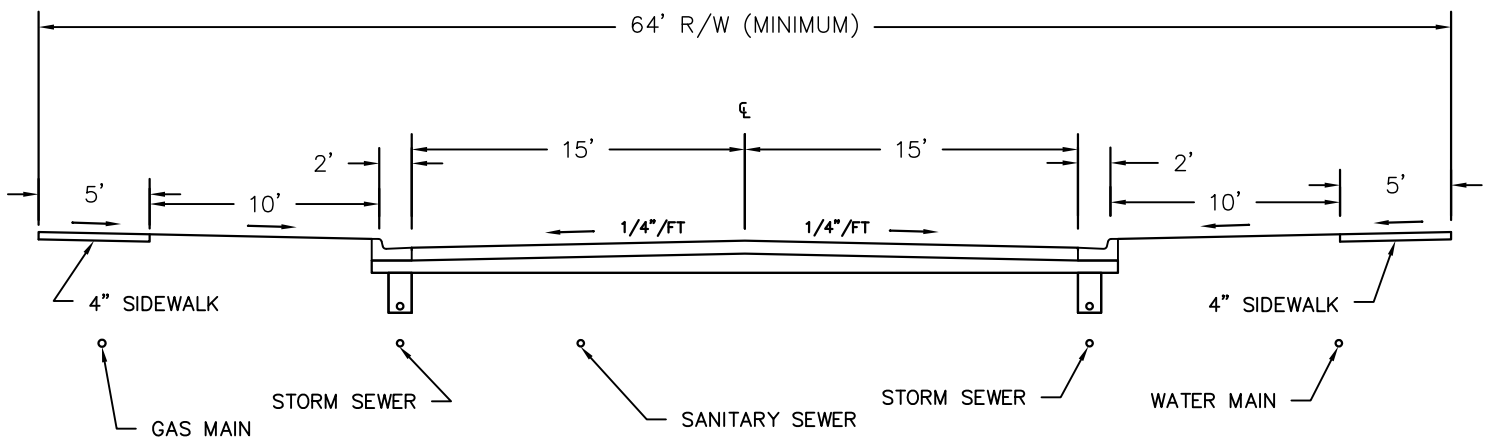
Section 209.3 – Streetlight Systems

Standard streetlight systems are those systems installed, owned and maintained by NIPSCO. Developers shall reimburse the Town for two years of annual lighting electric and maintenance costs.

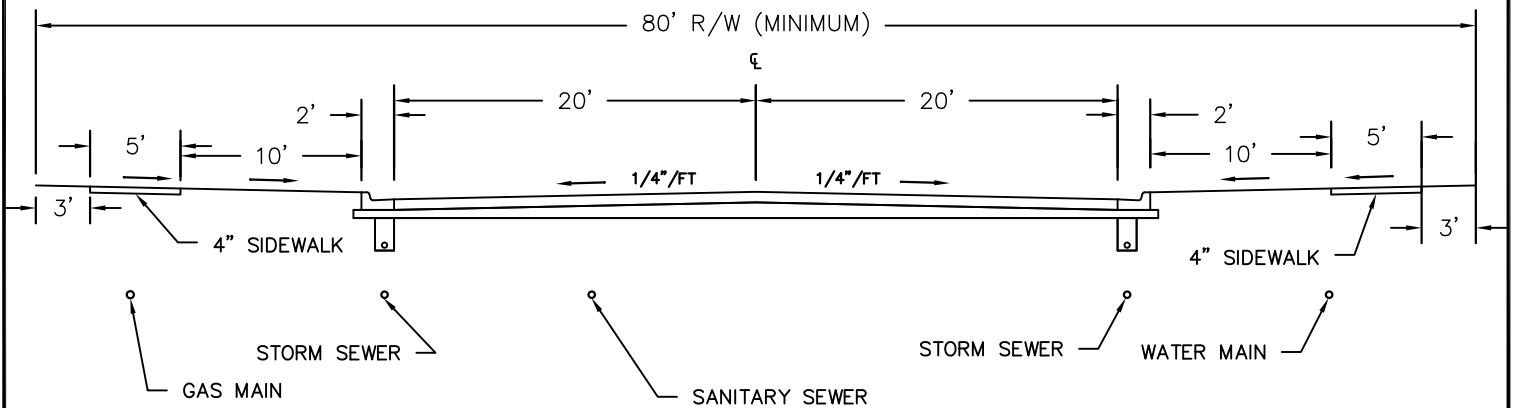
Non-standard streetlight systems are systems installed by the developer, but owned and maintained by the Town of Lowell. These systems may be utilized upon prior approval of the Director of Public Works and the Plan Commission. Developers shall reimburse the Town for two years of annual lighting electric costs.



TYPICAL LOCAL STREETS



TYPICAL COLLECTOR STREETS



TYPICAL ARTERIAL STREETS

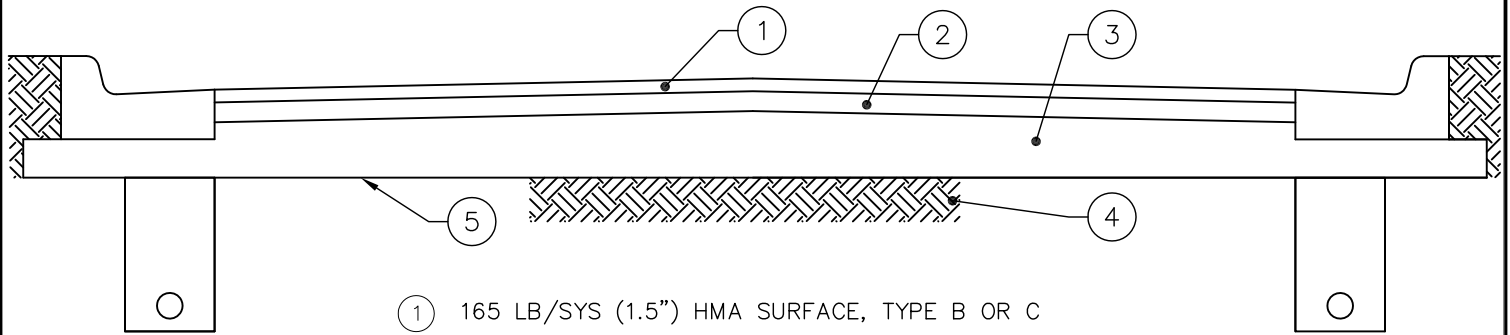
**STANDARD DETAILS
ROADWAY**



DATE:
01/01/15

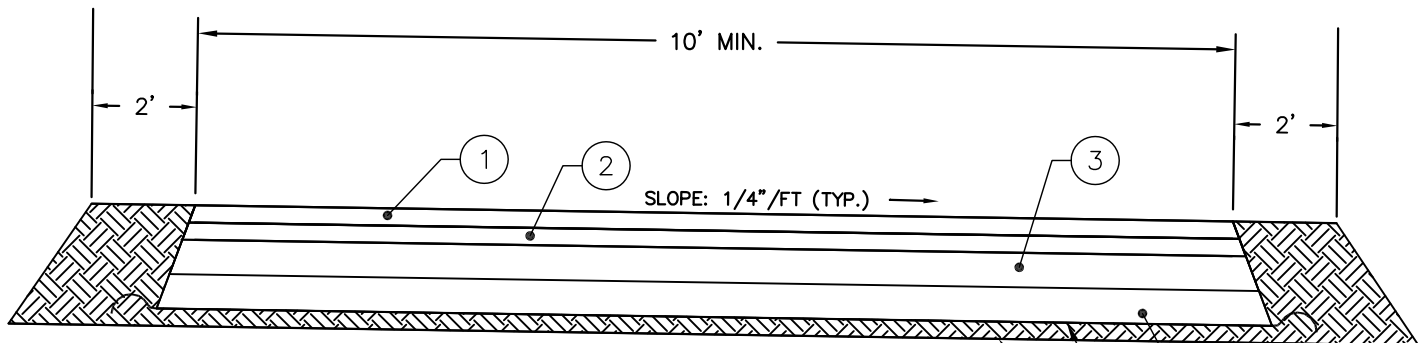
Plate No.

200 - 1



- ① 165 LB/SYS (1.5") HMA SURFACE, TYPE B OR C
- ② 275 LB/SYS (2.5") HMA INTERMEDIATE, TYPE B OR C
- ③ 12" COMPACTED AGGREGATE NO. 53, BASE
- ④ SUBGRADE TREATMENT TYPE AS SPECIFIED BY GEOTECHNICAL ENGINEER
- ⑤ GEOTEXTILE FABRIC

LOCAL, FRONTAGE, ARTERIAL, AND COLLECTOR STREETS



- ① 165 LB/SYS (1.5") HMA SURFACE, TYPE A
- ② 220 LB/SYS (2.0") HMA INTERMEDIATE, TYPE A
- ③ 6" COMPACTED AGGREGATE NO. 53, BASE
- ④ SUBGRADE TREATMENT (6" COARSE AGGREGATE NO. 53)
- ⑤ GEOTEXTILE FABRIC
- ⑥ PREPARED SUBGRADE

TRAIL SECTION

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 200 OF THE TOWN OF LOWELL ROADWAY STANDARDS AND MUNICIPAL CODE.

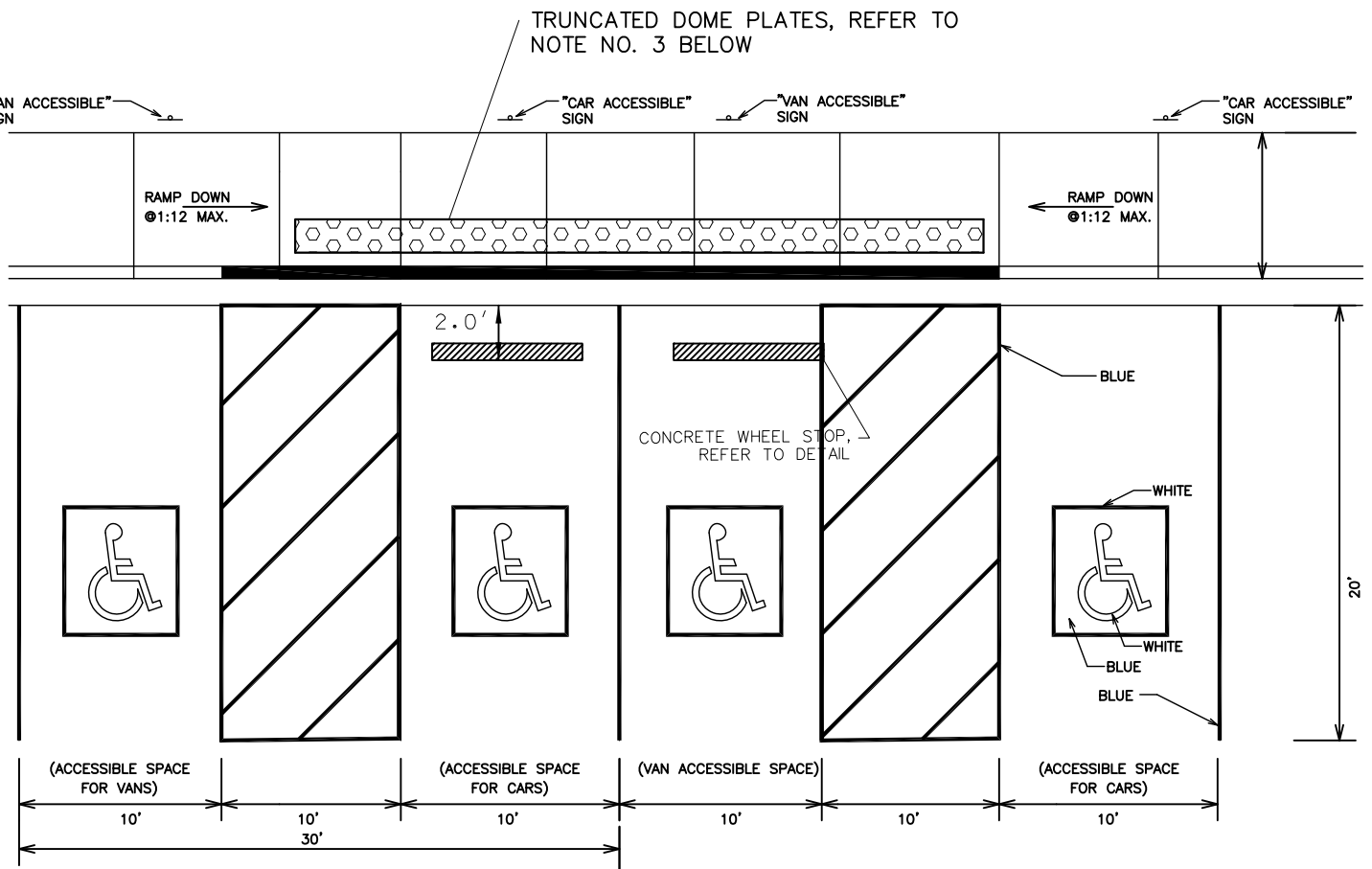
STANDARD DETAILS PAVEMENT CONSTRUCTION



DATE:
01/01/15

Plate No.

200 - 2



1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 200 OF THE TOWN OF LOWELL ROADWAY STANDARDS AND MUNICIPAL CODE.
2. 24" X 24" CAST IRON TRUNCATED DOME PLATES BY EAST JORDAN IRON WORKS (EJIW) WITH RED FINISH. PROVIDE ALL MATERIALS NECESSARY TO INSTALL PER MANUFACTURER'S SPECIFICATIONS. CONTACT EJIW AT 301 SPRING STREET, EAST JORDAN, MICHIGAN 49727, PHONE 1-800-626-4653.

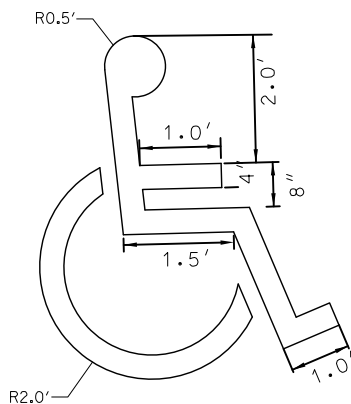
STANDARD DETAILS ADA PARKING STALLS



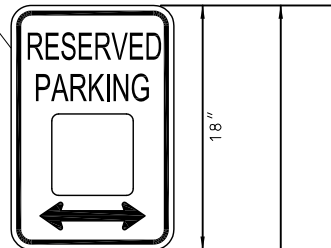
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Plate No.

200 - 4



STANDARD "HANDICAPPED PARKING" SIGN WITH SYMBOL. BOLT TO STEEL TUBE WITH $\frac{3}{8}$ " CADMIUM PLATED BOLTS, NUTS, AND WASHERS.



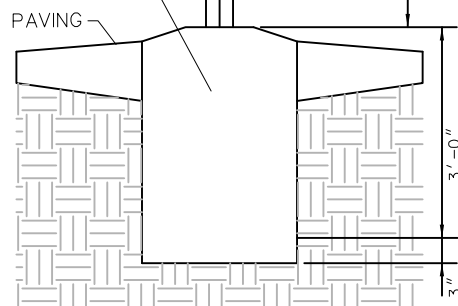
SIGNAGE STATING "VAN ACCESSIBLE", REFER TO HANDICAP PARKING DETAIL FOR DESIGNATED SPOTS, OTHERWISE NOT NECESSARY.



SIGNAGE STATING "\$XXX FINE", CHECK WITH MUNICIPALITY TO VERIFY FINE AMOUNTS.



1'-6" DIA. CONCRETE BASE



1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 200 OF THE TOWN OF LOWELL ROADWAY STANDARDS AND MUNICIPAL CODE.

STANDARD DETAILS ADA SIGNAGE AND MARKINGS



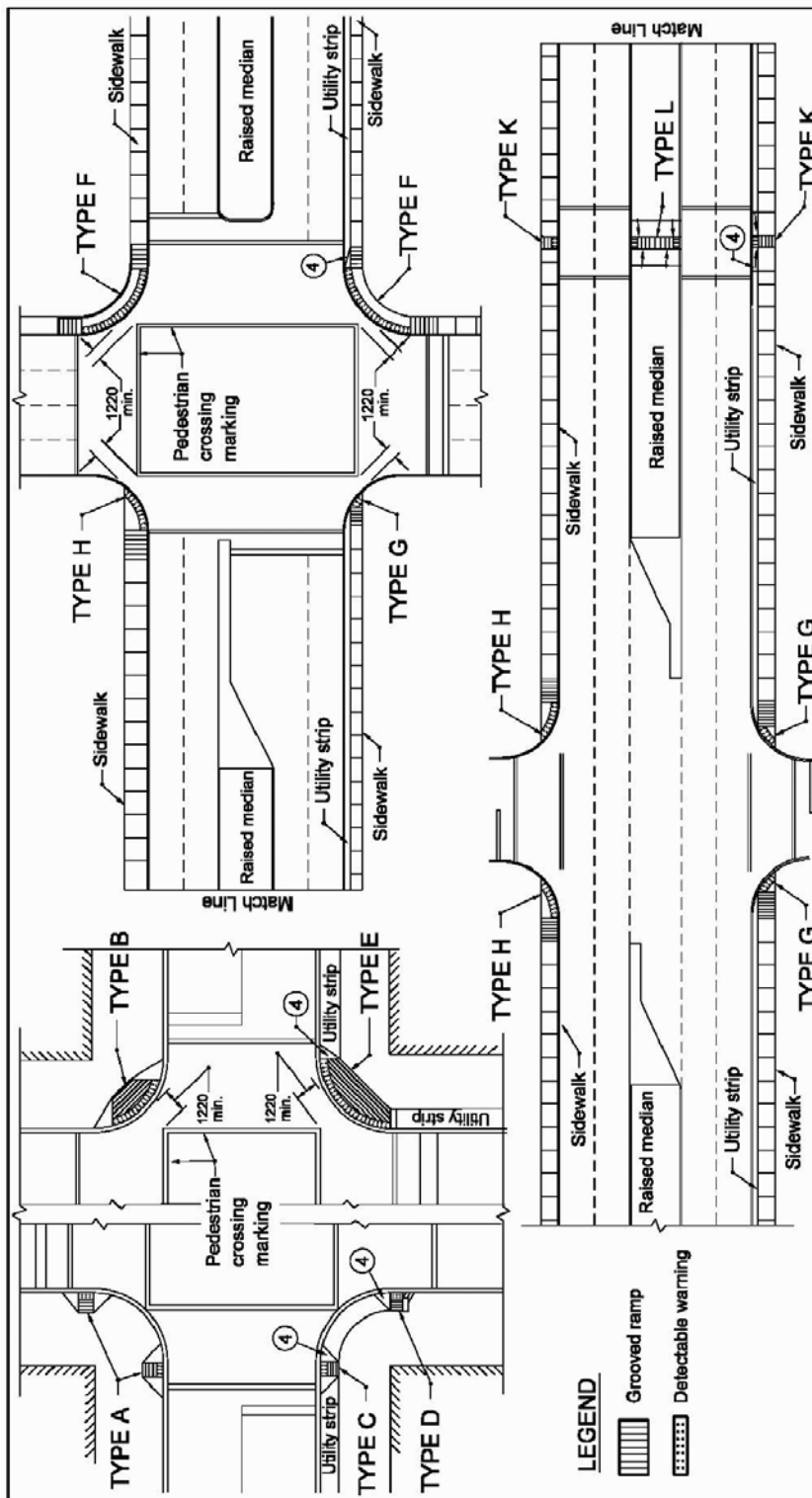
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200 - 5

STANDARD DETAILS ADA CURB RAMP TYPES

Page 11



1. The curb ramp type includes the ramp and flared sides as indicated on the details. A level landing shall be provided at the high end of every curb ramp.
2. For details of sidewalk curb ramp types see Standard Drawings 604-SWCR-03 to -11.
3. The curb ramps shall be placed within the marked crosswalk area.

4. Flared side of sidewalk curb ramp next to utility strip shall be sodded.
5. See Standard Drawing 604-SWCR-02 for General Notes.

INDIANA DEPARTMENT OF TRANSPORTATION
All Dimensions are in millimeters otherwise specified

LOCATION PLAN FOR
SIDEWALK CURB RAMPS
SEPTEMBER 2005

STANDARD DRAWING NO. 604-SWCR-01

NO. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

DATE 9-05-05
DATE 9-05-05

DESIGNER: J. L. VANCE
CHECKER: J. L. VANCE
DATE 9-05-05

Division 300
SANITARY SEWER
CONSTRUCTION STANDARDS

Section 300 – General

Section 300.1 – General

All developments, regardless of size within the corporate limits or otherwise within the jurisdiction of the Town, shall include provisions for the construction of sanitary sewerage facilities, designed in accordance with the latest revision of the Indiana Administrative Code 327 IAC 3. This rule includes minimum administrative requirements for obtaining a construction permit as well as technical standards for the design and installation of sanitary sewers.

Sanitary sewers shall be constructed throughout a development allowing for the extension of the Town sewer system to adjacent areas. Sanitary sewers must be extended across the frontage of the lot or parcel being serviced.

The design of all sanitary sewerage facilities proposed for construction or reconstruction as independent projects under Town jurisdiction shall also meet the technical requirements of this section.

The Service Area shall include the entire area proposed to be ultimately served by all or a portion of the sanitary sewer system submitted for approval.

Section 300.2 – Specifications

These specifications cover pipe for sanitary sewer mains and sanitary sewer service connections, sewer fittings, manholes and all appurtenances normally used for sanitary sewer collection systems. Special considerations will be covered in the detailed plans and special provisions covering the proposed construction. Shop drawings and material submittals shall be submitted to the Lowell Director of Public Works for review and approval prior to their installation.

Section 300.3 – Reference Standards

Additional rules and regulations governing sanitary sewer construction in the Town of Lowell are:

- A. The restrictions, policies, and instructions that may be adopted or issued from time to time by the Town of Lowell;
- B. 327 IAC 3-6: Technical Standards for Sanitary Collection Systems
- C. The Indiana Department of Environmental Management (IDEM); and
- D. Great Lakes – Upper Mississippi River Recommended Standards for Wastewater Facilities (Ten States Standards).

Section 301 – Sanitary Sewers

Section 301.1 – Sanitary Sewers

All sanitary sewage consisting of domestic and other water-borne wastes shall be collected and conveyed in a sanitary sewer pipe system to a point of discharge into an existing sanitary sewer system. No sanitary sewage shall be allowed to enter any storm sewer system or discharged onto the ground or into receiving streams without first being treated.

Section 301.2 – Footing Tiles

Footing tiles, perimeter tiles, downspouts, roof drains, or any other pipes, which drain groundwater, subsurface water, or surface runoff water shall not be connected to the sanitary sewer system.

Section 301.3 – Pipe Materials

All sanitary sewer pipe materials and sewer service lines shall conform to the latest applicable ASTM, ASA, AWWA, AASHTO, or other nationally accepted standards. Only the following sanitary sewer pipe and joint materials are approved for use in the Town of Lowell. Unless otherwise authorized by the Director of Public Works or the Town Engineer, sanitary sewer pipe and fittings shall be PVC, with a standard dimension ratio (SDR) appropriate for the pipe application. All fittings shall be SDR 26.

Sanitary sewer pipe and the joint specification required for the various types of pipe shall be as follows:

<u>Pipe</u>	<u>Pipe Material</u>	<u>Joint</u>
Ductile Iron Pipe	ASA A-21.52 CL52	ASA A-21.11
PVC SDR	ASTM D-3034	ASTM D-3212 (GASKET)
Reinforced Concrete Pipe	ASTM C-76	ASTM C-443 (O-RING)

Minimum size for sanitary sewer mains shall be eight inches and sanitary service laterals shall be six inches.

Section 301.4 – Design Flows

Flow rate requirements for sanitary collection systems shall be determined in accordance with 327 IAC 3-6-11.

Section 301.5 – Slope Requirements

Sanitary sewers shall be installed with pipe slopes in accordance with 327 IAC 3-6-12. Flowing-full velocities shall not be less than two feet per second. Where velocities greater than ten feet per second will occur in a sanitary sewer flowing full, special provisions shall be taken to prevent erosion or displacement of the pipe. Oversized gravity sewers shall not be utilized to justify using decreased slopes.

Minimum Slopes	
Sewer Size (Inches)	Minimum Slope (Percent)
6	1.00
8	0.40
10	0.28
12	0.22
14	0.17
15	0.15
16	0.14
18	0.12
21	0.10
24	0.08

Section 301.6 – Protection of Water Mains

Sanitary sewers shall not be located within ten feet of any existing or proposed water mains, when measured horizontally from the outside edge of the sanitary sewer to the outside edge of any existing or proposed water mains unless:

1. The sanitary sewer and water main crossing is separated by a minimum of 18 inches measured vertically from the outside edge of the sanitary sewer and the outside edge of the water main.
2. The crossing must be at a minimum angle of 45 degrees measured from the centerlines of the pipes.
3. The conditions specified in paragraphs 1 and 2 above must be maintained for a minimum distance of 10 feet from either side of the sanitary sewer.

Shorter separation distances are permitted provided the sewer is installed in accordance with 327 IAC 6-9(b). No sanitary sewer manhole shall be within eight feet from the edge of a sanitary manhole.

Section 301.7– Sewer Location

All sanitary sewers shall be located in the roadway or in easements as approved by the Director of Public Works or the Town Engineer. Care should be taken to place manholes in locations to avoid the travel way of vehicle tires. In no circumstance will sanitary sewer construction be allowed in rear yards.

Section 301.8 – Sewer Size Changes

Under normal conditions, the slopes, for all sanitary sewers of equal size connected at manholes, shall be matched through the manholes. When sanitary sewers of different diameters join, the invert of the larger pipe shall be lowered to maintain the same energy gradient as the smaller pipe.

Section 302 – Sanitary Sewer Service Line

Section 302.1 – Sanitary Sewer Service Line

A sanitary sewer service line, for the purposes of these standards, is defined as a sewer pipe designed to receive flow from a single building, extending from the sewer main to the building.

Section 302.2 – Minimum Diameter/Material

Minimum diameter of a sanitary sewer service line is six inches. If the sanitary service line is larger than six-inch diameter, a manhole shall be constructed at the point of its connection with the sanitary sewer main or lateral.

Sanitary sewer service pipe material shall conform to Section 301.3 Pipe Materials.

Section 302.3 – Sanitary Sewer Service Lines Design Standards

Capacity requirements and design details for sanitary sewers shall apply to sanitary sewer service lines, except the minimum slope shall be 1/8-inch per foot or one percent (1%).

Section 302.4 – Plugs

In those instances when the service line is not immediately connected to the building to be serviced, it shall be tight plugged using a manufactured plug to hold it firmly in place and protect it from leaking and blow-off during leakage testing.

Section 302.5 – Sanitary Sewer Service Line Connections

Sanitary sewer services shall be extended to the property line or building. Ridge sleeve risers or deep socket adapters shall be required for services where sewers are over 12 feet deep.

When Sanitary Sewer Service Lines are constructed as part of the same project as the sewer main, they shall be connected to the sewer main or lateral using a wye or tee-wye. Where a Sanitary Sewer Service Line is to connect to an existing sewer main, or where specific approval has been granted by the Director of Public Works or the Town Engineer for the construction of a service line after the completion of the sewer main, the connection shall be made by one of the methods detailed below:

- A. Installation of a manhole.
- B. Circular saw-cut of sewer main by proper tools, and proper installation of a hub wye or tee saddle, or an insertion tee in accordance with manufacturer's recommendations.
- C. Using pipe cutter, neatly and accurately cut out desired length of pipe for insertion of proper fittings. Use "Band-Seal" couplings, or similar couplings, and shear rings and clamps to fasten the inserted fitting and hold it firmly in place. Follow manufacturer's recommendations for the installation. Cement joints are prohibited.

The locations of sanitary sewer service lines shall be permanently stamped on the curb with an "S" and temporarily marked at the lot line with a wooden 2 x 2 or metal pipe. A magnetic locating tape or trace wire shall be installed prior to backfilling.

A six inch diameter clean out shall be installed within five feet of the building foundation.

Sanitary sewer service lines shall be in conformance with Lowell's Standard Drawings.

Section 302.6 – Private Lift Systems

In those instances when the building service line is too low to permit gravity flow to the public sewer, sanitary sewage shall be lifted by an approved artificial means and discharged to the public sewer. Such device shall be the sole responsibility of the property owner. No water operated sewage injector shall be used.

Section 302.7 – Proximity Bearing Walls

Whenever possible, the building sewer shall be brought to the building at an elevation below the basement floor. No building sewer shall be laid parallel to or within three feet of any bearing wall which might thereby be weakened.

Section 303– Sewers In Relation to Streams

Section 303.1 – Location of Sewers on Streams

- A. Cover Depth: The top of all sewers entering or crossing streams shall be at a sufficient depth below the natural bottom of the stream bed to protect the sewer line. In general, the following cover requirements must be met:
1. One foot of cover is required where the sewer is located in rock.
 2. Three feet of cover is required in other material. In major streams more than three feet of cover may be required.
 3. In paved stream channels, the top of the sewer line should be placed below the bottom of the channel pavement.

Note: Less cover will be approved only if the proposed sewer crossing will not interfere with the future improvements to the channel stream.

- B. Horizontal Location: Sewers located along streams shall be located outside of the stream bed and sufficiently removed from there to provide for future possible stream widening and to prevent pollution by siltation during construction.
- E. Structures: The Sewer outfalls, headwalls, manholes, gate boxes, or other structures shall be located so they do not interfere with the free discharge of flood flows of the stream.
- F. Alignment: Sewers crossing streams should be designed to cross the stream as nearly perpendicular to the stream flow as possible and shall be designed without change in grade. Sewer systems shall be designed to minimize the number of stream crossings.

Section 303.2 – Construction Requirements

- A. Materials and Backfill: Sewers entering or crossing streams shall be constructed of ductile iron pipe with mechanical joints; otherwise they shall be constructed so they will remain watertight and free from changes in alignment and grade.

The backfill used in the trench shall be coarse aggregate, gravel, or other materials which will not cause siltation, pipe damage during placement or chemical corrosion in place.

- B. Siltation and Erosion: Construction methods that will minimize siltation, erosion and sediment shall be employed. The design engineer shall include in the project specifications the methods and practices to be employed in the construction of sewers in or near streams or provide adequate control of siltation, erosion and sediment in accordance with the Town of Lowell Erosion and Sediment Control Ordinance, Lake County Soil Conservation Service and IDEM requirements, Section 915.0 – Erosion and Sediment Control. IDEM Rule 13, Notice of Intent (NOI) in particular shall be adhered to.

303.3 – Aerial Crossings

- A. Structural Support: Support for all joints shall be provided in pipes utilized in aerial crossings. The supports shall be designed to prevent frost heave, overturning and settlement.
- B. Freeze and Expansion Protection: Protection against freezing shall be provided. This may be accomplished through the use of insulation and increased slope expansion jointing shall be provided between the aerial and buried sections of the sewer line.
- C. Flood Clearance: For aerial stream crossings the impact of floodwaters and debris shall be considered. The bottom of the pipe should be placed no lower than the elevation of the 100-year flood.

303.4 – Inverted Siphons

Inverted siphons shall have not less than two barrels with a minimum pipe size of six inches and shall be provided with the necessary appurtenances for convenient flushing and maintenance; the inlet and outlet structures shall have adequate clearance for cleaning; and in general, sufficient head shall be provided and pipe sizes selected to secure velocities at least three feet per second for average flows. The inlet and outlet structures shall be designed so that normal flow is diverted to one barrel so that either barrel may be taken out of service for cleaning.

Section 304– Sanitary Sewer Installation

Section 304.1 – Handling of Pipe

Sanitary sewer pipe shall be handled in a manner that will prevent damage. Damaged or defective material on the job site shall be rejected and replaced to the satisfaction of the Director of Public Works or Town Engineer. Methods of construction conducive to the damage of sewer pipe shall be avoided and corrected when called to the attention of the contractor. All pipe and fittings shall be examined by the contractor above grade before placement in the trench.

Section 304.2 – Depth of Pipe Cover

All pipe shall be laid to a radial minimum depth of five feet measured from the existing or proposed ground surface to the outer edge of the pipe barrel unless specifically allowed otherwise, in special circumstances by the Director of Public Works or the Town Engineer.

Section 304.3 – Laying of Pipe

Sanitary sewer pipe shall be installed in accordance with ASTM D2321 and laid true to line and grade. Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during

handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned, and re-laid.

At times when pipe laying is not in progress, the open end of the pipe shall be closed with a watertight plug or by other means approved by the Director of Public Works or Town Engineer to ensure absolute cleanliness inside the pipe.

Section 304.4 – Laying of Pipe Curves

The curvature of sanitary sewers is not allowed unless, in the opinion of the Director of Public Works or Town Engineer, special circumstances dictate otherwise. Pipe required to be laid on curved alignment shall be joined in straight alignment and then deflected, joint by joint. Special care shall be taken in blocking the pipe and in no case shall the degree of deflection exceed manufacturer's recommendations for the respective pipe size, material and barrel length.

Section 304.5 – Dewatering

Prior to pipe laying and jointing, the trench shall be de-watered sufficient to maintain the water level in the trench at or below the base of the bedding.

Section 304.6 – Pipe Bedding and Backfilling

Sanitary sewers and service lines shall be bedded and backfilled with INDOT #8 crushed stone a minimum of four inches below the sewer to a minimum of 12 inches above the sewer. For sanitary sewers less than five feet deep, the entire trench shall be backfilled to the pavement subgrade with crushed stone. For sanitary sewers greater than five feet deep, structural backfill, Type 1, meeting Section 211.04 (1) may be placed. Bedding and Backfilling shall be in conformance with the Lowell Standard Drawings.

Section 305 – Sanitary Manholes

Section 305.1 – Sanitary Manholes

Manholes shall be constructed in accordance with 327 IAC 3-6-16 and ASTM C-478. Manholes shall be provided at the junction of two or more sanitary sewer pipes, all changes in grade, size or alignment. Separation between manholes shall not exceed 300 feet. Manholes shall have eccentric cones and be no less than 48 inches inside diameter and shall be constructed of pre-cast concrete units or a cast-in-place concrete. Openings shall be minimum of 22 inches in diameter. Inlet or outlets pipes shall be joined to the manhole with a gasketed, flexible and watertight connection.

All upstream sewers less than 24 inches from the manhole invert shall be filleted to prevent solids deposition. A flow channel shall be constructed through the bottom of the manhole to connect sewers entering and exiting. A bench shall be provided on each side of the flow channel. Inlets into manholes from sanitary force mains shall enter the manhole less than 24 inches above the invert of the flow channel.

All joints, risers and castings shall be sealed from the outside with a water-tight, shrinkable wrap. A maximum of three riser rings, totaling no greater than 12 inches is permitted.

Manholes shall be in conformance with Lowell's Standard Drawings.

Section 305.2 – Manhole Appurtenances

Manholes shall be furnished with a watertight frame and solid cover (Neenah Foundry, East Jordan Iron Works 1020 HD, or approved equal) with the words, "Sanitary Sewer" imprinted on the cover in raised letters. Both the manhole frame and cover shall have machined horizontal and vertical bearing surfaces. Manholes located in areas subject to inundation shall be furnished with waterproof, bolt-down frames and covers (Neenah Foundry, East Jordan Iron Works, or approved equal).

Pick holes shall not create openings in the manhole cover.

Manhole frames shall be adjusted to proper grade utilizing reinforced pre-cast concrete rings; brick or concrete blocks will not be allowed. Adjusting rings shall be securely sealed to the cone section or top barrel section of the manhole using resilient, flexible, non-hardening, pre-formed, bituminous rope mastic material. This mastic shall be applied in such a manner that no surface water inflow can enter the manhole through gaps between the top barrel section or cone section and the first adjusting ring, between adjusting rings, or between the last ring, adjusting ring and manhole frame. Up to twelve inches of adjusting rings may be installed on a given manhole; however, no more than three rings shall be used.

Rubber coated manhole steps on maximum of 16-inch centers shall be furnished with each manhole securely anchored in place true to vertical alignment, in accordance with the Lowell Standard.

Section 305.3 – Inspection Manholes

All industries and other establishments that are covered under the Town of Lowell Pre-Treatment Ordinance shall be required to construct an inspection manhole. The inspection manhole shall conform to the Town of Lowell Standard Detail.

Section 305.4 – Drop Manhole Assemblies

Drop pipes shall be provided for incoming sewers entering a manhole at an elevation greater than 24 inches above the manhole invert. Drop pipes for sewers 10 inches in diameter or less shall be placed inside the manhole and secured to the interior of the manhole. Drop pipes for sewers greater than 10 inches in diameter shall be placed outside the manhole and encased in concrete.

Section 306 – Acceptance of Sanitary Sewers and Manholes

Section 306.1 – Testing for Acceptance of Sanitary Sewers

A deflection test shall be performed on each flexible pipe following the 30 days after the placement of the backfill. No pipe shall exceed a deflection of 5% or greater. The diameter of the rigid ball or mandrel used for a deflection test shall be no less than 95% of the base inside diameter of the pipe being tested. The test shall not be performed with the aid of a mechanical pulling device.

All gravity sewer pipe shall be tested using one of the following leakage test types:

1. A hydrostatic test performed with a minimum of 2 feet of positive head. The rate of exfiltration or infiltration shall not exceed 200 gallons per inch of pipe diameter per linear mile per day.
2. An air test for plastic shall conform to ASTM F-1417-92, Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air.

Prior to acceptance, all sanitary sewers and manholes shall be thoroughly cleaned and televised. A digital video shall be submitted for the Town's review and approval together with "as-built" drawings.

Section 306.2 – Testing and Acceptance of Manholes

Manholes shall be inspected and tested for watertightness or damage. Manholes shall be air tested in accordance with ASTM C-1244 prior to being placed into service.

Section 306.3 – Test Results

If the sanitary sewer installation or manhole fails to meet the test requirements specified, the contractor shall determine the cause or causes of the defect and shall, at his own expense, repair or replace all materials and workmanship as may be necessary to comply with the test requirements.

Section 307 – Grease, Oil and Sand Interceptors

Section 307.1 – Grease, Oil and Sand Interceptors

Sand, oil and grease traps shall be required at any commercial or industrial facility likely to introduce sand or grease products into the sewer system. This includes all filling/gas stations, automotive repair garages, car washes, restaurants, and similar places that may have wash or grease racks connected with the sewer utility. These traps shall be sized and constructed in accordance with the Uniform Plumbing Code and presented to the Town's Building Official for review and approval prior to installation.

Section 308 – Sanitary Lift Stations

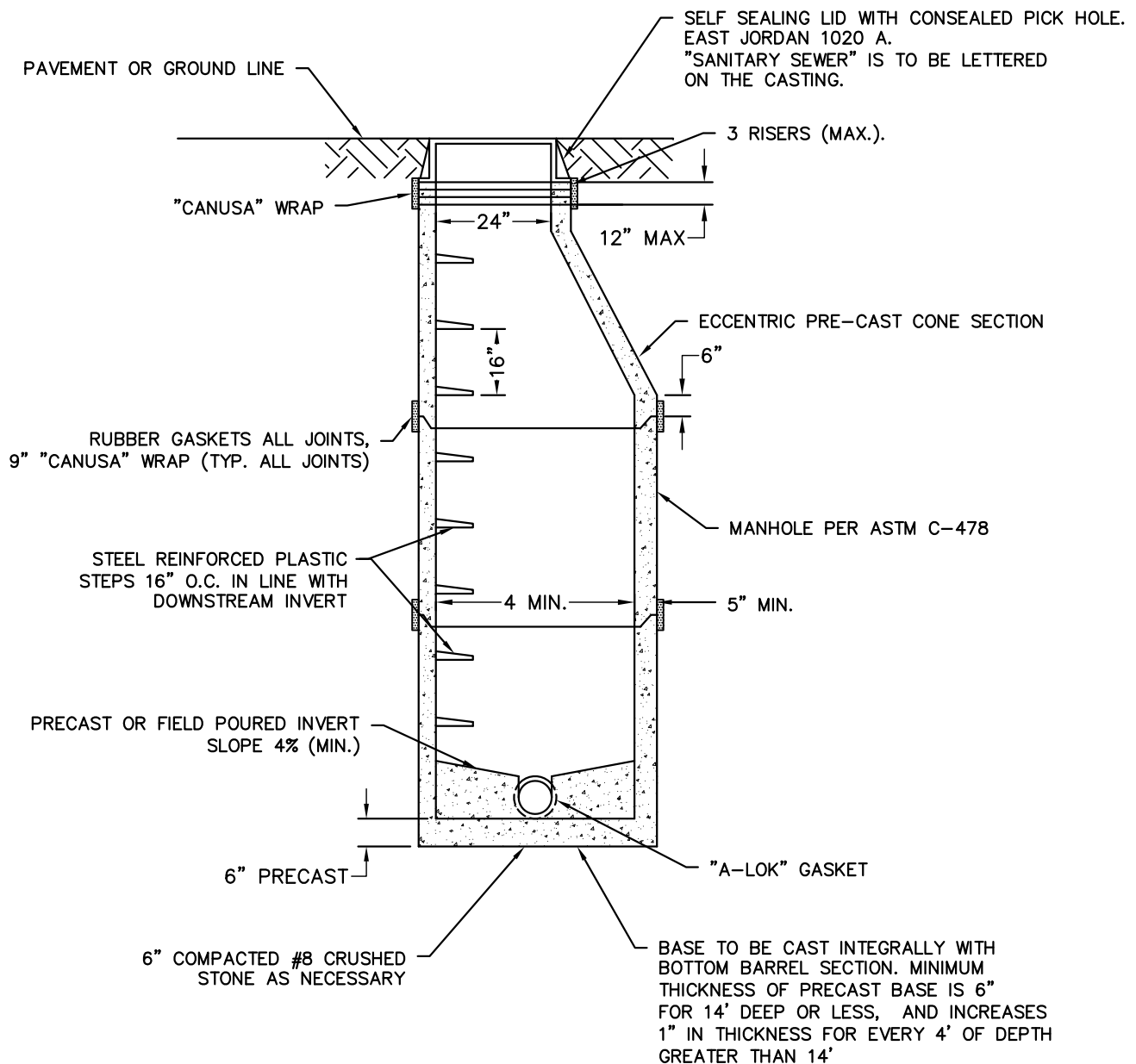
Section 308.1– General

All sewage pumping stations, or lift stations which are now or may in the future be connected to Town of Lowell collection and Treatment System must be approved by the State of Indiana Department of Environmental Management (IDEM) and further reviewed by the Town of Lowell Department of Public Works, approved and conforming to the following additional Minimum Standards as established by the Town of Lowell.

Sanitary Lift Stations shall be designed specifically for the area(s) intended to be served. Sanitary lift stations shall be designed in accordance with 327 IAC 3-6. Unless otherwise agreed upon, sanitary lift stations shall be designed, assembled and installed by developer/developments requiring the station at the sole cost of the developer/development. Sanitary lift stations being installed to serve a private development shall be owned, operated and maintained by the development. Sanitary lift stations installed to serve the public shall be owned, operated and maintained, after final inspection and startup, by the Town of Lowell.

The following requirements, at a minimum, shall apply to sanitary lift stations:

1. The station shall be a submersible type with a precast concrete wet well.
2. The station shall be accessed from a public roadway with a paved (asphalt/concrete) drive. The drive shall be arranged and constructed to permit access for large equipment utilized for maintenance.
3. The station shall be placed within a parcel or easement dedicated to the Town of Lowell. The site shall be at least 1,200 sft (30' x 40') and be fenced. The fenced area shall include a 12-foot vehicle gate. Vegetation shall be provided to properly screen the site.
4. The station shall be equipped with natural gas powered emergency generator with an automatic power transfer.
5. The station shall be equipped with multiple pumps.
6. The station shall be equipped with telemetry as directed by the Town of Lowell.
7. The station shall be located at least 2 feet above the Base Flood Elevation.
8. The station shall be equipped with a flow meter acceptable to the Town of Lowell.
9. Force mains shall be ductile iron.



1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 300 OF THE TOWN OF LOWELL SANITARY STANDARDS.

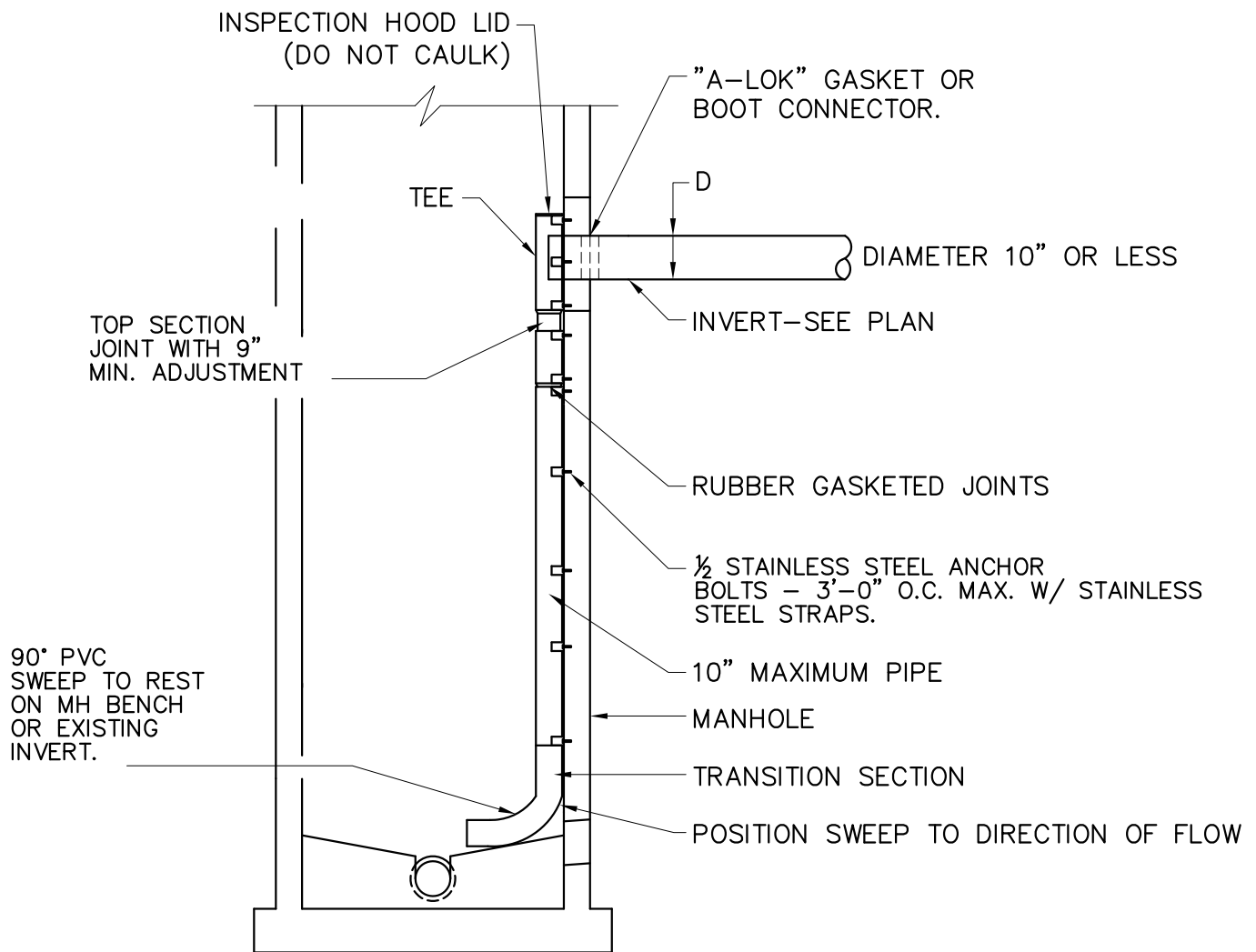
STANDARD DETAILS SANITARY MANHOLE



DATE:
01/01/15

Plate No.

300 - 1



NOTES:

DO NOT DRILL WITHIN 8" ABOVE OR BELOW THE MANHOLE JOINT.

LOW PROFILE INSIDE DROP SYSTEM TO BE INSTALLED PER
MANUFACTURER'S RECOMMENDATIONS.

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 300
OF THE TOWN OF LOWELL SANITARY STANDARDS.

STANDARD DETAILS
SANITARY DROP MANHOLE (INSIDE)

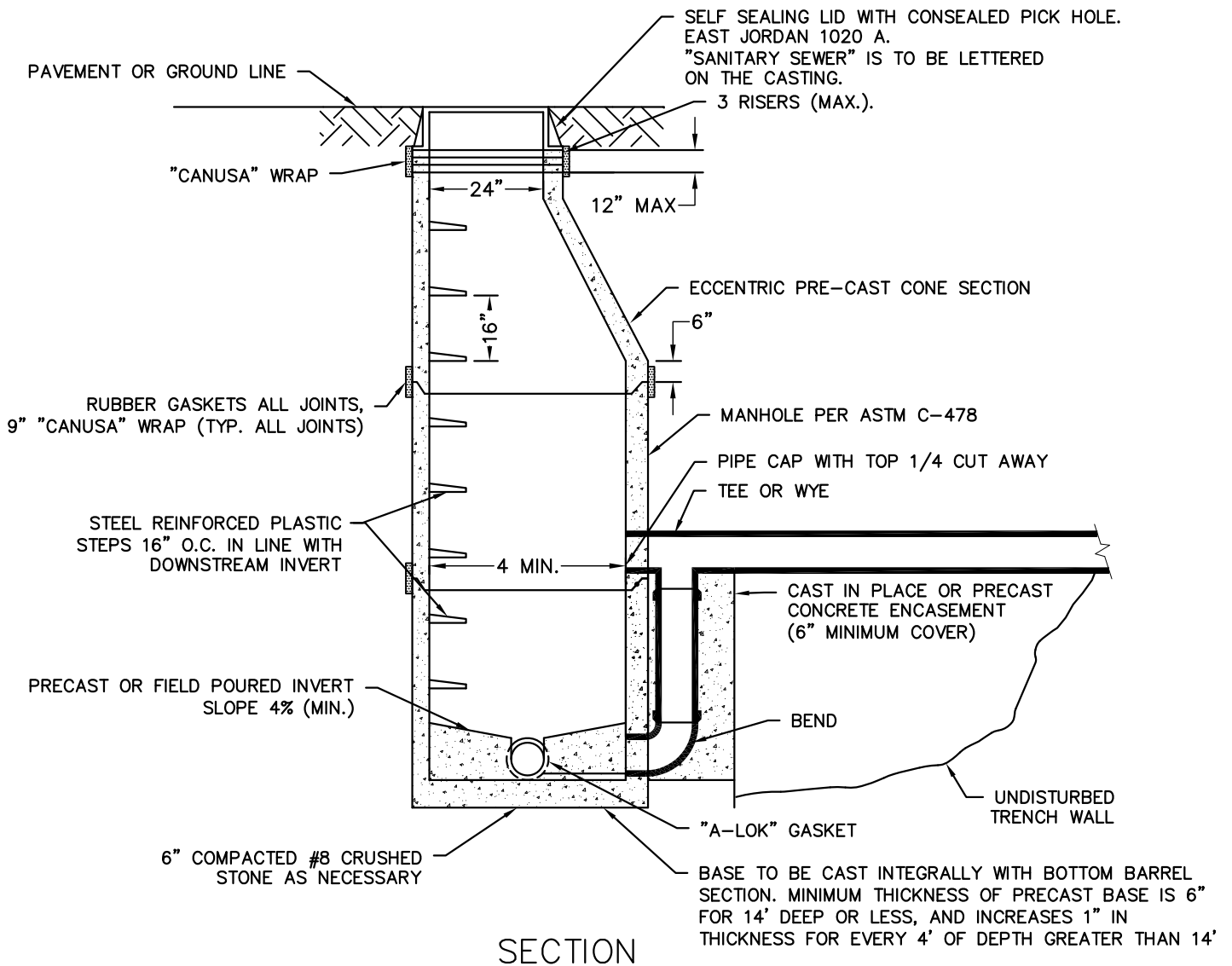
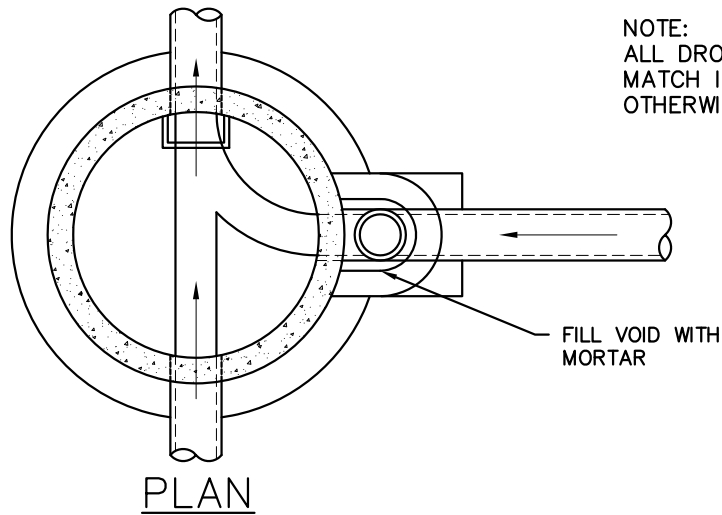


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01/01/15

Plate No.

300 - 2

NOTE:
ALL DROP SECTIONS SHALL
MATCH INCOMING PIPE SIZE UNLESS
OTHERWISE NOTED.



1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 300 OF THE TOWN OF LOWELL SANITARY STANDARDS.

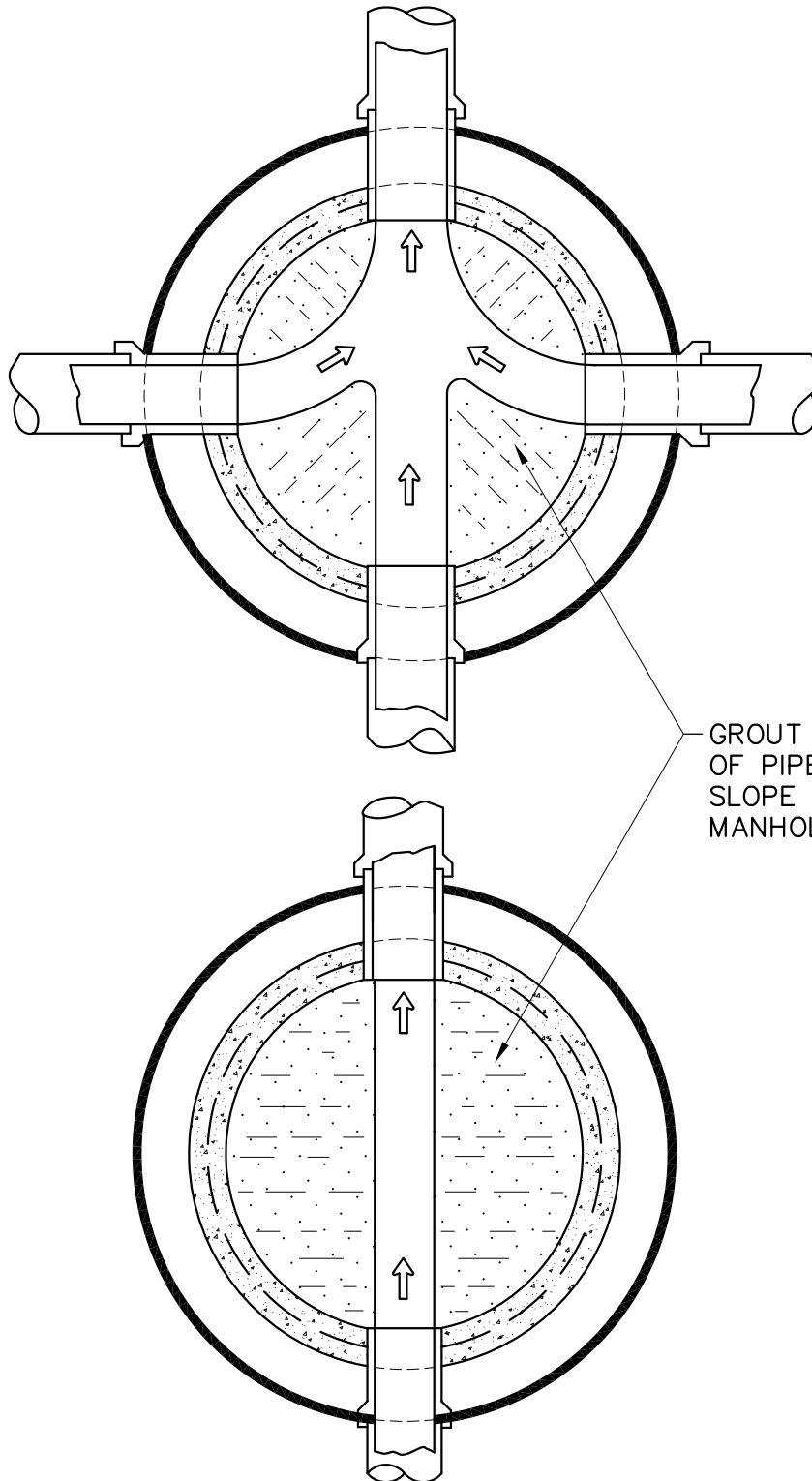
STANDARD DETAILS SANITARY DROP MANHOLE (OUTSIDE)



DATE:
01/01/15

Plate No.

300 - 3



GROUT BOTTOM CROWN
OF PIPE AND
SLOPE UP 4% TO
MANHOLE WALL

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 300 OF THE TOWN OF LOWELL SANITARY STANDARDS.

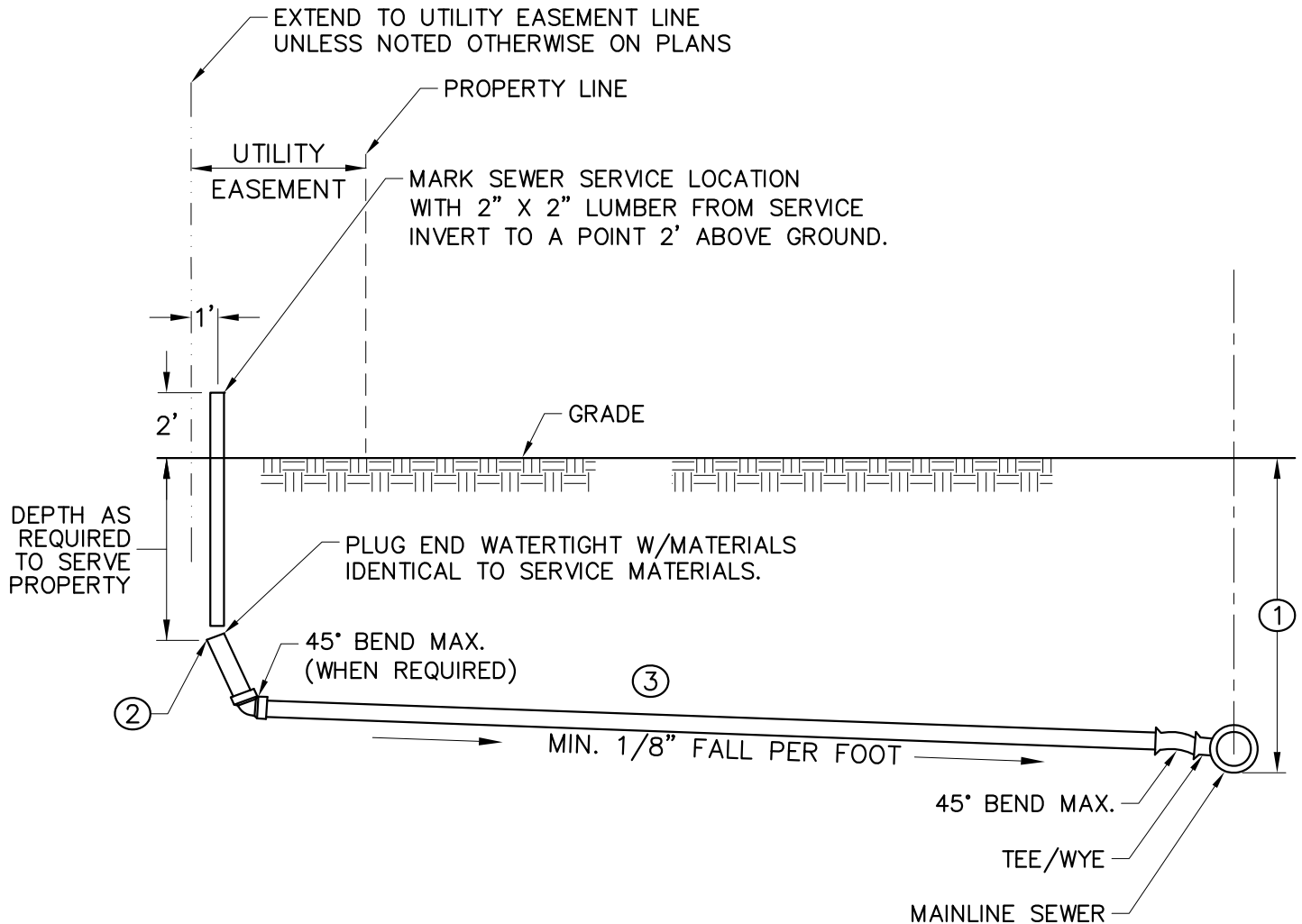
STANDARD DETAILS SANITARY TYPICAL INVERT DETAILS



DATE:
01/01/15

Plate No.

300 - 4



- ① WHERE SEWER DEPTH EXCEEDS 12 FEET, USE RISER DETAIL, UNLESS NOTED OTHERWISE ON PLANS.
- ② IF GROUND WATER IS PRESENT, CONTINUE PIPE UNTIL ABOVE WATER TABLE.
- ③ ALL SERVICE PIPE, BENDS, AND TEE/WYES SHALL BE SDR 26 PVC UNLESS OTHERWISE SPECIFIED.

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 300 OF THE TOWN OF LOWELL SANITARY STANDARDS.

STANDARD DETAILS SANITARY SERVICE CONNECTION

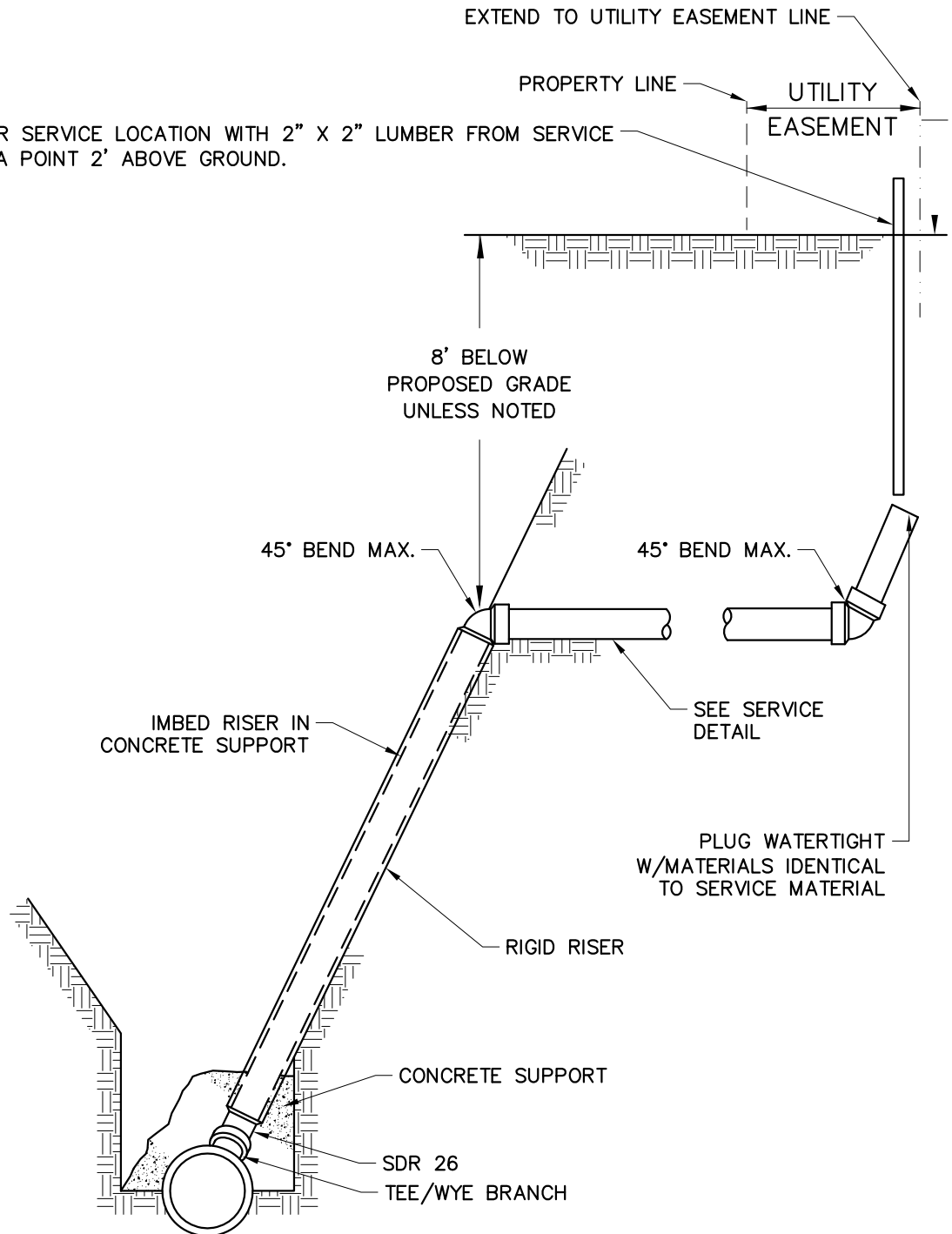


DATE:
01/01/15

Plate No.

300 - 5

MARK SEWER SERVICE LOCATION WITH 2" X 2" LUMBER FROM SERVICE
INVERT TO A POINT 2' ABOVE GROUND.



1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 300 OF THE TOWN OF LOWELL SANITARY STANDARDS.
2. DEEP SOCKET ADAPTERS MAY BE SUBSTITUTED IN LIEU OF RIGID RISER.

STANDARD DETAILS

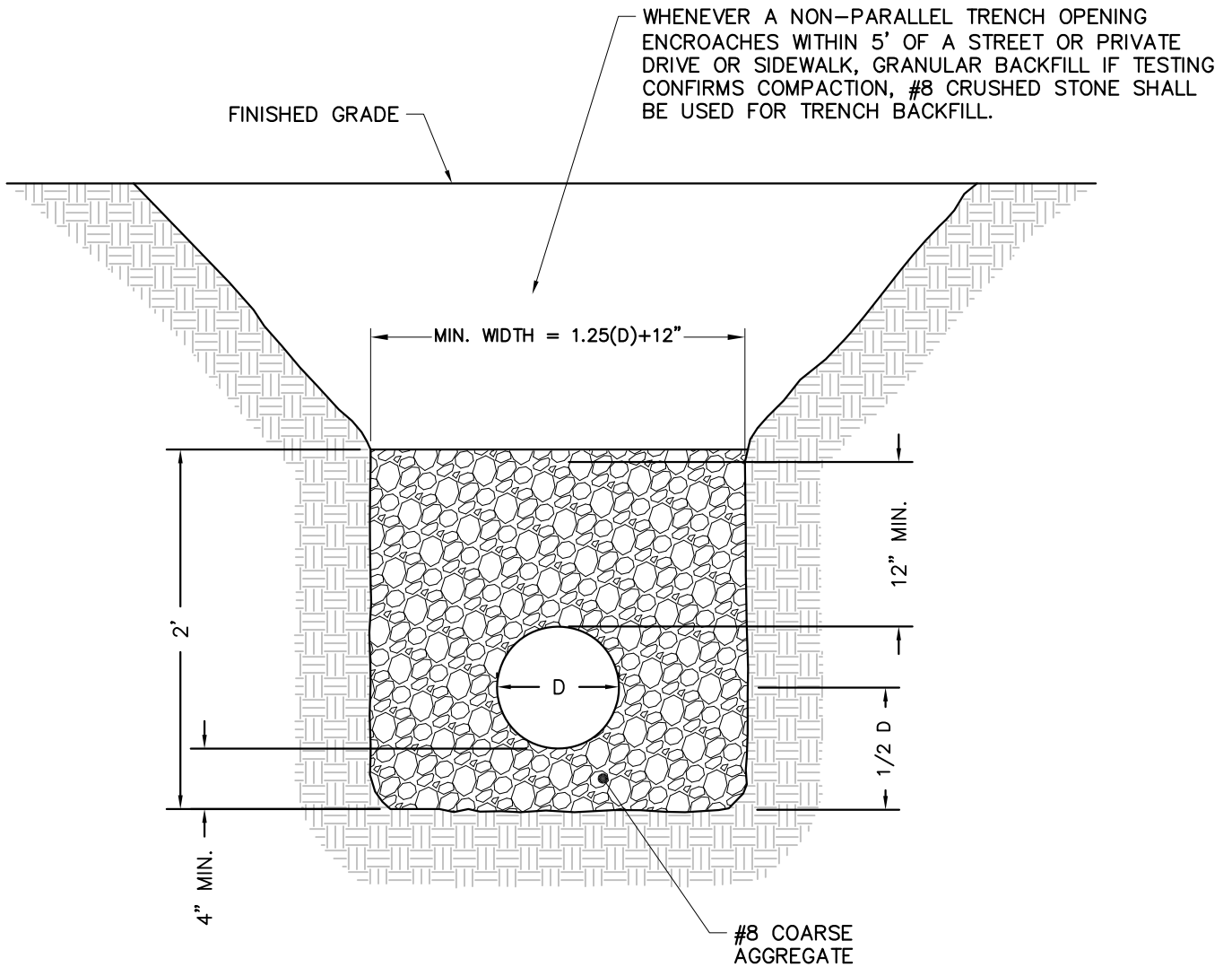
SANITARY SERVICE RISER CONNECTION



DATE:
01/01/15

Plate No.

300 - 6



1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 300 OF THE TOWN OF LOWELL SANITARY STANDARDS.

STANDARD DETAILS

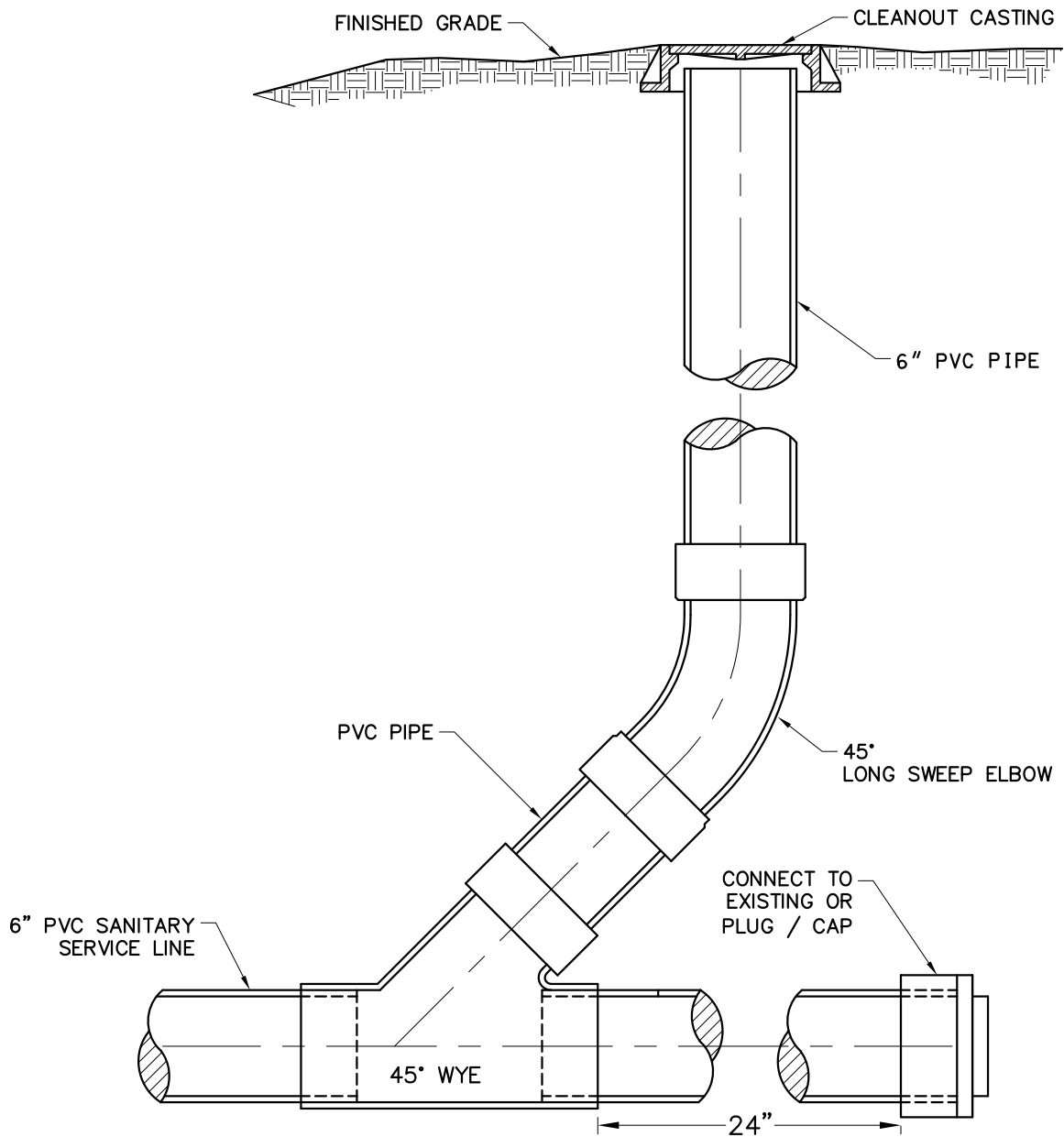
TRENCH BEDDING AND FOUNDATION



DATE:
01/01/15

Plate No.

300 - 7



1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 300 OF THE TOWN OF LOWELL SANITARY STANDARDS.
2. ALL NEW SEWER CONNECTIONS SHALL BE REQUIRED TO HAVE A SEWER CLEAN OUT AT A POINT FIVE FEET FROM THE STRUCTURE'S FOUNDATION.
3. IF THE SEWER CONNECTION IS OVER 150 FEET IN LENGTH, A SECOND CLEAN OUT SHALL BE NECESSARY. IT SHALL BE LOCATED MIDWAY BETWEEN THE STRUCTURE AND THE SEWER MAIN.
4. SEWER CONNECTIONS SHALL HAVE A MAXIMUM DISTANCE OF 200 FEET BETWEEN CLEANOUTS.
5. IF A SEWER CONNECTION REQUIRES A BEND, A CLEAN OUT SHALL BE REQUIRED AT THAT BEND.
6. NO BEND SHALL BE MADE AT 90 DEGREES, BUT TWO 45 DEGREE CURVED BENDS ARE ACCEPTABLE.

STANDARD DETAILS
SANITARY SEWER CLEAN OUT



DATE:
01/01/15

Plate No.

300 - 8

Division 400
STORMWATER DESIGN AND
CONSTRUCTION STANDARDS

Section 400 – General Requirements

Section 400.1 – General

The standards and requirements found in this article are for the design and constructing of stormwater management systems within the Town of Lowell.

The designer of the stormwater management system for the proposed development shall implement “better site design practices”. Better site design for stormwater management includes a number of site design techniques such as preserving natural features and resources, effectively laying out the site elements to reduce impact, reducing the amount of impervious surfaces, and utilizing natural features on the site for stormwater management.

Plans that propose to direct stormwater onto lands or waterways under the jurisdiction of other governmental agencies (i.e., unincorporated Lake County) shall also be subject to the approval of that agency.

Section 400.2 – Reference Standards

The documents listed below are hereby incorporated into this Specification by reference.

1. US Department of Agriculture – NRCS TR-55 - Urban Hydrology for Small Watersheds
2. Lake County Indiana Stormwater Technical Standards Manual
3. Midwestern Climate Center Bulletin 71 – Rainfall Frequency Atlas of the Midwest

Section 401 – Stormwater Design Criteria

Section 401.1 – Stormwater Management Plan Design Criteria

The stormwater designer shall prepare Stormwater Management Plans in accordance with Section 53.204 – Stormwater Management Plan Design Criteria and Section 53.205 – Stormwater Management Permit Procedures and Requirements of the Town of Lowell Municipal Code.

Section 401.2 – Development in Flood Hazzard Areas

Development within Flood Hazzard Areas shall be in accordance with Section 151 – Flood Hazzard Areas of the Town of Lowell Municipal Code.

Section 401.3 – Methodology to Determine Runoff

Runoff quantities shall be computed for the area of the parcel under development plus the area of the watershed flowing into the parcel from offsite parcels under the existing or future development conditions. Runoff rates, volumes and hydrographs shall be computed according to one of the following methods:

A. Rational Method

1. For areas up to 5 acres within well-defined watersheds, having a contributing drainage area of less than 50 acres and with no existing depressional storage, the Rational Method may be used provided that the time of concentration is calculated using NRCS TR-55 methodology.
2. Values for runoff coefficients are provided in Tables 401-1 and 401-2. Runoff coefficients for the project area should be calculated based on the actual surface types proposed. Generalized coefficients such as commercial or industrial should only be applied to offsite areas where detailed knowledge of surface types is not readily available.
3. Rainfall intensity shall be determined from the rainfall frequency data shown in Table 401-3.

Table 401-1

Urban Runoff Coefficients	
Type of Surface	Runoff Coefficient "C"
Hard Surfaces	
Asphalt	0.82
Concrete	0.85
Roof	0.85
Lawns (Sandy)	
Flat (0-2% Slope)	0.07
Rolling (2-7% Slope)	0.12
Steep (Greater than 7% Slope)	0.17
Lawns (Clay)	
Flat (0-2% Slope)	0.16
Rolling (2-7% Slope)	0.21
Steep (Greater than 7% Slope)	0.30

Source: HERPICC Stormwater Drainage Manual, July 1995.

Table 401-2

Rural Runoff Coefficients	
Type of Surface	Runoff Coefficient “C”
Woodland (Sandy)	
Flat (0-5% Slope)	0.10
Rolling (5-10% Slope)	0.25
Steep (Greater than 10% Slope)	0.30
Woodland (Clay)	
Flat (0-5% Slope)	0.30
Rolling (5-10% Slope)	0.35
Steep (Greater than 10% Slope)	0.50
Pasture (Sandy)	
Flat (0-5% Slope)	0.10
Rolling (5-10% Slope)	0.16
Steep (Greater than 10% Slope)	0.22
Pasture (Clay)	
Flat (0-5% Slope)	0.30
Rolling (5-10% Slope)	0.36
Steep (Greater than 10% Slope)	0.42
Cultivated (Sandy)	
Flat (0-5% Slope)	0.30
Rolling (5-10% Slope)	0.40
Steep (Greater than 10% Slope)	0.52
Cultivated (Clay)	
Flat (0-5% Slope)	0.50
Rolling (5-10% Slope)	0.60
Steep (Greater than 10% Slope)	0.72

Source: *HERPICC Stormwater Drainage Manual, July 1995.*

Table 401-3

Rainfall Intensities for Various Return Periods and Storm Durations						
Intensity (<i>Inches/Hour</i>)						
Duration	Return Period (<i>Years</i>)					
	2	5	10	25	50	100
5 Minutes	5.04	8.24	7.08	8.16	9.00	9.84
10 Minutes	3.84	4.74	5.46	6.24	6.90	7.50
15 Minutes	3.20	3.96	4.52	5.16	5.72	6.20
20 Minutes	2.85	3.51	4.02	4.59	5.10	5.55
30 Minutes	2.22	2.74	3.12	3.58	3.96	4.32
40 Minutes	1.85	2.28	2.61	2.99	3.30	3.60
50 Minutes	1.60	1.97	2.24	2.57	2.83	3.10
1 Hour	1.40	1.73	1.97	2.25	2.49	2.72
1.5 Hours	1.13	1.39	1.59	1.82	2.02	2.20
2 Hours	0.86	1.06	1.21	1.38	1.53	1.67
3 Hours	0.61	0.76	0.87	0.99	1.10	1.20
4 Hours	0.52	0.64	0.73	0.83	0.92	1.00
5 Hours	0.43	0.53	0.61	0.70	0.77	0.84
6 Hours	0.37	0.46	0.52	0.60	0.66	0.72
7 Hours	0.33	0.41	0.47	0.53	0.59	0.64
8 Hours	0.29	0.36	0.42	0.47	0.53	0.57
9 Hours	0.27	0.33	0.38	0.43	0.48	0.52
10 Hours	0.25	0.31	0.35	0.40	0.44	0.48
12 Hours	0.22	0.27	0.30	0.35	0.38	0.42
14 Hours	0.19	0.24	0.27	0.31	0.34	0.37
16 Hours	0.17	0.21	0.24	0.28	0.31	0.34
18 Hours	0.16	0.19	0.22	0.25	0.28	0.31
20 Hours	0.14	0.18	0.20	0.23	0.26	0.28
24 Hours	0.13	0.15	0.18	0.20	0.22	0.24

Source: Lake County, Indiana, Stormwater Technical Standards Manual, November 2004 Edition

B. Hydrograph Methods

1. Hydrograph methods of determining runoff and routing of stormwater shall be used to determine runoff rates and the storage volume required to control stormwater runoff for watersheds greater than 5 acres and/or watersheds with depressional storage or contributing drainage area greater than 50 acres. The runoff rate for these developments and contributing drainage areas shall be determined by a computer model that can generate hydrographs based upon NRCS TR-55 time of concentration and curve number calculation methodologies and the 24-hour NRCS Type 2 Rainfall Distribution. 24-hour Rainfall Depth for various frequencies shall be taken from Table 401-4. The NRCS Type 2 distribution ordinates are found in Table 401-5.

Table 401-4

Rainfall Depths for Various Return Periods						
Depth (<i>Inches</i>)						
Duration	Return Period (<i>Years</i>)					
	2	5	10	25	50	100
24 Hours	3.00	3.70	4.23	4.83	5.35	5.83

Source: Lake County, Indiana, Stormwater Technical Standards Manual, November 2004 Edition

Table 401-5

NRCS Type II Rainfall Distribution Ordinates	
Cumulative Percent of Storm Time	Cumulative Percent of Storm Depth
0	0
5	1
10	3
15	4
20	6
25	8
30	10
35	13
40	17
45	22
50	64
55	78
60	84
65	87
70	90
75	92
80	94
85	96
90	98
95	99
100	100

Source: Lake County, Indiana, Stormwater Technical Standards Manual, November 2004 Edition

Section 401.4 Allowable Release Rates

A. Watersheds Without Depressional Storage

1. Control devices shall limit the discharge to a rate such that the post-developed release rate from the site is no greater than 0.2 cfs per acre (or applicable watershed release rate) of development for the 100-year rainfall event. For sites where the pre-developed area has more than one outlet, the release rate should be computed based on the pre-developed discharge to each outlet point. The computed release rate for each outlet point shall not be exceeded at the respective outlet point even if the post-developed conditions would involve a different arrangement of outlet points.

B. Watersheds With Depressional Storage

1. The allowable release rate will be the less of either of the following: 0.20 cfs per acre (or applicable watershed release rate) of watershed, or the modeled runoff rate in which the model accounts for the depressional storage. The model should account for the depressional storage by treating the area as a pond whose outlet is a weir at an elevation that stormwater overflows the depressional storage area in the existing conditions. For modeling purposes, the initial state of the depressional storage area shall be dry or a legally established water level.
2. Existing wetlands shall not be utilized for the purposes of post-developed stormwater storage.

C. Downstream/Receiving Facilities

1. Downstream Restrictions
 - a. In the event the downstream receiving channel or storm sewer is inadequate to accommodate the post-developed release rate determined above, the allowable release rate shall be reduced to that permitted by the capacity of the receiving downstream channel or storm sewer system. Additional storage shall be required to store that portion of the runoff exceeding the capacity of the receiving sewers or channels. When such downstream restrictions are suspected, additional analysis to determine the receiving system's limiting downstream capacity.
 - b. If the proposed development makes up only a portion of the undeveloped watershed upstream of the limiting restriction, the allowable release rate for the development shall be in direct proportion to the ratio of its drainage area to the drainage area of the entire watershed upstream of the restriction.
2. Discharge to an existing field tile is prohibited
3. Tail Water of Receiving Streams and Water Bodies
 - a. The 100-year tail water elevation of the receiving stream or water body shall be taken into consideration during the calculations for the purposes of the starting hydraulic grade line elevation.
 - b. Storage below the 100-year tail water elevation shall not be counted as part of the required storage volume.

Section 401.5 Management of Off-Site Runoff

At least one waterway opening shall be provided for each watershed at the upstream edge of the parcel to accept upstream runoff. Additional openings should be provided as necessary to prevent any increase in water elevation on adjacent properties. Runoff from upstream tributary areas (off-site land areas) may be bypassed through the storage facility without attenuation, provided that a separate

outlet system or channel is incorporated for the safe passage flows i.e., not through the primary outlet of the storage facility. Unless the facility is being designed as a regional facility, the primary outlet structure shall be sized and the invert elevation of the overflow weir determined according to the on-site runoff only. Once the size and location of the primary outlet structure and the invert elevation of the overflow weir are determined by considering on-site runoff only, the 100-year facility elevation is determined by routing the entire inflow, on-site and off-site through the facility.

The efficiency of the facility in controlling the on-site runoff may be severely affected if the off-site area is considerably larger than the on-site area. As a general guidance, on-line detention may not be effective in controlling on-site runoff where the ratio of off-site area to on-site area is larger than 5:1. Additional storage, above and beyond that required for on-site area, may be required.

Section 401.6 – Methodology for Determining Storage Volume

The increased stormwater runoff resulting from a proposed development shall be detained on-site by the provisions of appropriate wet or dry bottom reservoirs; by storage in parking lots, streets, lawns; or by other acceptable techniques. Measures which retard the rate of overland flow and the velocity in runoff channels should also be used to control the runoff rate. Control devices should limit the discharge to a rate not greater than prescribed by Lowell's Town Code.

- A. The required volume of stormwater storage may be calculated using the Rational or Hydrograph Methods, based upon the runoff from the 100-year return period storm.
 - 1. Rational Method
 - a. For areas up to 5 acres within well-defined watersheds, having a contributing drainage area of less than 50 acres and with no existing depressional storage, the Rational Method may be used provided that the time of concentration be calculated using NRCS TR-55 methodology.
 - b. Allowable release rates shall be as described above.
 - 2. Hydrograph Methods
 - a. Hydrograph methods of determining runoff and routing of stormwater shall be used to determine runoff rates and the storage volume required to control stormwater runoff for watersheds greater than 5 acres and/or watersheds with depressional storage or contributing drainage area greater than 50 acres. The runoff rate for these developments and contributing drainage areas shall be determined by a computer model that can generate hydrographs based upon NRCS TR-55 time of concentration and curve number calculation methodologies and the 24-hour NRCS Type 2 Rainfall Distribution.
 - b. Allowable release rates shall be as described above.
- B. Allowance For Sedimentation
 - 1. Storage basins shall be designed with an additional 10% of available capacity to allow for sediment accumulation resulting from development and to permit the facility to function for reasonable periods between cleaning. Basins should be designed to collect sediment and debris in specific locations, such as a forebay, so that removal efforts are minimized.

Section 401.7 – Detention Basin Design Requirements

A. General Requirements

1. The facility shall be designed in such a manner that a minimum of 90% of the maximum volume of water stored and subsequently released at the design release rate shall not result in a storage duration in excess of 48 hours from the start of the storm unless additional storms occur within the period. In other words, the design shall ensure that a minimum 90% of the original detention capacity is restored within 48 hours from the start of the design 100-year storm.
2. The 100-year elevation of stormwater detention facilities shall be separated by not less than 25 feet from any building or structure.
3. The Lowest Adjacent Grade (including walkout basement floor elevation) for all buildings shall be set a minimum of 2 feet above the 100-year pond elevation or 2 feet above the emergency overflow weir elevation, whichever is higher.
4. Any basement floor must be at least a foot above the normal water level of any wet-bottomed pond.
5. No detention facility or other water storage area, permanent or temporary, shall be constructed under or within 20 feet of any pole or high voltage electric line.
6. All storage facilities shall be separated from any road right-of-way by at least 50 feet.
7. Basin side slopes shall not be steeper than 4:1.
8. Safety screens having a maximum opening of 4 inches shall be provided for any pipe or opening to prevent children or animals from entering structures.
9. One foot of freeboard shall be provided between the 100-year water elevation and the top of the berm.
10. The distance between inlets and outlets shall be maximized.
11. Irregular basin shorelines shall be provided.
12. A minimum 5-foot-wide ledge with a maximum slope of 6% shall be provided around the perimeter of open basins over 5 feet deep. The ledge shall be located 3 feet above the bottom of open dry basins or 1 foot below the normal water level of wet basins.
13. Detention basins that have an impoundment volume of 50 acre-feet or more, and a hydraulic head of 15 feet or more, must meet the requirements of the Dam Safety guidelines of the IDNR.
14. A minimum 20-foot-wide maintenance access route from a public right-of-way to the basin shall be provided. The access way shall have a slope no greater than 5:1, and shall be stabilized to withstand the passage of heavy equipment. Direct access to forebays, control structures, and the outlet shall be provided.
15. Grass or other suitable vegetative cover shall be provided along the banks of the facility. Facilities shall be fully landscaped with appropriate trees and bushes.

B. Outlet Structures

1. Shall be designed to operate as simply as possible and shall require little or no maintenance and/or attention for proper operation.
2. Shall limit discharges as to not exceed the predetermined maximum authorized peak flow rate.
3. Shall be designed to prevent clogging.
4. Provisions shall be made to avert increased flooding to downstream areas caused by the concentration of allowable runoff at one point instead of the natural overland distribution.

C. Emergency Overflow Facilities

1. Shall be a weir or spillway and shall be provided for the release of exceptional stormwater runoff or in emergency situations. The overflow shall be of such design that its operation is automatic and does not require manual attention.
2. Shall be designed to handle 1.25 times the peak inflow discharge and peak flow velocity resulting from the 100-year storm event runoff from the entire contributing watershed draining to the storage facility, assuming post-developed condition on-site and existing condition off-site.
3. Shall be protected with riprap of a permanent erosion control blanket to prevent erosion.

D. Additional Requirements for Wet-Bottom Facilities

1. Facilities designed with permanent pools or containing permanent lakes shall have a water area of at least 0.5 acres. If fish are to be used to keep the facility clean, a minimum depth of approximately 10 feet shall be maintained over at least 25% of the facility's area. The remaining facility area shall have no extensive shallow areas.
2. Flood control volumes shall be provided above the permanent pool elevation. Volume provide below the invert of the outlet of the permanent pool pond will not be considered as storage volume.

E. Additional Requirements for Dry-Bottom Facilities

1. Dry-bottom facilities shall have a bottom slope toward the outlet of at least 1%.

F. Retention/Infiltration Facilities

1. Retention/Infiltration storage facilities shall not be constructed without prior approval.

G. Underground Infiltration and Retention Systems

1. Underground infiltration or retention systems are discouraged and will only be allowed when adequate space for and above ground system is not available. The site grading shall provide for parking lot storage of excess runoff should the underground system fail to function correctly. Manufactured underground systems shall be approved on a case-by-case basis. The Owner shall take full legal responsibility for the performance and safe operation of the system.

H. Parking Lot Storage

1. Paved parking lots may be designed to provide temporary storage of stormwater on their surfaces. Outlets for parking lot storage will be designed to empty stored water slowly. Depths of storage must be limited to a maximum of 6-inches so as to prevent damage to parked vehicles and so that access to parked vehicles is not impaired. Ponding should, in general, be confined to those positions of the parking lots farthest from the area served and should not be provided in the natural path of pedestrians.

I. Storage in Floodplains

1. If storage is provided within a floodplain, only the net increase in storage volume above that which naturally existed in the floodplain will be credited to the development. No credit will be granted for volumes below the elevation of the regulatory flood at the location unless compensatory storage is also provided.

Section 402 – Stormwater Conveyance Systems and Appurtenances

Section 402.1 – Specifications

These specifications cover materials, construction and all appurtenances normally used for the construction of a storm sewer system. Shop drawings and material submittals shall be submitted to the Lowell Public Works Director for review and approval prior to their installation.

Section 402.2 – Pipe Materials

All storm sewer pipe material and service lines shall conform to the latest A.S.T.M., or other nationally accepted standards. Only the following storm sewer pipe and joint materials are approved for use in the Town of Lowell.

<u>PIPE</u>	<u>SPECIFICATION</u>	<u>JOINT</u>
Reinforced concrete pipe	ASTM-C76	ASTM C 443
PVC Solid Wall, SDR 26 < 15-inch	ASTM D3034	Elastromatic gasket type, ASTM D1869 and ASTM D3212
PVC Solid Wall, min. thickness: T-1, 18-inch to 24-inch,	ASTM F679	ASTM F477 or ASTM D3212
Ductile iron pipe	ASTM A 2151	AWWA CIII
Approved equals ⁽¹⁾		

- (1) Any other pipe materials must be approved in writing by the Director of Public Works or Town Engineer.

Section 402.3 – Design Storm Frequencies

- A. All storm sewers, inlets, catch basins, channels, swales and street gutters shall accommodate as a minimum, peak runoff from a post developed 10-year return period. For Rational Method analysis, the duration shall be equal to the time of concentration of the drainage area. The Rational Method will be acceptable for storm sewer design as long as TR-55 time of concentration methodology is used. The appropriate Huff rainfall distribution should be used to determine the peak runoff for hydrograph/computer modeling methods.
- B. Culverts shall be capable of accommodating peak runoff from a 24-hour, 50-year frequency storm when crossing under a road which is part of the INDOT Rural Functional Classification System and are classified as principal or minor arterial or major or minor collector roads.
- C. Systems carrying runoff from an area of one or more square miles should be designed in accordance with IDNR standards.

Section 402.4 – Storm Sewer Design Criteria

- A. Manning's Equation – The determination hydraulic capacity of storm sewers sized by the Rational Method shall be determined using the Manning's equation where:

$$V = (1.486/n)(R^{2/3})(S^{1/2})$$

Then:

$$Q = VA$$

Where:

Q = capacity in cfs

V = mean velocity in f/s

A = cross sectional area in sft

R = hydraulic radius in ft

S = slope of the energy grade line in ft/ft

n = Manning's roughness coefficient

- B. Backwater Method for Pipe System Analysis

For hydraulic analysis of existing or proposed storm drains which possess submerged outfalls, a backwater analysis shall be provided. The backwater analysis shall include calculations accounting for total headloss in the system where total headloss equals frictional losses plus manhole losses plus velocity head losses plus junction losses.

- C. Minimum Size

The minimum size of all storm sewers shall be 12 inches. The rate of release for detention storage should be controlled by an orifice plate or other devices where the 12-inch pipe will not limit the rate of release required.

- D. Minimum Cover

The minimum depth of the cover shall be the greater of 24 inches from finished grade to the outside top or manufacturer's requirements.

- E. Minimum and Maximum Velocities

The minimum full flow storm sewer velocity shall be 3 feet per second. The maximum allowable velocity shall be 15 feet per second for RCP and PVC. The maximum allowable velocity shall be 7 feet per second for CMP.

- F. Change in Pipe Size

When changes in pipe size occur, the crown of the upstream pipe shall match the crown of the downstream pipe.

- G. Alignment

Storm sewers shall be straight between manholes and/or inlets.

H. Manholes, Catch Basins and Inlets

1. Manhole Spacing

Manhole spacing shall not exceed 400 feet for sewers with diameters less than 42 inches in diameter and 600 feet for sewers with diameters greater than or equal to 42 inches in diameter.

2. Locations of Manholes, Catch Basins and Inlets

a. Manholes should be installed to provide access to continuous underground storm sewers for the purpose of inspection and maintenance. Manholes shall be provided at the following locations:

- 1) Where two or more storm sewer converges.
- 2) Where the pipe size or material changes
- 3) Where a change in horizontal alignment
- 4) Where a change in grade occurs
- 5) In rear yards of residential lots such that:
 - a) each lot has access to and touches an inlet
 - b) drain cleaning can be accomplished from the roadway

3. Structure Dimensions

- a. The minimum inside diameter of all manholes shall be 48 inches.
- b. The minimum inside diameters for catch basins shall be 48 inches.
- c. The minimum inside diameter for inlets shall be 24 inches.
- d. The minimum inside diameter for rear yard inlets shall be 24 inches

4. Markings

- a. All inlets shall be pre-stamped with an appropriate "clean water" message.
- b. Stormwater covers shall have the words "STORM SEWER" cast in the cover in letters 2 inches in height.

5. A minimum drop of one-tenth of one foot (0.1') through the manholes should be provided.

6. Castings shall be initially placed flush with the intermediate course of pavement. Castings shall be adjusted with adjustment rings prior to the placement of the final surface course.

I. Inlet Design

Inlets shall be utilized to collect surface water through grated openings and convey it to storm sewers, channels or culverts.

1. Inlet design and spacing may be computed using the hydraulic equations by manufacturers or orifice/weir equations. Use of the U.S. Army Corps of Engineer's HEC-12 computer program is also acceptable. Gutter spread on continuous grades may be determined by using the Manning's equation.
2. Spacing and/or number of catch basins and inlets required to accommodate the design flows in streets, drives and parking areas shall be provided based on inlet capacity with no ponding occurring during a 10-year storm. The amount of allowable spread of water on collector streets is limited to maintaining two clear 10-foot moving lanes of traffic. One 10-foot lane is to be maintained for local roads.
3. The inlet grate provided must be adequate to pass the design 10-year flow with fifty percent (50%) of the sag inlet areas clogged. An overland flow route from the sag inlets to the overflow channel or storage basin shall be provided at sag inlets.
4. Inlets shall be placed at low points of streets and be spaced no greater than 400 feet.
5. Inlet design and spacing calculations shall be submitted with the drainage calculations

6. No more than 150 feet of street drainage will be allowed to flow around a corner.
7. No flow will be allowed across a street intersection.
8. All roadway sag inlets and catch basins shall have 6-inch-perforated underdrains a minimum length of 50 feet (50') along the curbs.

J. Swales, Ditches and Overland Flow Paths

1. Swales, ditches and overland flow paths shall be designed to contain the 100-year flow within its banks with a 2-foot freeboard between the 100-year water surface elevation and the lowest adjacent structure opening.
2. Overland flow paths resulting from the 100-year storm event shall be determined, clearly shown as hatched areas on the plans and situated within permanent drainage easements. These easements shall be clearly marked as Overland Flow Paths on final plats. No fences or landscaping that can impede the flow of stormwater shall be constructed within these easements. These areas are to be maintained by the property owner or be designated as common areas that are to be maintained by homeowner's associations.
3. An overflow channel between sag inlets and overflow paths or the storage basin(s) shall be provided at sag inlets so that the maximum depth of water that might be ponded in the street sag will not exceed 7 inches above the centerline crown elevation of the roadway.
4. Velocities, capacities and friction losses shall be based on Manning's formula. Typical Manning's values for open channels, swales and ditches are included in Table 401-6; however, a minimum Manning value of 0.035 shall be used as the roughness coefficient for open channels, unless special treatment is given to the bottom and sides (riprap, paving, mown sod).
5. Minimum bottom width for grassed waterways shall be 1 foot.
6. Minimum bottom slope shall be 0.5%. All flow shall be confined to the specific easements associated with each swale. Unless designed to act as a stormwater BMP, vegetated swales with a slope less than 1.0% shall have underdrains to dry the swale.
7. Side slopes shall be no steeper than 3:1.
8. When design discharge produces a depth of greater than 3 feet in the channel, appropriate safety precautions shall be added to the design criteria based upon reasonably anticipated safety needs.
9. Along streets and roads, the bottom of the channel should be low enough to install adequately sized driveway culverts without creating bumps. The driveway culverts shall be designed to adequately consider upstream and downstream culvert elevations.
10. Grassed waterway flow velocities shall be neither siltative nor erosive. The minimum velocity for vegetated channels shall be 1.5 ft/s. The maximum velocity shall be 4 ft/s. Appropriate erosion control measures shall be used where the velocity exceeds 4 ft/s, up to a maximum allowable design velocity of 8 ft/s.
11. Where maximum velocities are exceeded due to channel slope, rock check dams, or grade control structures shall be used to reduce overall flow velocities.
12. Erosion control blankets shall be used to protect bare channels.
13. Outlets into grassed waterways shall enter at an angle of 90 degrees or less with the direction of flow.
14. A minimum clearance of 4 feet is required between swales and ditch inverts and underground utilities unless special provisions are approved.

Table 401-6

NRCS Type II Rainfall Distribution Ordinates	
Material	Manning's "n"
Closed Conduits	
Concrete	0.013
Vitrified Clay	0.013
HDPE	0.012
PVC	0.011
Circular CMP, Annular Corrugations, 2-2/3 x 1/2 inch	
Unpaved	0.024
25% Paved	0.021
50% Paved	0.018
100% Paved	0.013
Concrete Culverts	0.013
HDPE or PVC	0.012
Open Channels	
Concrete, Trowel Finish	0.013
Concrete, Broom Finish	0.015
Gunite	0.018
Riprap Placed	0.030
Riprap Dumped	0.035
Gabion	0.028
New Earth (1)	0.025
Existing Earth (2)	0.030
Dense Growth of Weeds	0.040
Dense Weeds and Brush	0.040
Swale with Grass	0.035

Source of manning "n" values: *HERPICC Stormwater Drainage Manual*, July 1995.

(1) New earth (uniform, sodded, clay soil)

- (2) Existing earth (fairly uniform, with some weeds). Various computer modeling programs such as HYDRA, ILLUDRAIN and STORMCAD are available for analysis of storm drains under those conditions. Computer models to be utilized other than those listed, must be accepted by the Lake County Drainage Board and/or Lake County Surveyor.

Section 402.5 - Cleaning and Televising of Storm Sewers

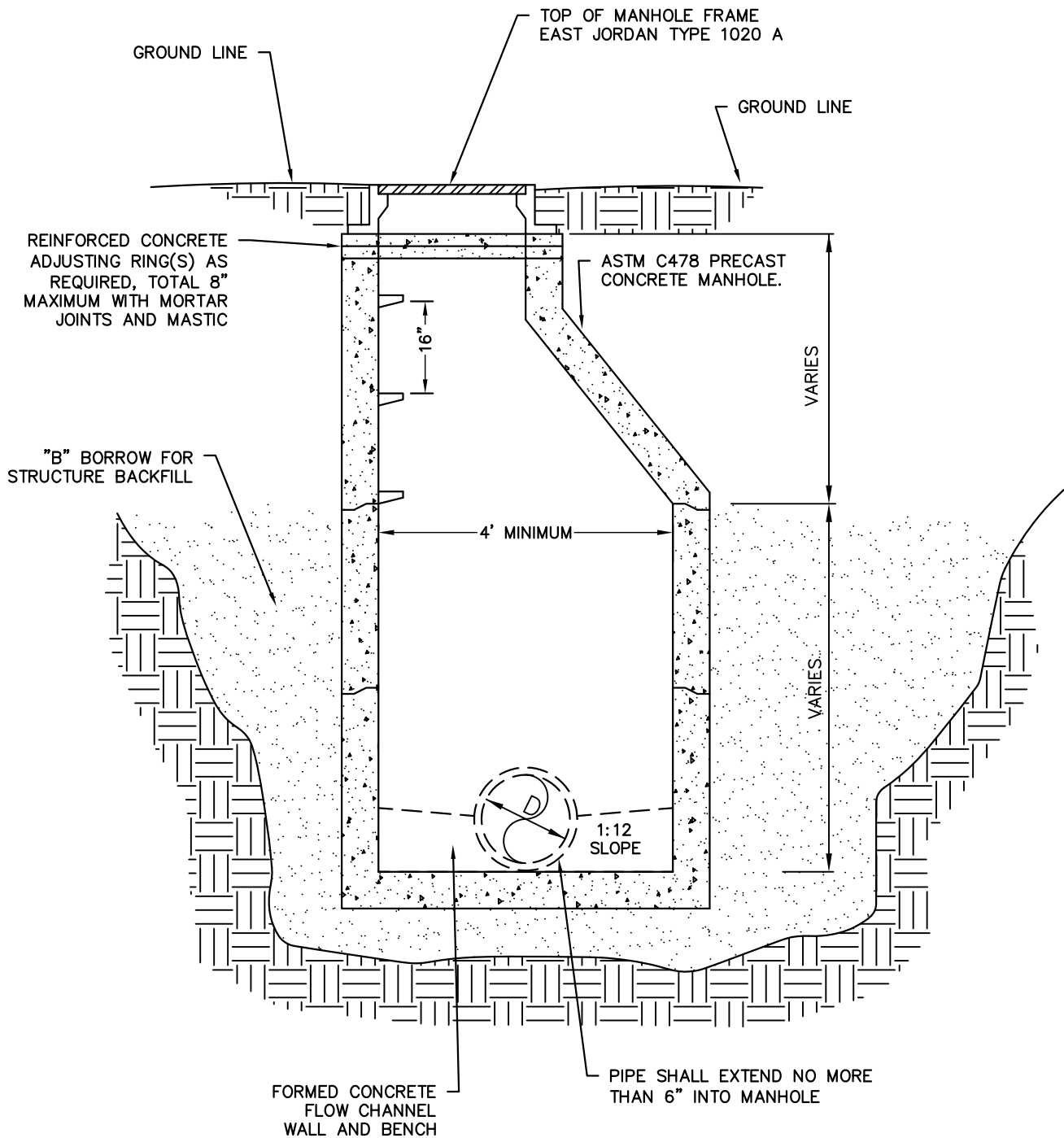
The Developer shall thoroughly clean and televise all stormwater infrastructure prior to acceptance. A digital copy of the inspection shall be provided to the Lowell Public Works Director for review and acceptance.

Section 403 – Drainage Easements

Section 403.1 – Drainage Easements

The following minimum easement widths are required within the confines of the proposed development:

- A. Non-regulated open drains (waterways, ditches, major overland flow paths, swales, etc.)
 1. For waterways, ditches and major overland flow paths the distance between the open drain tops of banks plus 15 feet each side of its bank.
 2. For swales the distance between the open drain tops of banks plus 10 feet on each side of its bank.
 3. The easement shall be centered on the centerline of the open drain.
- B. Regulated Drains
 1. Width between the top of bank plus 75 feet each side of the top of bank.
 2. The easement shall be centered on the centerline of the open drain.
- C. Enclosed drains (pipes, tiles, rear yard drains, etc.)
 1. Drains and structures less than 2 feet in diameter and less than 6 feet deep to invert shall be 15 feet.
 2. Drains and structures greater than 2 feet in diameter and less than 6 feet deep to invert shall be 20 feet
 3. Drains and structures greater than 6 feet deep to invert shall be 25 feet.
 4. The easement shall be centered on the centerline of the enclosed drain.
- D. Storage Facilities
 1. A minimum of 20 feet from the top of bank surrounding the entire facility.
 2. A minimum of 20-foot-wide access easement from the facility to an improved public right-of-way.



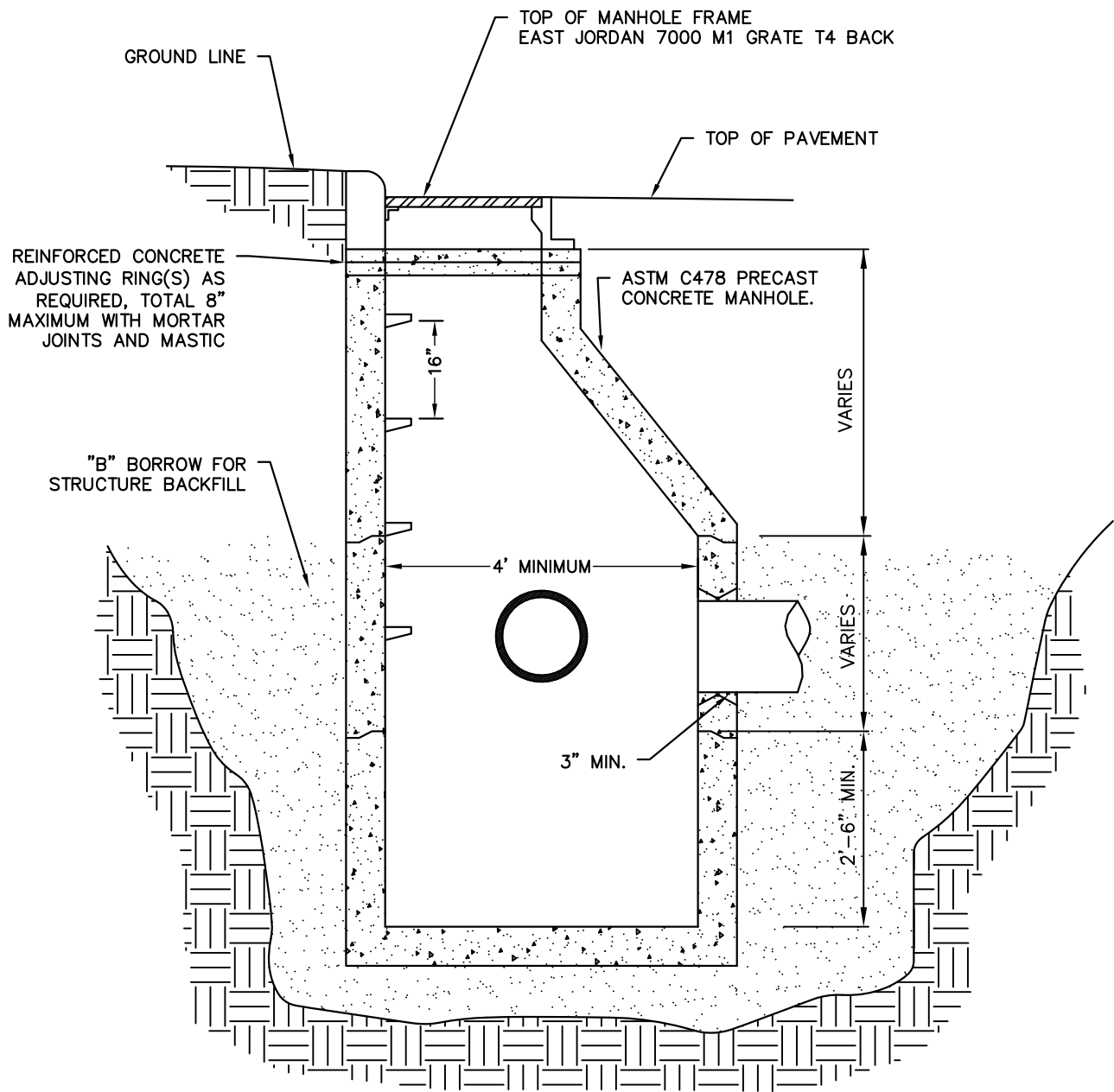
**STANDARD DETAILS
MANHOLE**



DATE:
01/01/15

Plate No.

400 - 1



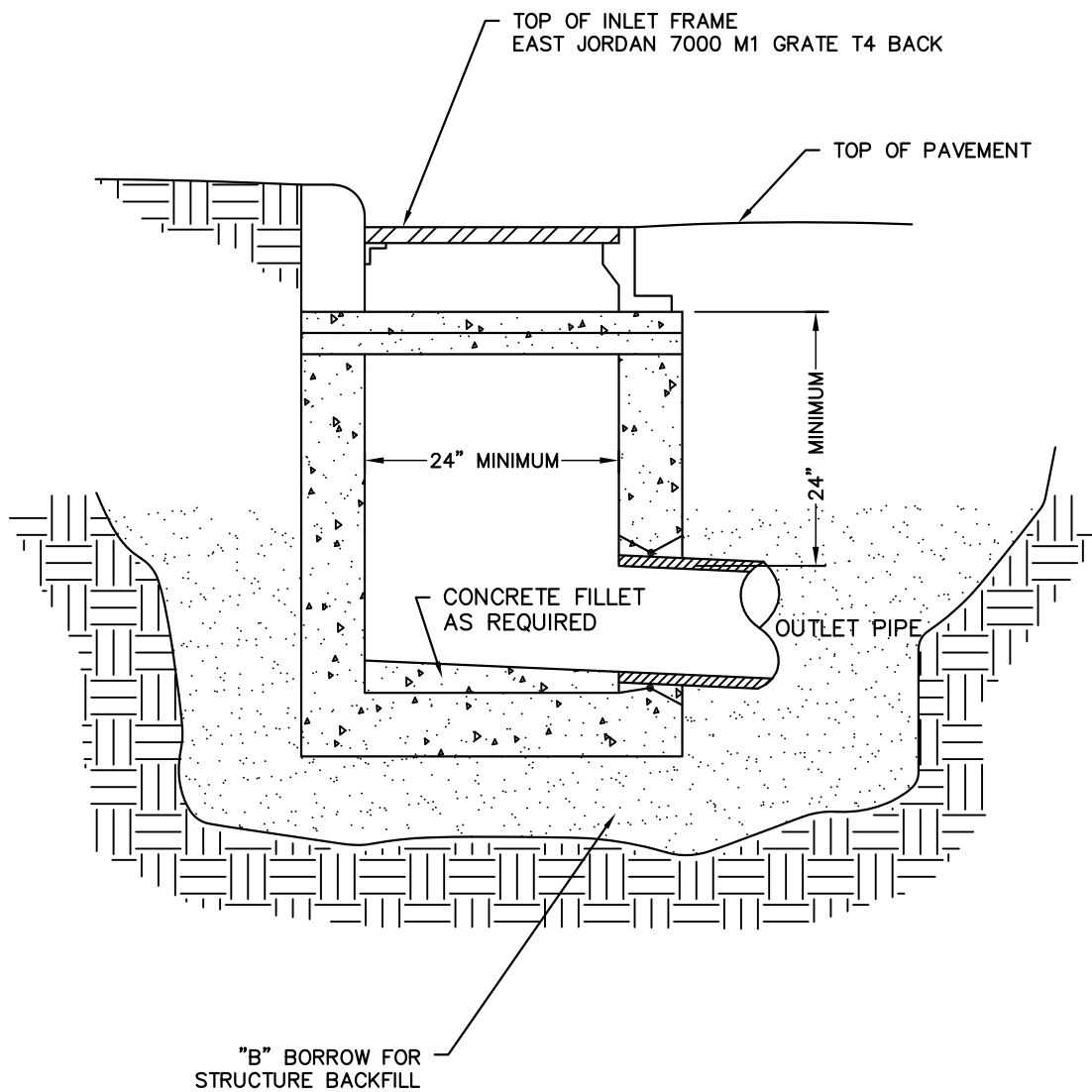
STANDARD DETAILS
CATCH BASIN



DATE:
01/01/15

Plate No.

400 - 2



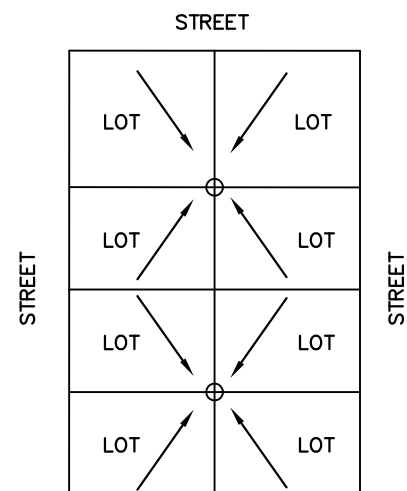
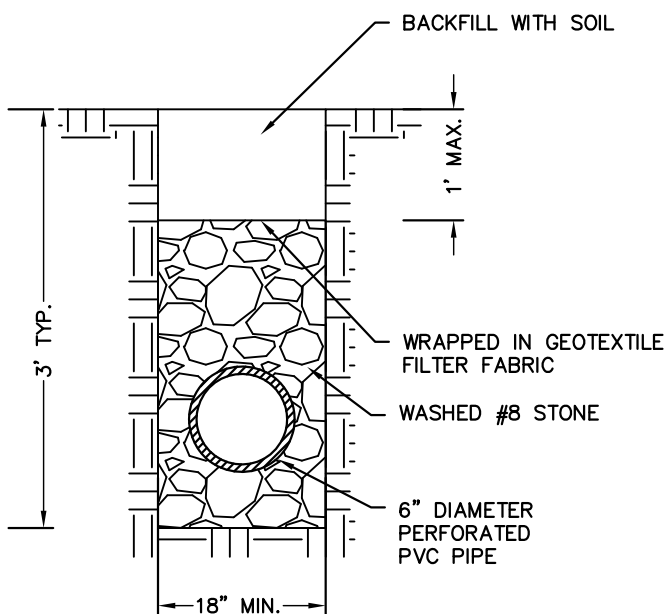
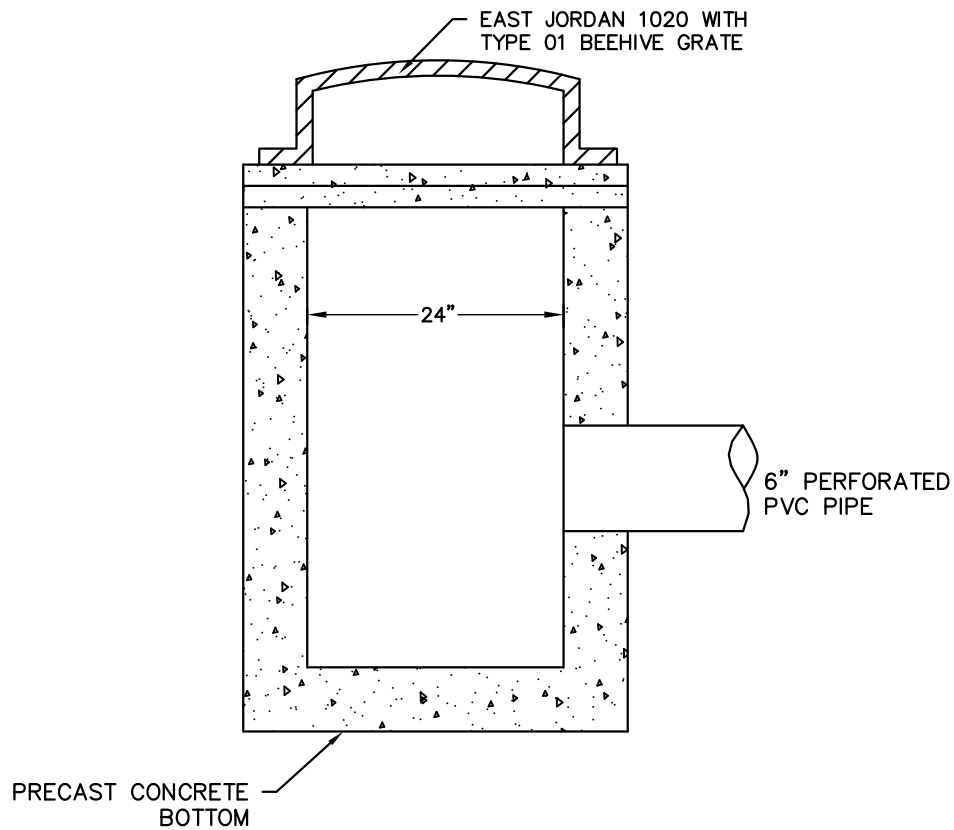
STANDARD DETAILS
GUTTER INLET



DATE:
01/01/15

Plate No.

400 - 3



TYPICAL REAR YARD DRAINAGE

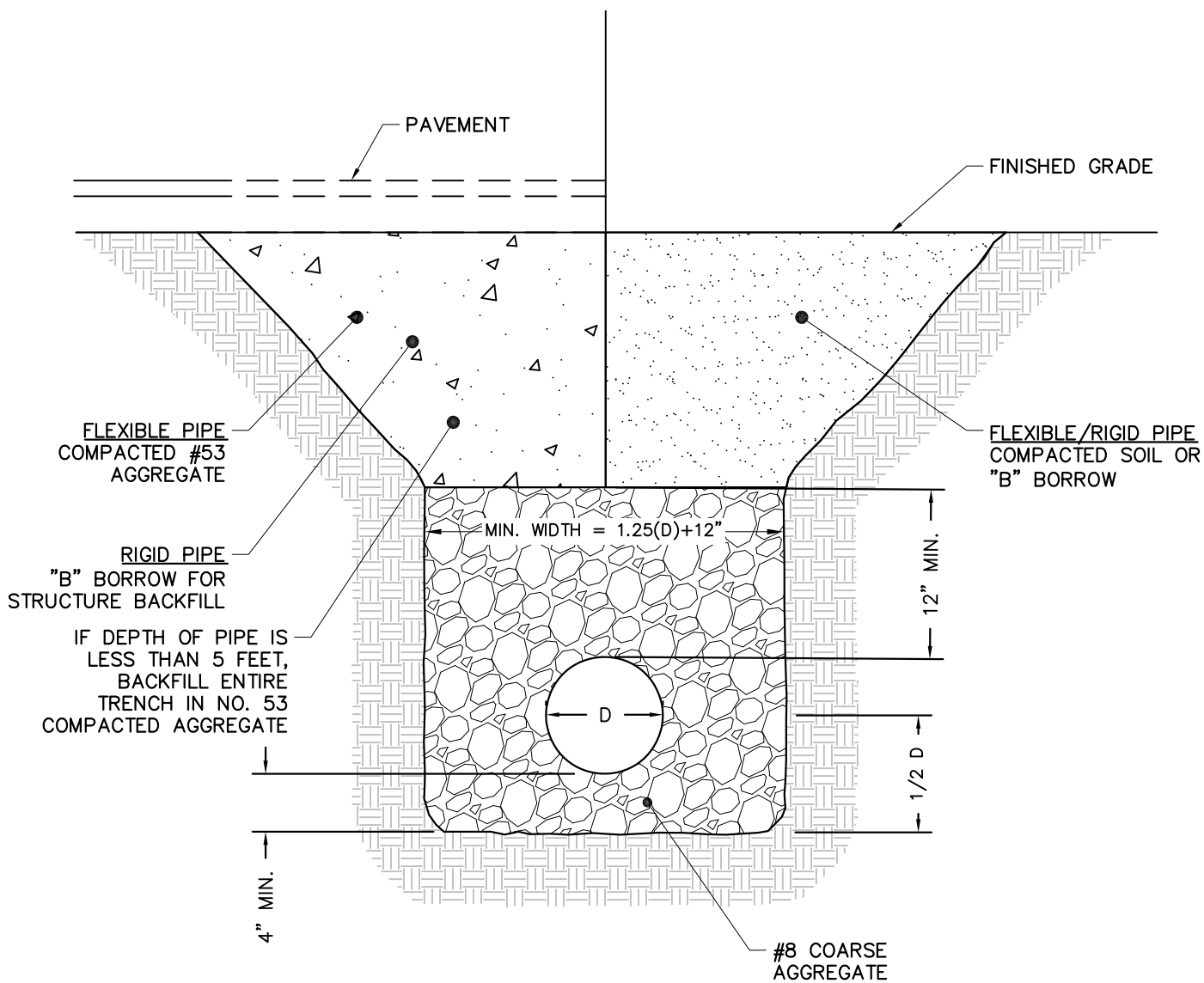
STANDARD DETAILS
REAR YARD DRAIN



DATE:
01/01/15

Plate No.

400 - 4



STANDARD DETAILS
PIPE BEDDING



DATE:
01/01/15

Plate No.

400 - 5

Division 500
WATER DISTRIBUTION SYSTEM
CONSTRUCTION STANDARDS

Section 500 – General Requirements

Section 500.1 - General

The standards and requirements found in this article are for materials and construction of water mains within the Town of Lowell, Indiana and must meet the minimum requirements of IAC 327Article 8. Specification references made herein for manufactured materials such as pipe, hydrants, valves and fittings refer to designations for American Water Works Association (AWWA) or to the American National Standard Institute (ANSI).

All work shall be constructed in accordance with the lines and grades shown on the approved engineering plans. All water mains shall have a minimum diameter of 8 inches.

Water mains shall be located in the public right-of-way or front yard easements. Water mains shall not be located in side or rear yard easements, unless no other reasonable alternative exists, and approved by the Lowell Public Works Director or the Lowell Town Engineer.

All water mains shall be extended across the entire frontage of the lot or parcel being served.

The contractor shall furnish three (3) sets of cut sheets from the manufacturer for all products, valves, hydrants, etc.

Section 500.2 - Specifications

These specifications cover pipes, fittings and accessory items normally used for water distribution systems. Special considerations will be covered in the plans and special provisions. Water distribution systems shall be constructed in accordance with Town of Lowell Standard Specifications. Shop drawings and material submittals shall be submitted to the Lowell Public Works Director for review and approval prior to their installation.

Section 500.3 – Reference Standards

This Specification references the following documents. They form a part of this Specification to the extent specified herein. In case of any conflict, the requirements of this Specification shall prevail. The latest edition of these standards shall control.

1. AWWA C104 – Cement-Mortar Lining for Ductile Iron Pipe and Fittings
2. AWWA C105 – Polyethylene Encasement for Ductile Iron Piping
3. AWWA C110 – Ductile Iron Fittings, 3 in. through 48 in.
4. AWWA C111 – Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
5. AWWA C115 – Flanged Ductile Iron Pipe with Threaded Flanges

6. AWWA C116 – Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-iron Fittings for Water Supply Service
7. AWWA C150 – Thickness Design of Ductile Iron Pipe
8. AWWA C151 – Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Liquids Molds, For Water and Other Liquids
9. AWWA C153 – Ductile Iron Compact Fittings and Other Liquids
10. AWWA C500 – Gate Valves
11. AWWA C509 – Resilient Seated Gate Valves for Water-Supply Services
12. AWWA C550 – Protected Epoxy Interior Coatings for Valves and Hydrants
13. AWWA C600 – Installation of Ductile Iron Water Mains and Appurtenances
14. AWWA C651 – Disinfecting Water Mains
15. AWWA C800 – Underground Service Line Valves and Fittings
16. 327 IAC Article 8. Public Water Supply
(<http://www.in.gov/legislative/iac/T03270/A00080.PDF>)
17. “10 States Standards” – Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (<http://10statesstandards.com/waterrev2012.pdf>)
18. ANSI – American National Standards Institute
19. Town of Lowell Code of Ordinances (http://www.lowell.net/council/code_of_ordinances)

Section 501 – Pipes, Fittings and Appurtenances

Section 501.1 - Ductile Iron Pipe

Ductile iron pipe shall conform to ANSI Specification A21.51 or AWWA C151. Pressure Class 350 shall be used for pipes having a diameter of 12 inches or less. Thicknesses of pipes larger than 12 inches in diameter shall be determined by considering trench load and internal pressure in accordance with ANSI/AWWA C150/A21.5. Joints shall be push-on type unless otherwise approved by Lowell.

Section 501.2 - Lining

The interior lining of ductile iron pipe shall be cement-mortar in accordance with ANSI/AWWA C104/A21.4. The exterior of the pipe shall be standard asphaltic coating.

Section 501.3 - Pipe Fittings

Ductile iron fittings shall conform to ANSI/AWWA C110/A21.10 and ANSI/AWWA C153/A21.53 for compact fittings with the exception of the manufacturer’s proprietary design dimensions.

Section 501.4 - Joints

Joint components shall be in accordance with ANSI/AWWA C111/A21.11. Joints shall be push-on type unless otherwise approved by Lowell.

Section 501.5 – Polyethylene Encasement

All ductile iron pipe, fittings and appurtenances shall be polyethylene encased in accordance with ANSI/AWWA C105/A21.5.

Section 502 - Protection of Water Main

Section 502.1 - General

The following factor should be considered in providing adequate protection of water mains:

- Materials and types of joints for water and sewer pipes,
- Soil conditions,
- Services and branch connections into the water main and sewer line,
- Compensating variations in the horizontal and vertical separations,
- Space for repair and alterations of water and sewer pipes,
- Off-setting of pipes around manholes

Section 502.2 - Parallel Water Mains and Sewers

Water mains shall be laid at least 10 feet horizontally from any existing or proposed gravity sanitary or storm sewer. The distance shall be measured edge to edge.

Should conditions prevail which prevent a lateral separation of 10 feet (10'), the pipeline may be laid closer than 10 feet (10') to a storm or sanitary sewer, provided the main is laid in a separate trench and at such an elevation that the bottom of the water main is at least 18 inches (18") above the top of the sewer.

If it is impossible to obtain a horizontal separation of at least 10 feet (10'), and a vertical separation of at least 18 inches (18") as stipulated above, the sewer shall be constructed or reconstructed of mechanical or slip-on joint ductile iron pipe, or concrete pressure pipes specified herein and be pressure tested to assure water tightness.

Section 502.3 - Water Main Crossing Sewers

Water mains crossing sewers shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer with preference to the water main located above the sewer.

At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. The sewer shall be supported to prevent settling.

Section 502.4 - Water Main Crossing Sanitary Force Mains

There shall be at least a 10-foot horizontal and 18-inch vertical separation between water mains and sanitary sewer force mains.

Section 502.5 - Water Main Near Sewer Manholes

No water pipe shall pass through or come in contact with any part of the sewer manhole. Water main should be located at least 8 feet from sewer manholes.

Section 502.6 – Surface Water Crossings

Surface water crossings shall be constructed according to the following:

- A. In above water crossings the water pipe shall be adequately supported and anchored, protected from vandalism, damage and freezing and accessible for repair or replacement.
- B. For underwater crossings a minimum of 5 feet shall be provided over the water pipe. The water pipe shall have flexible, restrained joints. Valves shall be provided at both ends so the section can be isolated for testing or repair. The valves shall be easily accessible and not subject to flooding. Permanent taps or other provisions shall be installed to allow insertion of a small meter to determine leakage and obtain water samples on each side of the valve closest to the supply of water.

Section 503 - Pipeline Installation for Water Mains

Section 503.1 - General

Pipe shall be installed in accordance with AWWA C600, the manufacturer's specifications and instructions for installing the type of pipe used and the Lowell Standard Details.

Section 503.2 – Excavation and Backfill

All water mains shall be bedded and backfilled in accordance with the Lowell Standard Details. The use of slag material as bedding or backfill is not acceptable.

Section 503.3 – Depth of Pipe Cover

Unless otherwise shown on the engineering plans or indicated in the special provision, all water pipe shall be laid to a minimum depth of 5 feet (5') measured from the ground surface or edge of pavement of the adjoining roadway (whichever is deeper), or established grade to the top of the barrel of the pipe. In areas subject to subsequent excavation or fill, the mains shall be laid to grades shown on the engineering plans.

Section 503.4 - Pipe Foundations

The trench, unless otherwise specified, shall have a flat bottom conforming to the grade to which the pipe is laid. The pipe shall be laid on sound soil cut true and even so that the barrel of the pipe will have a bearing to its full length. Bell holes shall be excavated for joints. Any part of the trench excavated below grade shall be corrected with an approved material and thoroughly compacted.

Section 503.5 - Dewatering of Trench

Where water is encountered in the trench, it shall be removed during pipelaying and jointing operations. Provisions shall be made to prevent floating of the pipe. Trench water shall not be allowed to enter the pipe at any time.

Section 503.6 - Handling of Pipe

Water pipe shall be handled in such a manner as will prevent damage to the pipe or coating. Damaged pipe, specials and other accessories shall be rejected and replaced to the satisfaction of the Public Works Director or Town Engineer. The methods of handling shall be corrected to prevent further damage when called to the attention of the Contractor.

The pipe ends shall be protected by the Contractor from defects while suspended above grade.

Dirt or other foreign material shall be prevented from entering the pipe or during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and relaid. At times when pipe placement is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the Director of Public Works or the Town Engineer to ensure absolute cleanliness inside the pipe.

Section 504 - Laying of Pipe

Section 504.1 - Laying of Pipe on Curves

Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflections at the joints. Where deflection for curves is required, the Director of Public Works or Town Engineer will approve the methods to be used.

Maximum deflections at pipe joints and laying radius for various pipe lengths are as found in the following standards:

Ductile Cast Iron Pipe Restrained Joints AWWA C600
Ductile Iron Pipe Push-On Joints AWWA C600

When rubber gasketed pipe is laid on a curve, the pipe shall be jointed in a straight alignment. Trenches shall be made wider on curves for this purpose.

Section 504.2 – Restrained Joints for Ductile Iron Pipe

All bends, tees, hydrants, valves, dead ends and plugs shall be restrained by utilizing restrained joint piping and fittings. Concrete thrust blocks may only be used in lieu of restrained joints with prior approval of the Public Works Director or the Town Engineer.

A. Approved Restrained Joint Pipe and Fittings

1. U.S. Pipe: Field Lok Gaskets, TR Flex Pipe
2. McWane Cast Iron Pipe Co: Tyton Joint or Fastite Restrained Joint.
3. Griffin Pipe Products: Field Lok Gasket or equivalent
4. American Cast Iron Pipe Co.: Fast Grip Gasket, Lok-Ring or Flex Ring Joint Pipe.
5. EBBA Iron Co: Mega-Lugs.

Section 504.3 - Jointing Rubber Gasket Joint Pipe (AWWA C111)

The inside of the bell shall be thoroughly cleaned to remove all foreign matter from the joint. The circular rubber gasket shall be inserted in the gasket seat provided. A thin film of gasket lubricant shall be applied to inside surface of the gasket. Gasket lubricant shall be a solution of vegetable soap or other solution supplied by the pipe manufacturer. The spigot end of the pipe shall be cleaned and entered in the rubber gasket in the bell, using care to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end to the seat of the bell.

All water pipe shall be furnished with a depth mark to assure that the spigot end is inserted to the full depth of the joints. Field-cut pipe lengths shall be beveled to avoid damage to the gasket and facilitate making the joint.

Section 504.4 - Connections to Existing Mains

Connections to existing water mains shall be accomplished without interruption of service. Materials and methods for making wet connections to existing mains shall be pre-approved by the Lowell Public Works Director or the Town Engineer prior to the execution of the work. Tapping sleeves, saddles and valves shall be installed in accordance with the manufacturer's instructions.

- A. Tapping sleeves shall be used for making wet taps 4 inches and larger on existing water mains 6-inches and larger. Tapping sleeves shall either be ductile iron split sleeve type with a flanged outlet and mechanical joints to seal around the pipe or stainless steel split sleeves with a flanged outlet and a full-face rubber gasket to form the seal.
- B. Ductile iron tapping sleeves shall be used for size on size taps up to 12" x 12". For applications greater than 12" x 12" a tapping sleeve and valve is not permitted. The tee and valve shall be cut into the existing main.
- C. Tapping valves shall conform to the applicable requirements of AWWA C509. All tapping valves shall have flanged inlets and mechanical joint outlets.
- D. Before a tapping sleeve is installed, the exterior of the existing main and the interior surfaces of the sleeve shall be thoroughly cleaned and disinfected to remove all contaminants.

Section 504.5 – Boring and Casing

When casing pipe is specified for highway or railroad crossings, the installation shall be completed in accordance with applicable federal, state and local regulations and the terms of the excavation permit for the installation. In the case of a railroad crossing the installation shall comply with the regulations established by the railroad permit or license.

In order to avoid the transfer of earth and live loads to the water main, the space between the water main and casing should not be completely filled unless required by the permit. The ends of the casing pipe shall be closed so as not to allow any drainage to flow into or earth to fill the casing. Casing chocks shall be installed at a minimum of two points on each water pipe and each pipe joint shall be restrained.

Section 504.6 - Water Main Pressure Test

All new water main construction shall be hydrostatically tested in accordance with ANSI/AWWA C600. Before testing, all air shall be expelled and all caps, plugs and fittings shall be properly braced. Air shall be expelled by opening a hydrant or air release vent or corporation stops at the high points of the main. Once all the air is released, valves between the existing distribution system and main to be tested are closed. The main shall be pressurized to 150 psi and held at this test pressure for at least two (2) hours, with leakage and pressure recordings being conducted simultaneously. Any make-up water shall be carefully measured by a meter or by pumping water from a vessel of known volume. After every five (5) psi drop (in the event the psi drop should occur) the pressure shall be returned to 150 psi and the leakage recorded.

Leakage shall not exceed the volume allowed by ANSI/AWWA C600 in accordance with the following formula:

$$L = \frac{SD\sqrt{P}}{133,200}, \text{ where}$$

L = Allowable Leakage in Gallons per Hour.

S = Length of Pipe Tested in Feet.

D = Nominal Diameter of Pipe in Inches.

P = Average Test Pressure during Test in Pounds/Square Inch (psi) (Gauge).

If the leakage from a test section is greater than the allowable leakage, the leak shall be located and repaired. The pressure and leakage test shall be repeated until satisfactory results are obtained.

Section 504.7 – Disinfection

All mains shall be disinfected by utilizing the Tablet, Continuous Feed or Slug method in accordance with AWWA C651. A Disinfection Plan shall be submitted to the Lowell Public Works Director or the Lowell Town Engineer for review and approval prior to the installation of any water mains.

All taps required for the purposes of chlorination, flushing, temporary or permanent release of air, and sampling shall be provided as a part of the construction of water mains.

Section 504.8 - Final Flushing and Testing

Final flushing and bacteriological testing shall be completed in accordance with AWWA C651. A Flushing Plan shall be submitted to the Lowell Public Works Director or the Lowell Town Engineer for review and approval prior to the installation of any water mains. Flushing shall be accomplished by using permanent or temporary hydrants or flush-outs installed at the end of the main. Heavily chlorinated water shall be neutralized prior to being discharged.

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length shows, upon test, the absence of chlorine in excess of that carried in the system.

After flushing, a sample of the water shall be taken for bacteriological examination by the Lowell Water Department. The laboratory shall test for the presence of coliform organisms. A second water sample shall be taken 24 hours after the first. If both water samples are determined safe by Lowell, the main may be placed into service. If the first or second sample shows contamination or if the chlorine residuals are not adequate, the main shall be reflushed and/or rechlorinated and the above procedure repeated until tests indicate the main has been properly disinfected.

Section 505 - Valves

Section 505.1 - Description

The valves shall be suitable for ordinary waterworks service, intended to be installed in a normal position on buried pipe lines for water distribution systems. The minimum requirements for all valves shall, in design, material and workmanship, conform to the standards of AWWA C500 and C509. All materials used in the manufacture of water works valves shall conform to the AWWA standards designed for each material listed.

Valves shall be placed to minimize inconvenience and sanitary hazards during main repairs. Valves shall be placed at each branch, hydrant, dead end and at intervals not exceeding 800 feet.

Section 505.2 - Materials

All valves shall be resilient wedge gate valves. Butterfly valves may not be used except as directed by the Lowell Public Works Director or the Lowell Town Engineer. End connections of gate valves shall be restrained by one of the following means:

1. Mechanical Joint restrained by Mega Lugs
2. Push-On (Rubber Gasket) Joints restrained by locking gaskets
3. Flange Joints for use with tapping valves.

Acceptable manufacturers include: US Pipe, Mueller, American Pipe and McWane.

Section 505.3 - Installation of Gate Valves

All gate valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe on the manner as set forth in the AWWA Standards for the type of connection ends furnished.

All valves shall be installed in a vertical position and be provided with a standard valve box and valve box stabilizer, as shown in Lowell Standard Drawings.

After installation, all valves shall be subjected to the field test for piping and valves.

Section 505.4 – Valve Boxes for Water Mains and Water Services

Adjustable cast iron valve boxes shall be set to position during backfilling operations so they will be in a vertical alignment to the gate valve operating stem. The lower casting of the unit shall be installed on top of a valve box stabilizer, in such a manner as to be cushioned and to not rest directly upon the body of the gate valve or upon the water main alignment into such an elevation that its top

will be at final grade. Backfill around the unit shall be placed and compacted to the satisfaction of the Lowell Public Works Director or Lowell Town Engineer.

Section 506 - Fire Hydrants

Section 506.1 - Description

These specifications are to be used in conjunction with the AWWA Standard C502 for fire hydrants for ordinary water works service.

Section 506.2 – Hydrant Materials

All materials used in the production of fire hydrants for ordinary service shall conform to the specifications designated for each material listed in AWWA Standard C502.

The hydrant shall be Mueller Model Super Centurion 250 A421 with Aqua Grip Shoe or Kennedy Model K81D. The name or make of the manufacturer size of the valve opening shall be plainly cast in raised letters and so placed on the hydrant barrel as to be visible after the hydrant has been installed.

Section 506.3 - Hydrant Details

A. The dimensions and details of hydrants and nozzles, unless otherwise noted, shall be as follows:

- Minimum hydrant connection pipe size diameter – 6 inches (6")
- Minimum size of hydrant lead and auxiliary gate valve – 6 inches (6")
- Hose nozzles, number and size: Two (2) - two and one half inch (2 ½") nozzles and One (1) – four and one half inch (4 ½") pumper nozzle. The 4 ½-inch opening shall be equipped with a Storz Connector.
- Thread pattern – National Standard
- Color – Safety yellow
- Hydrant valve opens counterclockwise

Section 506.4 - Construction Details

Hydrant shall be plumb and shall be set so that the lowest hose connections are at least 18 inches (18") and no more than 24 inches (24") above the surrounding finished grade. The pumping nozzle shall face the adjoining roadway. All hydrants shall be inspected in the field upon delivery to the job to insure proper operations before installation. A minimum of one quarter cubic yard (1/4 cy) of coarse stone, with gravel or like porous material, shall be placed at and around the base of the hydrant to insure proper drainage of the hydrant after use. Care shall be taken to insure that weep holes are not covered by concrete. The hydrant shall be set on a concrete block to insure a firm bearing for the hydrant base. The resetting of existing hydrants and moving and reconnection of existing hydrants shall be handled in a manner similar to a new installation.

Fire hydrants shall be encased in polyethylene in accordance with AWWA C105. Wrap shall be taped off 6 inches above and below the drain port and wrap removed in this area to allow for proper barrel drainage.

Section 506.5 - Hydrant Location

Hydrants shall be installed at locations shown on the approved construction drawings. Hydrants should be placed at each street intersection and at intermediate points between intersections as required by the Lowell Director of Public Works or the Lowell Town Engineer. Generally, hydrant spacing shall be no more than 600 feet depending on the area being served.

For structures with fire department connections (FDC), a hydrant shall be placed no further than 100 feet from the FDC. The hydrant shall be accessible to the fire department from a paved surface.

Fire hydrants shall be installed along public streets within the public right of way or easement, at the side property lines. No hydrant shall be located in excess of 10 feet from the curb or edge of pavement nor closer than 2 feet from the curb or edge of pavement.

Section 506.6 - Fire Flow Requirements

The amount of water necessary to fight a fire for a particular building is called the required fire flow. It is based on the type of construction, building size, and fire hazard of the occupancy.

Fire flow calculations shall be prepared in accordance with the Guide for Determination of Required Fire Flow, published by Insurance Services Office, Inc. (ISO).

The design engineer shall show that the water system can supply the required fire flow based upon source information provided by Lowell.

Section 507 Water Services

Section 507.1 - Installation

Service connections shall be made by the developer or contractor. Water mains in newly constructed subdivisions shall be pre-tapped for future customers. No tap shall be connected to a customer service line until the water main has passed its pressure test and been properly disinfected. Each separate building shall have its own service connection. All service fittings shall be in accordance with the current edition of AWWA C800.

The minimum size of water service connections in the Town of Lowell shall be 1-inch (1") and shall be copper tube type "K". Water service connections 4 inches (4") and larger shall be ductile iron pipe water main and shall comply with all specifications for water mains. All copper connections shall be made with compression fittings. Service connections to mains 6 inches in diameter and larger can be tapped directly to the main. Service connections to mains less than 6-inches in diameter shall utilize tapping saddles.

The corporation stop shall be Mueller Company H-1500 Ori-seal III, Ford FB 1000-4Q or approved equal and shall be installed by tapping machine. The tap shall be made in the upper third of the main as close to a forty-five degree (45°) angle with the horizontal axis as is practical. A tap into the top of the main will not be permitted. All taps shall have a minimum of 1-foot (1') separation.

The round way ground key stop shall be Mueller Company H-1504-2 Ori-seal III with quarter turn check, Ford B44-444-Q or approved equal. Buffalo box shall be Mueller Company H-10334 Arch Type with 33-inches (33") stainless steel rod or approved equal 5 1/2 feet (5-1/2') in length having an inside diameter of the upper section of not less than 1 inch (1"). All water services shall have a minimum of 5 feet (5') of cover over the service. All buffalo boxes shall be installed in the parkway within 3 feet (3') of the side property line.

The contractor shall record the location of each buffalo box in relation to the nearest corner lot line. Two copies of this record shall be filed with the Town prior to final inspection. When a water service is installed beneath existing roadways, sidewalks and/or driveways, the pipe shall be installed by pushing or auguring a hole beneath the said roadway, sidewalk and/or driveway and installing the service pipe through the hole.

The size of any opening in the roadway to connect the water service to the main shall be kept to a minimum, and the roadway replaced in accordance with Section 200, materials and thickness to be approved by the Town.

Installation of a water service in the same trench as the sanitary sewer service will not be allowed. A 10-foot (10') horizontal separation between a sanitary sewer and water service shall be maintained. The buffalo box shall not be placed within a hard surface sidewalk, driveway or access drive.

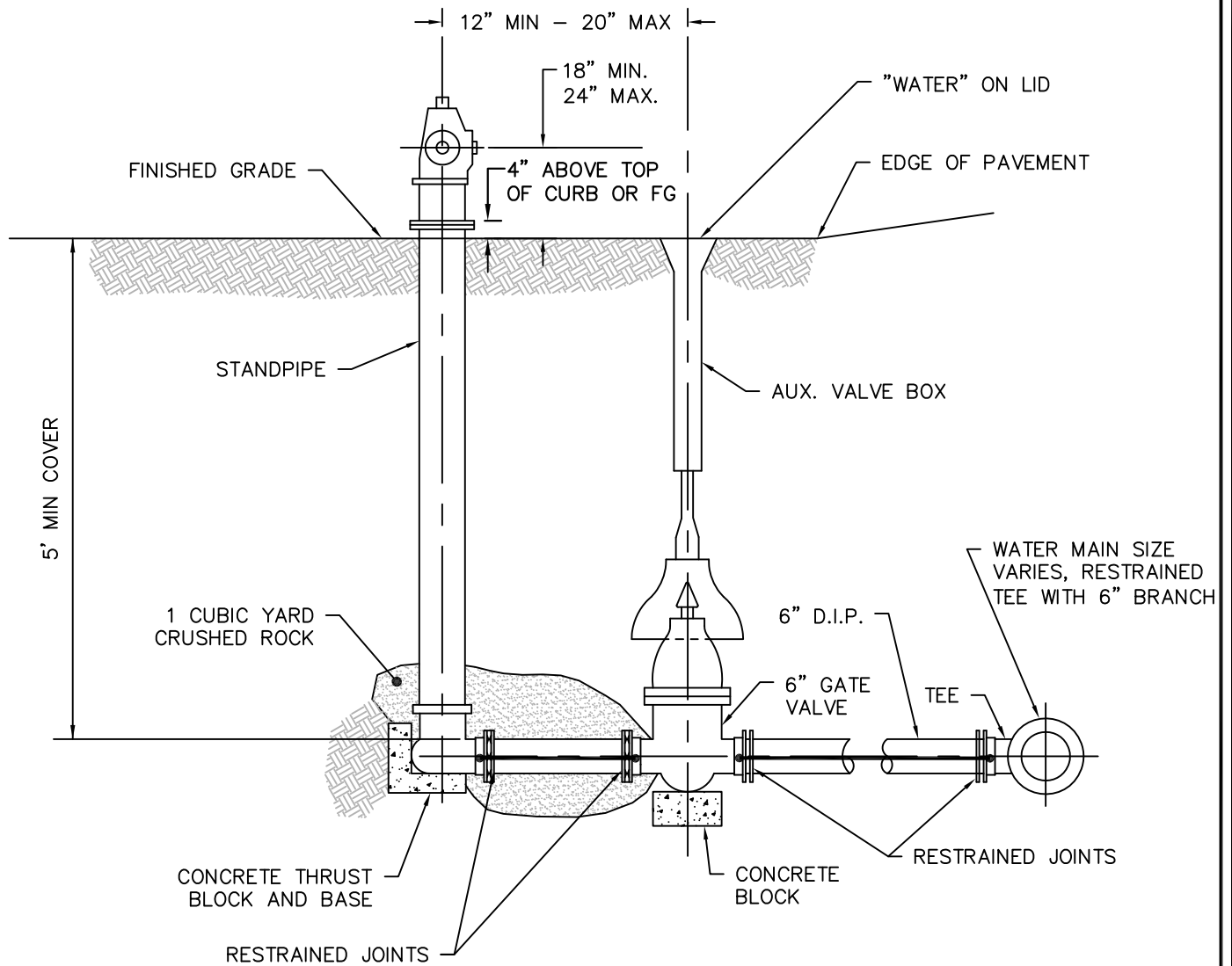
Section 508 - Meters

Section 508.1 - Meters

All water services shall be metered as close to the point where the service enters the building as possible. Meters and meter horns shall be provided by the Town in accordance with the Town's water ordinance. Meter horns shall be installed by a licensed contractor. The Town will install the meter. Water service shall be installed in such a manner that all meters shall be centered 18-inches (18") above the floor and spaced from the outside wall as follows:

- 1-inch (1") meter span shall be 10 inches (10") from outside wall.
- 1 1/2-inches (1-1/2") meter span shall be 12 inches (12") from outside wall.
- 2 inches (2") and larger meter spans shall be not less than 15 inches (15") from outside wall.

Valves shall be installed on both sides of the meter spread. In the case of a bypass system utilized around a meter installation, a gate valve shall be installed in the bypass line and a positive locking system provided by the Town, with a lock.



1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN SYSTEMS STANDARDS.

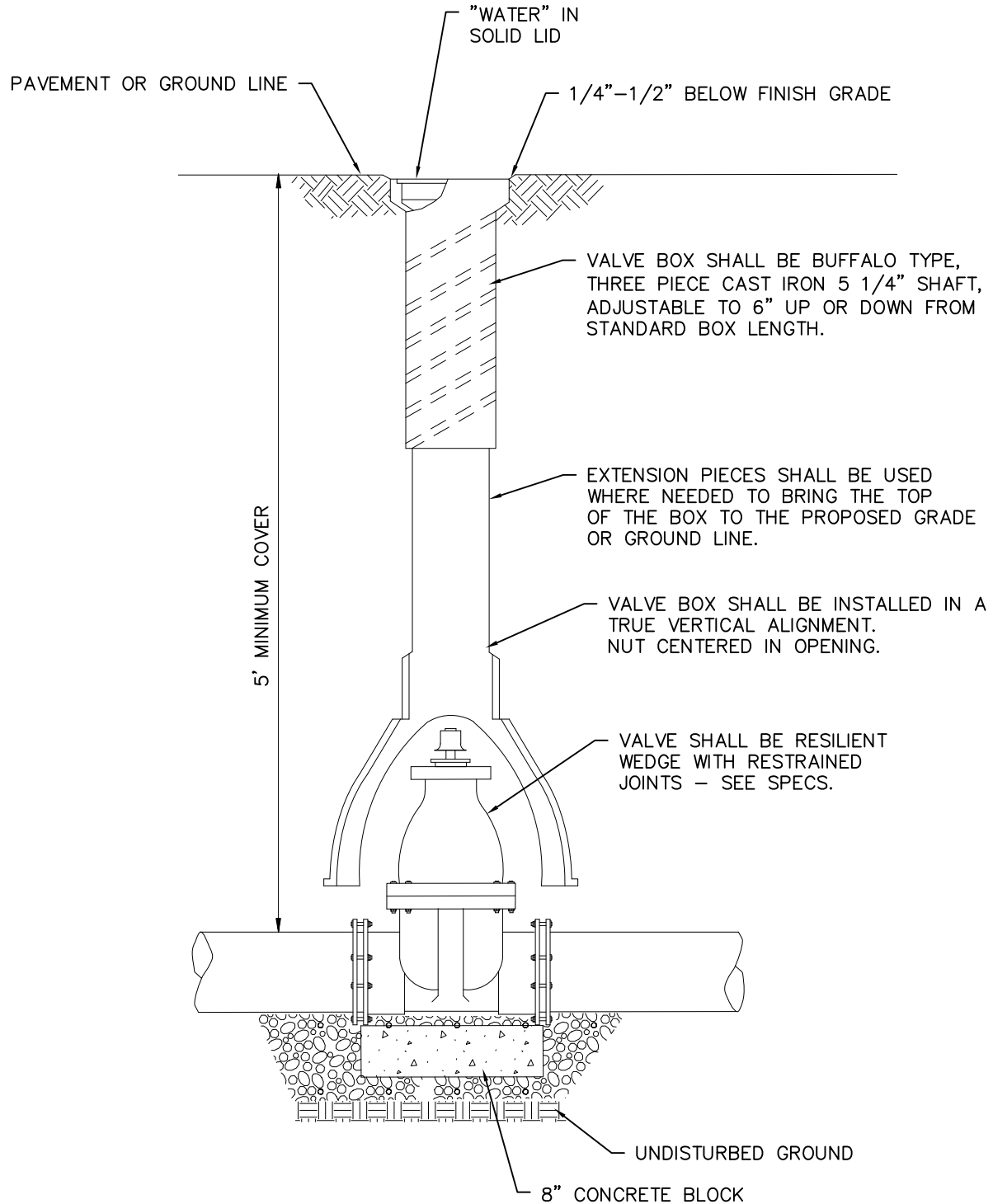
STANDARD DETAILS FIRE HYDRANT



DATE:
01/01/15

Plate No.

500 - 1



1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN SYSTEMS STANDARDS.

STANDARD DETAILS

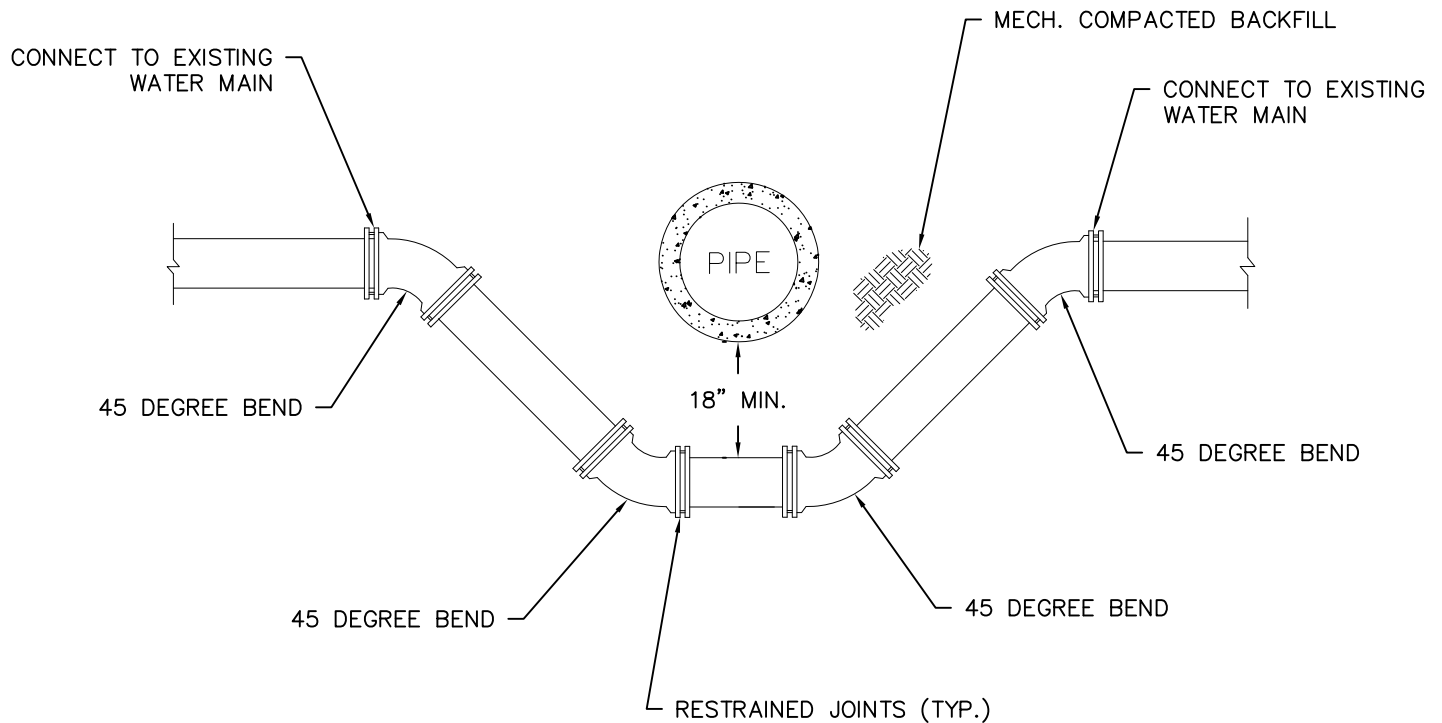
GATE VALVE BOX



DATE:
01/01/15

Plate No.

500 - 2



NOTES:

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN SYSTEMS STANDARDS.
2. IN LIEU OF 45 DEGREE BENDS, WATER MAIN DEPRESSION MAY BE CONSTRUCTED BY DEFLECTING WATER MAIN PER MANUFACTURER'S RECOMMENDATIONS TO ACHIEVE THE MINIMUM 18 INCHES OF VERTICAL SEPARATION.

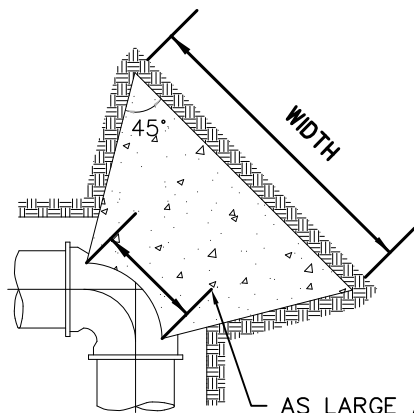
**STANDARD DETAILS
WATER MAIN DEPRESSION**



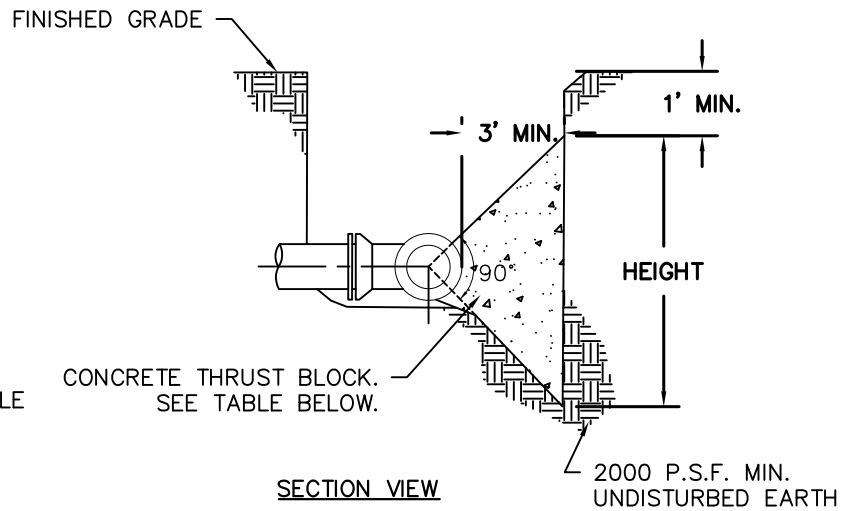
DATE:
01/01/15

Plate No.

500 - 3



PLAN VIEW



SECTION VIEW

THRUST BLOCK DIMENSIONS				
FITTING	TOTAL POUNDS THRUST	TOTAL BEARING AREA (S.F.)	THRUST BLOCK	
			HEIGHT (FT.)	WIDTH (FT.)
6" 90° BEND	12,000	12,000	2.5	2.5
6" 45° BEND	6,700	6,700	1.75	2
6" TEE OR PLUG	8,400	8,400	2	2
8" 90° BEND	19,000	19,000	3	3
8" 45° BEND	10,500	10,500	2.5	2
8" TEE OR PLUG	13,500	13,500	2.75	2.5
10" 90° BEND	28,000	28,000	4	3.5
10" 45° BEND	15,500	15,500	2.75	3
10" TEE OR PLUG	19,500	19,500	3.5	3
12" 90° BEND	41,000	41,000	4	5
12" 45° BEND	23,000	23,000	3	4
12" TEE OR PLUG	28,000	28,000	3.5	4
16" 90° BEND	70,000	70,000	6	6
16" 45° BEND	38,000	38,000	4	5
16" TEE OR PLUG	50,000	50,000	5	5

NOTES:

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN SYSTEMS STANDARDS.
2. PIPE JOINT AND BOLTS MUST BE ACCESSIBLE.
3. CONCRETE SHALL BE CURED FOR MINIMUM OF 7 DAYS AND SHALL HAVE A COMPRESSION STRENGTH OF 3000 P.S.I. @ 28 DAYS.
4. THRUST BLOCKS SHALL BE POSITIONED TO COUNTERACT THE DIRECTION OF THE RESULTANT THRUST FORCE.
5. CONTRACTOR SHALL NOTIFY ENGINEER IF SOIL OF LESS THAN 2000 P.S.F. IS ENCOUNTERED.
6. FIVE (5) MIL POLYETHYLENE PLASTIC SHALL BE USED TO COVER FITTINGS PRIOR TO POURING THE THRUST BLOCK.
7. THRUST BLOCKS SHALL ONLY BE UTILIZED WITH PRIOR APPROVAL FROM THE DIRECTOR OF PUBLIC WORKS FOR THE TOWN OF LOWELL.

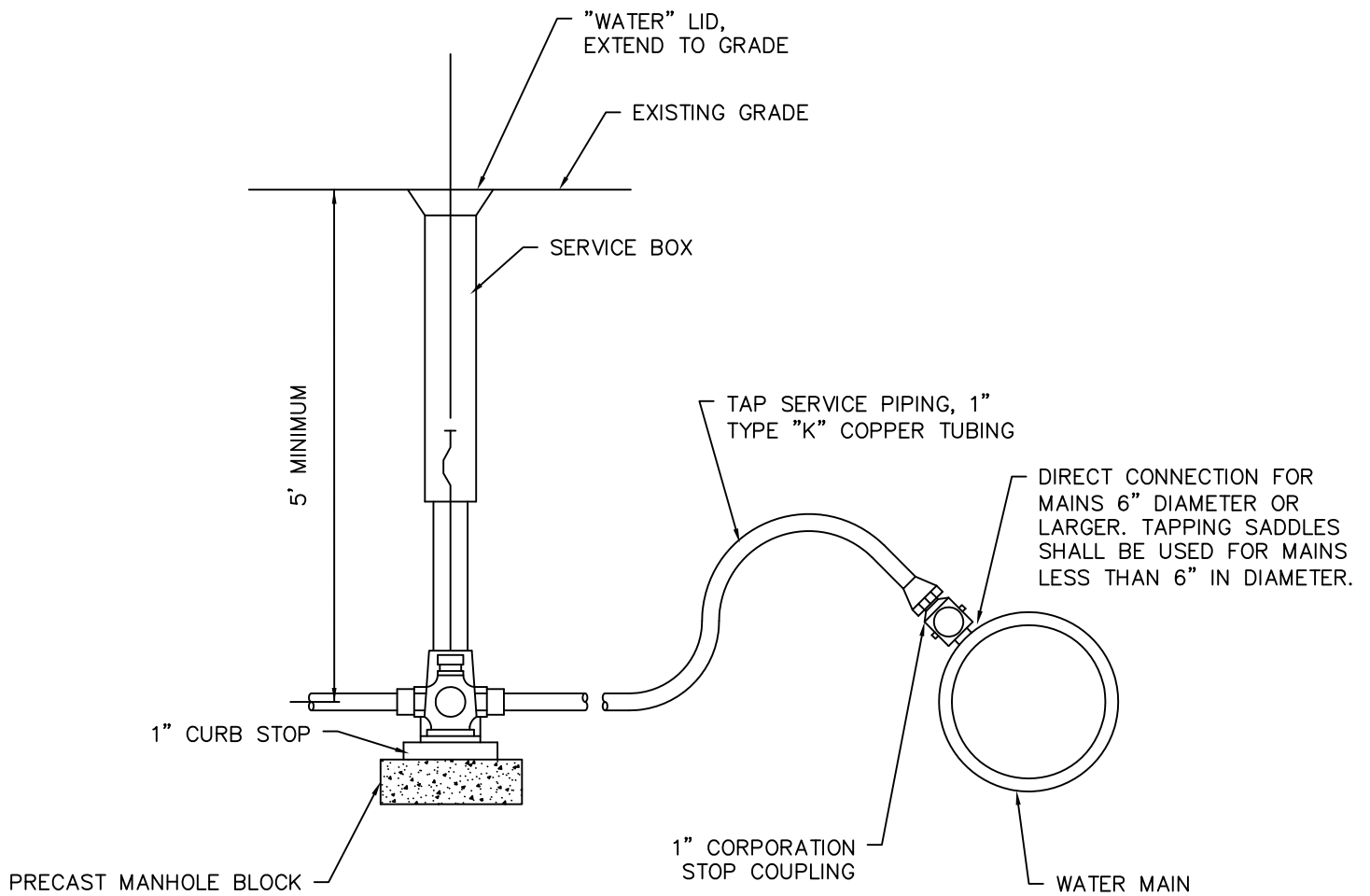
**STANDARD DETAILS
CONCRETE THRUST BLOCKING**



DATE:
01/01/15

Plate No.

500 - 4



1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN SYSTEMS STANDARDS.

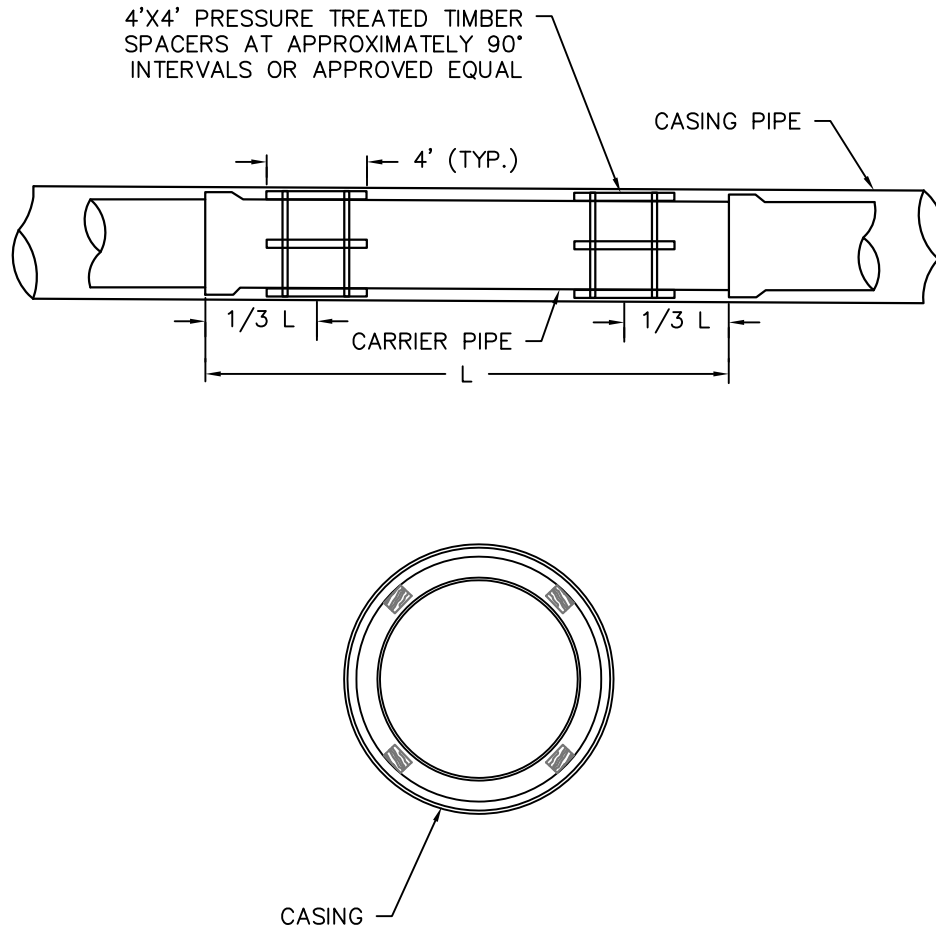
STANDARD DETAILS SERVICE CONNECTION



DATE:
01/01/15

Plate No.

500 - 5



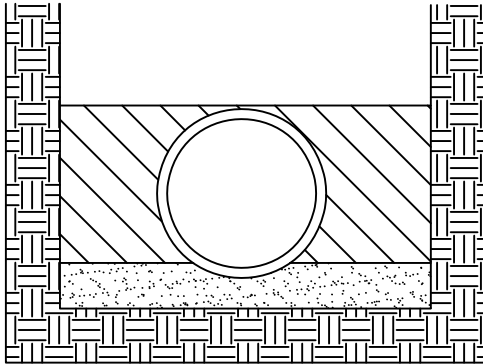
NOTES:

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN SYSTEMS STANDARDS.
2. SUPPORT CARRIER PIPE WITHIN CASING PIPE USING EITHER PREFABRICATED PLASTIC SPACERS OR PRESSURE TREATED 4" X 4" TIMBERS STRAPPED TO THE CARRIER PIPE WITH $\frac{1}{2}$ " MINIMUM STEEL STRAPPING. PROVIDE MINIMUM OF TWO SETS OF SPACERS/TIMBERS PER LENGTH OF PIPE. SPACERS / TIMBERS SHALL BE SPACED EVENLY ACROSS THE LENGTH OF EACH PIPE. THE CARRIER PIPE AND CASING SHALL NOT BE IN DIRECT CONTACT. SPACERS TO PROVIDE SUPPORT AT ANY ORIENTATION WITHIN THE CASING PIPE.
3. AFTER ALL TESTING IS COMPLETE, SEAL EACH END OF THE CARRIER PIPE WITH GROUT.
4. MAINTAIN THE ANNULAR SPACE BETWEEN THE CARRIER PIPE AND CASING PIPE FREE OF DEBRIS OR EARTH. ANNULAR SPACE TO BE DRY BEFORE SEALING THE ENDS.
5. DO NOT FILL THE ANNULAR SPACE WITH GROUT, PEA GRAVEL, OR OTHER MATERIAL EXCEPT AT THE END SEALS.
6. IF PREFABRICATED PLASTIC SPACERS ARE UTILIZED, INSTALL IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

STANDARD DETAILS
CASING DETAIL FOR WATER MAIN

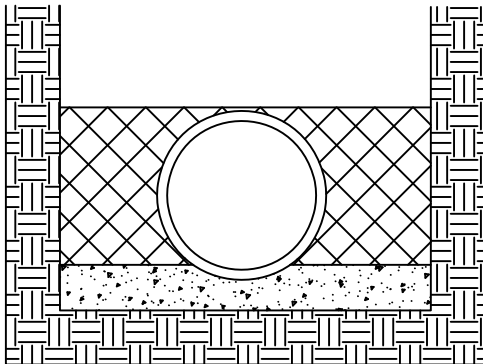


STANDARD ANSI/AWWA C150/A21.50 LAYING CONDITIONS



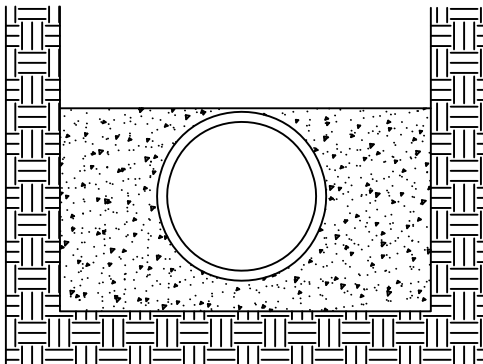
TYPE 3

PIPE BEDDED IN 4" MINIMUM LOOSE SOIL. BACKFILL LIGHTLY CONSOLIDATED TO TOP OF PIPE.



TYPE 4

PIPE BEDDED IN SAND, GRAVEL, OR CRUSHED STONE TO DEPTH OF 1/8 PIPE DIAMETER, 4" MINIMUM. BACKFILL COMPACTED TO TOP OF PIPE. (APPROXIMATELY 80% STANDARD PROCTOR, AASHTO T-99).



TYPE 5

PIPE BEDDED TO ITS CENTERLINE IN COMPACTED GRANULAR MATERIAL, 4" MINIMUM UNDER PIPE. COMPACTED GRANULAR OR SELECT MATERIAL TO TOP OF PIPE. (APPROXIMATELY 90% STANDARD PROCTOR, AASHTO T-99).

NOTES:

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN SYSTEMS STANDARDS.
2. "FLAT BOTTOM" IS DEFINED AS UNDISTURBED EARTH.
3. "LOOSE SOIL" OR "SELECT MATERIAL" IS DEFINED AS NATIVE SOIL EXCAVATED FROM THE TRENCH, FREE OF ROCKS, FOREIGN MATERIALS, AND FROZEN EARTH.

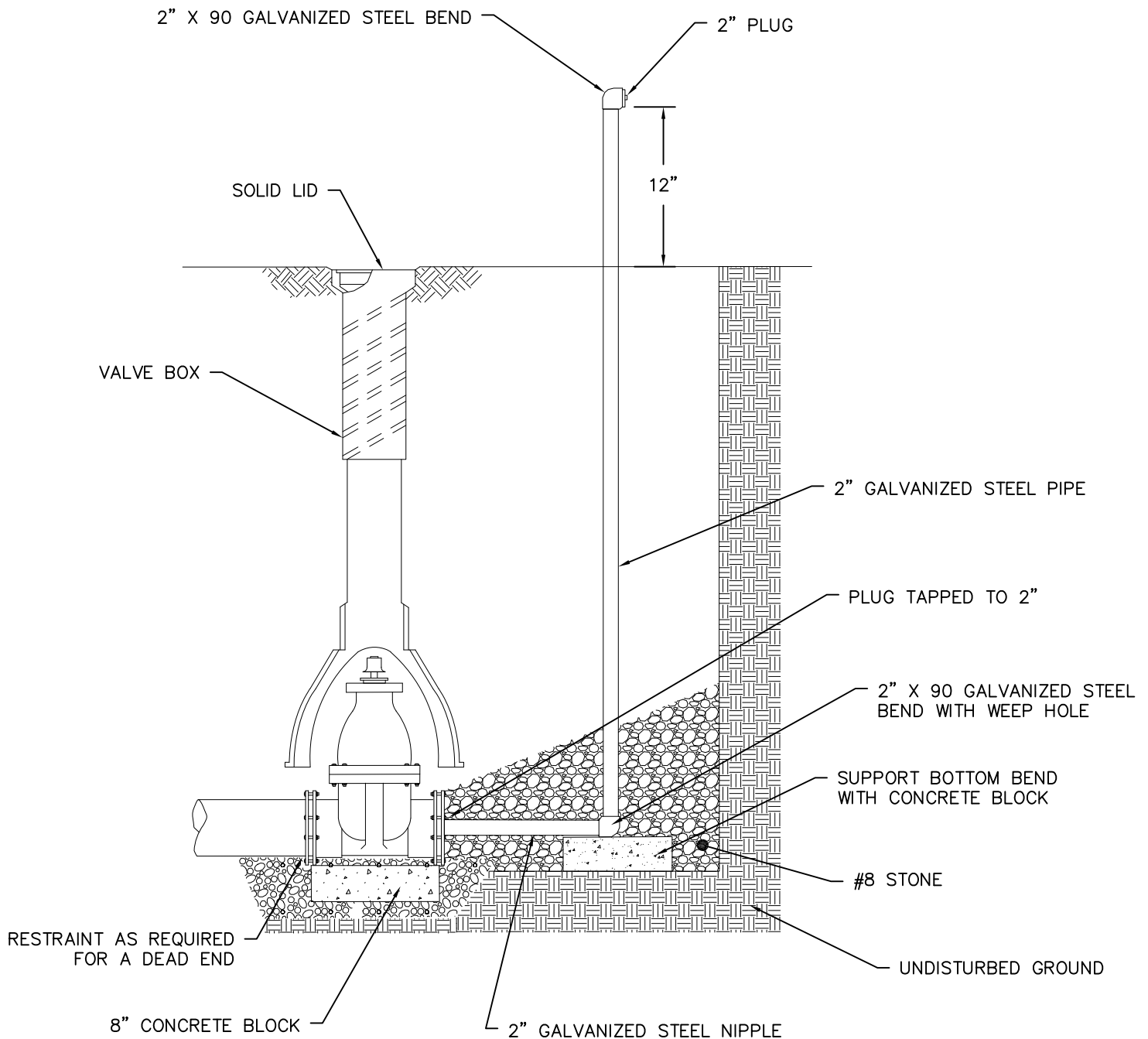
STANDARD DETAILS
WATER MAIN LAYING CONDITIONS



DATE:
01/01/15

Plate No.

500 - 7



1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN SYSTEMS STANDARDS.

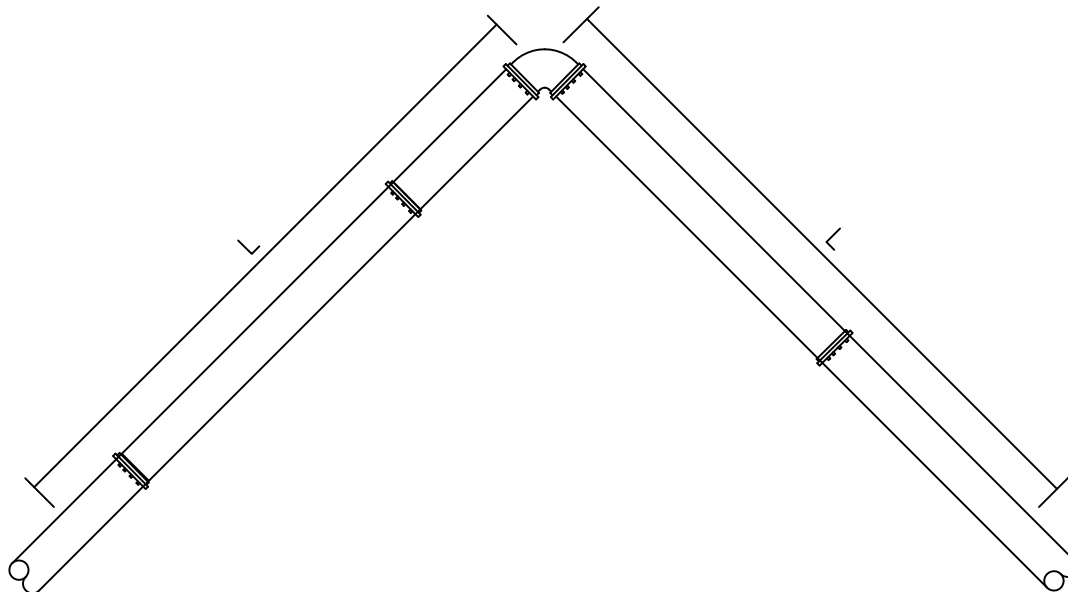
STANDARD DETAILS FLUSH OUT ASSEMBLY



DATE:
01/01/15

Plate No.

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DUCTILE IRON LINE

PIPE DIA.	BEND ANGLE			
	11 1/4°	22 1/2°	45°	90°
6	2	5	9	21
8	3	6	11	27
10	4	7	14	32
12	4	8	16	38
16	5	10	20	48

PE WRAPPED DIP:
 SOIL TYPE: ML OR CL
 TRENCH TYPE: 3
 COVER: 5'
 TEST PRESSURE: 150 PSI
 SAFETY FACTOR 1.5

MINIMUM RESTRAINED LENGTH (L)

NOTES:

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN SYSTEMS STANDARDS.
2. LENGTH OF RESTRAINT SHOWN IS IN FEET. PIPE DIAMETERS ARE IN INCHES.
3. INFORMATION IN THE TABLES ABOVE ARE BASED ON THE DESIGN INFORMATION SHOWN. THE ENGINEER SHALL PROVIDE AMENDED RESTRAINT LENGTHS IF SITE CONDITIONS DIFFER.

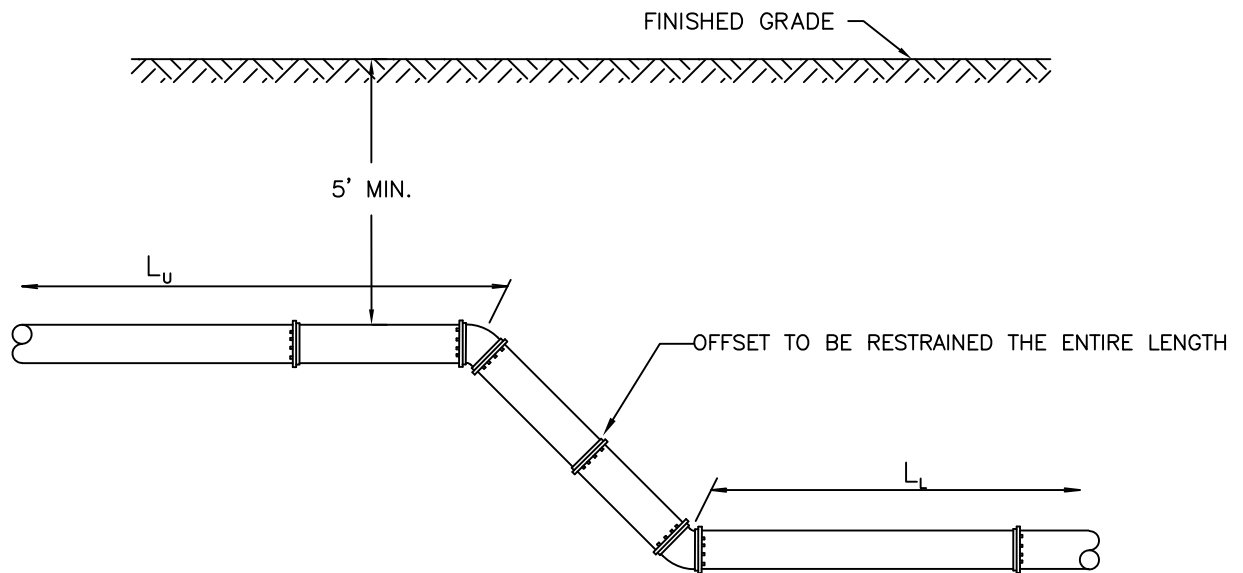
STANDARD DETAILS HORIZONTAL BEND RESTRAINT



DATE:
 01/01/15

Plate No.

500 - 9



POLYETHYLENE WRAPPED DUCTILE IRON LINE

PIPE DIA.	BEND ANGLE					
	11 $\frac{1}{4}^{\circ}$		22 $\frac{1}{2}^{\circ}$		45 $^{\circ}$	
	L_u	L_L	L_u	L_L	L_u	L_L
6	6	2	11	5	23	9
8	8	3	15	6	31	11
10	9	4	18	7	37	14
12	11	4	21	8	43	16
16	14	5	27	10	56	20

PE WRAPPED DIP:
SOIL TYPE: CL OR ML
TRENCH TYPE: 3
COVER: 5'
TEST PRESSURE: 150 PSI
SAFETY FACTOR 1.5

NOTES:

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN SYSTEMS STANDARDS.
2. LENGTH OF RESTRAINT SHOWN IS IN FEET. PIPE DIAMETERS ARE IN INCHES.
3. INFORMATION IN THE TABLES ABOVE ARE BASED ON THE DESIGN INFORMATION SHOWN. THE ENGINEER SHALL PROVIDE AMENDED RESTRAINT LENGTHS IF SITE CONDITIONS DIFFER.

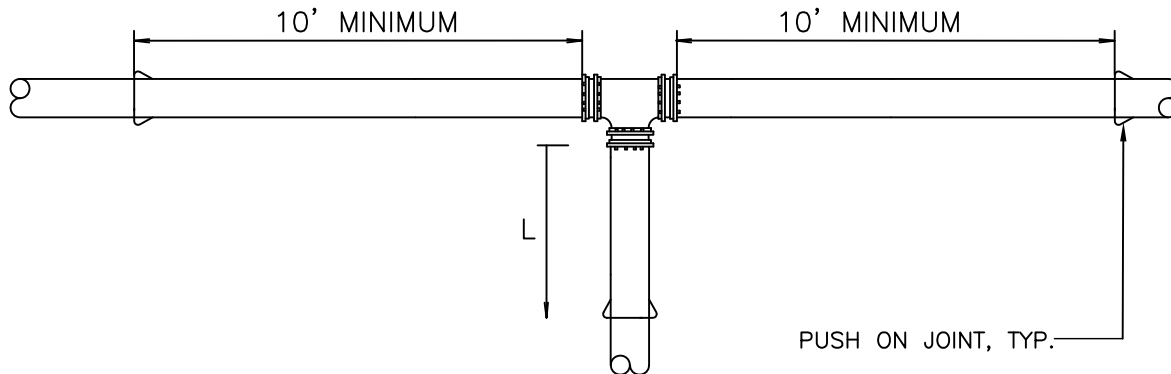
STANDARD DETAILS VERTICAL BEND RESTRAINT



DATE:
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500 - 10



POLYETHYLENE WRAPPED DUCTILE IRON PIPE

PE WRAPPED DIP:
 SOIL TYPE: CL OR ML
 TRENCH TYPE: 3
 COVER: 5'
 TEST PRESSURE=150 PSI
 SAFETY FACTOR 1.5

TEE \ Ur	10'
6X6	*
8X6	*
8X8	21
10X6	*
10X8	7
10X10	35
12X6	*
12X8	*
12X10	24
12X12	51
16X6	*
16X8	*
16X10	*
16X12	32
16X16	80

MINIMUM RESTRAINED LENGTH (L)

* RESTRAIN AT TEE ONLY.

NOTES:

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN SYSTEMS STANDARDS.
2. LENGTH OF RESTRAINT SHOWN IS IN FEET. FITTING DIAMETERS ARE IN INCHES.
3. L = MINIMUM RESTRAINED LENGTH ALONG THE BRANCH.
4. INFORMATION IN THE TABLES ABOVE ARE BASED ON THE DESIGN INFORMATION SHOWN. THE ENGINEER SHALL PROVIDE AMENDED RESTRAINT LENGTHS IF SITE CONDITIONS DIFFER.

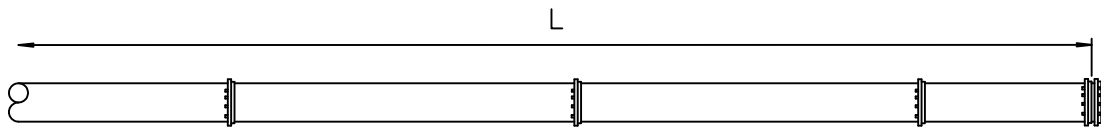
STANDARD DETAILS TEE RESTRAINT



DATE:
01/01/15

Plate No.

500 - 11



POLYETHYLENE WRAPPED
DUCTILE IRON LINE

PE WRAPPED DIP:
SOIL TYPE: CL OR ML
TRENCH TYPE: 3
COVER: 5'
TEST PRESSURE=150 PSI
SAFETY FACTOR 1.5

PIPE DIA.	L
6	56
8	73
10	88
12	104
16	134

NOTES:

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN SYSTEMS STANDARDS.
2. LENGTH OF RESTRAINT SHOWN IS IN FEET. FITTING DIAMETERS ARE IN INCHES.
3. FOR THE STUBS, THE LENGTH OF RESTRAINT (L) SHALL BE FROM THE VALVE AND NOT THE CAP.
4. INFORMATION IN THE TABLES ABOVE ARE BASED ON THE DESIGN INFORMATION SHOWN. THE ENGINEER SHALL PROVIDE AMENDED RESTRAINT LENGTHS IF SITE CONDITIONS DIFFER.

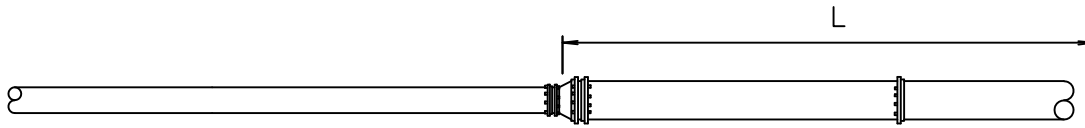
**STANDARD DETAILS
DEAD END RESTRAINT**



DATE:
01/01/15

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500 - 12



POLYETHYLENE WRAPPED
DUCTILE IRON LINE

REDUCER	L
8X6	31
10X6	54
10X8	30
12X6	76
12X8	55
12X10	31
16X6	113
16X8	98
16X10	80
16X12	57

PE WRAPPED DIP:
SOIL TYPE: CL OR ML
TRENCH TYPE: 3
COVER: 5'
TEST PRESSURE=150 PSI
SAFETY FACTOR 1.5

L = MINIMUM RESTRAINED LENGTH.

NOTES:

1. CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL COMPLY WITH SECTION 500 OF THE TOWN OF LOWELL WATER MAIN STANDARDS.
2. LENGTH OF RESTRAINT SHOWN IS IN FEET. FITTING DIAMETERS ARE IN INCHES.
3. INFORMATION IN THE TABLES ABOVE ARE BASED ON THE DESIGN INFORMATION SHOWN. THE ENGINEER SHALL PROVIDE AMENDED RESTRAINT LENGTHS IF SITE CONDITIONS DIFFER.

STANDARD DETAILS
REDUCER RESTRAINT



DATE:
01/01/15

Plate No.

500 - 13

Division 600
EROSION CONTROL
CONSTRUCTION STANDARDS

Section 600 – General Requirements

Section 600.1 – Guidelines

All persons who cause, in whole or in part, any earth change to occur shall provide soil erosion and sedimentation control so as to adequately prevent soils from being eroded and discharged or deposited onto adjacent properties or into a storm water drainage system, public street or right-of-way, wetland, creek, stream, water body or floodplain.

Section 600.2 – Reference Standards

The documents listed below are hereby incorporated into this Specification by reference:

1. Indiana Stormwater Quality Manual (<http://www.in.gov/idem/stormwater/2363.htm>)
2. Lake County, Indiana Stormwater Technical Standards Manual

Section 601 – Construction Water Quality

Section 601.1 – Erosion and Sediment Control Requirements

The major pollutant of concern during construction is sediment. Natural erosion processes are accelerated at a project site by the construction process for a number of reasons including the loss of surface vegetation and compaction damage to the soil itself, resulting in reduced infiltration and increased surface runoff. Siltation reduces the capacity of waterways, resulting in increased flood hazards to the public. Siltation also poses direct toxicity to wildlife damaging wildlife habitat.

The following principles should govern erosion and sediment control practices on all sites:

1. Sediment-laden water flowing from the site shall be detained by erosion control measures appropriate to minimize sedimentation.
2. Water shall not be discharged in a manner that causes erosion at or downstream of the point of discharge.
3. Wastes or unused building materials including, but not limited to, garbage, debris, cleaning wastes, wastewater, toxic materials and hazardous substances shall not be carried by runoff from a site. All wastes shall be disposed of in a proper, legal manner. No construction debris shall be allowed to be placed within the permanent pool of the detention ponds. If the pond is used as a sediment control measure during active construction, the performance sureties will not be released until sediment has been removed and grades have been reestablished per the approved design plans.
4. Sediment being tracked from a site onto public or private roadways or parking lots shall be minimized. This can be accomplished initially by a temporary gravel construction entrance. Sediment that has accumulated on the roadways shall be removed daily, or prior to a rain event.

5. All stormwater inlets shall be protected against sedimentation with barriers acceptable to the MS4 Operator.
6. Runoff passing through a site from adjacent areas shall be controlled by diverting it around disturbed areas, where practical. Diverted runoff shall be conveyed in a manner that will not erode receiving areas.
7. Drainageways and swales shall be designed and adequately protected so that their final gradients and resultant velocities will not cause channel or outlet scouring.
8. Disturbed ground left inactive for 15 days or more shall be stabilized by seeding, sodding, mulching, covering or other equivalent manner.
9. Sediment control measures shall be installed prior to any land disturbance and thereafter whenever necessary.
10. Earth changes shall be staged to keep the exposed areas of the ground as small as practicable.
11. Retain existing vegetation on the construction site whenever possible.
12. Manage dust emissions by applying water or tackifiers.
13. Protect soil stockpiles from erosion by utilizing appropriate erosion control measures.

Section 602 – Post Construction Water Quality

Section 602.1 – Requirements

Pollutants deposited onto surfaces or are present within the surface material can be dislodged and entrained by the rainfall-runoff process. Usually the stormwater that initially runs off an area will be more polluted than the stormwater that runs off later, after the rainfall has “cleansed” the catchment. The stormwater containing this high initial pollutant load is called the “First Flush”.

The existence of this first flush of pollutants provides an opportunity for controlling stormwater pollution from a broad range of land uses. First flush collection systems are employed to capture and isolate this most polluted runoff, with subsequent runoff being diverted directly to the stormwater system.

The first flush can be addressed as a volume or a rate. Best management practices (BMPs) can be designed to address either. Generally, volume based BMPs are those that are constructed on-site and utilize detention to settle material. Rate based BMPs (flow through) are manufactured and installed during development. The choice between volume based or rate-based BMPs must be addressed by the designer during the development of the Stormwater Management Plan with input from Lowell as the potential owner of the final product.

Section 602.2 – Detention Based BMPs

Water quality (detention) BMPs must be designed to store the water quality volume for treatment. The water quality volume, WQv, is the storage needed to capture and treat the runoff from the first one inch of rainfall (first flush). The water quality volume is equivalent to 1 inch of rainfall multiplied by the volumetric runoff coefficient (Rv) multiplied by the site area.

The minimum required water quality volume is given by the equation:

$$WQ_v = (P)(R_v)(A)/12$$

Where: WQ_v = water quality volume (acre-feet)
 P = 1 inch of rainfall
 R_v = Volumetric runoff coefficient
 A = Area in acres

The volumetric runoff coefficient is a measure of imperviousness for the contributing area and is calculated as:

$$R_v = 0.05 + 0.009(I)$$

Where: I = Percent impervious cover

If there is significant sources of off-site runoff, the designer would have the option of diverting off-site runoff around the system or the detention BMP should be sized to treat the water quality volume for the entire contributing area including off-site sources.

Section 602.3 – Flow Through BMPs

Flow through BMPs are designed to treat runoff at peak design flow rate through the system. Proprietary systems such as hydrodynamic separators are commercially available and are designed to treat runoff. The most effective hydrodynamic products combine a swirl unit to remove oils and sediments. They should be capable of removing a minimum of 80% of suspended particles. The pollutant removal efficiency will vary among manufacturers. Hydrodynamic separators alone may not remove all targeted pollutants. Secondary in-line filter systems may be required to achieve these objectives.

Proprietary systems should be designed using accepted principles of fluid mechanics to demonstrate that the water surface inside the tank can be elevated to a predetermined level in order to prevent the re-entrainment of previously trapped buoyant and nonbuoyant particles.

Section 603 – Stormwater Management Plan

Section 603.1 – Stormwater Management and Pollution Prevention Plans

Stormwater Management Pollution Prevention Plans shall be prepared in accordance with Chapter 53 of the Town of Lowell Municipal Code. Plan preparers are encouraged to follow the guidelines set forth in the Indiana Stormwater Quality Manual when preparing management and pollution prevention plans and selecting appropriate construction and post-construction erosion control practices. Any of the BMPs suggested in the Manual are acceptable to Lowell provided that they are appropriate for the situation they are being proposed. All proposed BMPs shall be approved by the Lowell Director of Public Works and/or the Lowell MS4 Coordinator during the development of the Stormwater Management Plan.