

Development Standards Manual

Town of Cedar Lake

April 2007

Amended: March 2009
 August 2009

Call Before You Dig

If you are planning to do any digging around your home or business, Indiana state law requires that you contact the Indiana Underground Plant Protection Service at 1-800-382-5544 at least two working days before you dig.



Indiana Underground Plant Protection Service (IUPPS), is a free, non-profit, statewide utility notification service that provides a communication link between IUPPS members and contractors, homeowners, or anyone else engaged in excavating activities.

This service is in place to help you avoid serious injury and avoid financial liabilities associated with damaged underground utility lines.

If you plan to dig within two feet of a marked utility line, state law requires that you expose the utility line only by the use of hand excavation, air-cutting, or vacuum excavation.

Indiana state law (IC8-1-26) requires that anyone engaged in excavating using mechanized equipment must call at least 2 full working days prior to the start of their project. IUPPS offers a one-point contact to reach member utilities to notify them of your proposed excavation.

When you call, be ready to provide the following information:

- The county where the excavation will take place
- The township where the excavation will take place
- The address of the excavation site
- The nearest cross street
- A second cross street
- What city or town the excavation site is in or near
- Where on the property the excavation will take place

IUPPS also offers on-line services. You can find their Web site at: <http://www.iupps.org>

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MANUFACTURER CITATIONS

<u>Manufacturer</u>	<u>Section(s) and Paragraph</u>
Fernco, Inc. (Tapping Saddles)	Section A, Paragraph 2.1.F.3
American Cast Iron Pipe Co. (Restrained Joints)	Section A, Paragraph 2.2.A.1.b
U.S. Pipe Co. (Restrained Joints)	Section A, Paragraph 2.2.A.1.b
Victaulic (Ductile Iron Fittings)	Section A, Paragraph 2.2.A.3.c
Hydromatic Pump (Submersible Pump)	Section A, Paragraph 2.3.A.1
Hydromatic Pump (Level Control Floats)	Section A, Paragraph 2.3.B
Bilco Co. (Access Hatches)	Section A, Paragraph 2.3.E.5
Halliday Products (Access Hatches)	Section A, Paragraph 2.3.E.5
MMC International (CamLock Quick Connect)	Section A, Paragraph 2.3.F.1
Jupiter-Neptune (Generator hookup)	Section A, Paragraph 2.3.F.2
McElroy Manufacturing (HDPE Fusion)	Section B, Paragraph 2.3.A.6 Section B, Paragraph 2.3.B.3
GNR Technologies (Risers and Shims)	Section C, Paragraph 2.1.C.1
Neenah Foundry (Castings)	Section C, Paragraph 2.1.G.1
East Jordan Foundry (Castings)	Section C, Paragraph 2.1.G.1
Cretex Specialty Products (Chimney Seal)	Section C, Paragraph 2.1.J.3
Press-Seal Gasket Corp. (Pipe Connections)	Section C, Paragraph 3.1.J.3
Mirafi Products (Geotextile Fabric)	Section D1, Paragraph 3.2.C
Tensar Corporation (Bi-Axial Geogrid)	Section D1, Paragraph 3.2.C
Press-Seal Gasket Corp. (Pipe Connections)	Structure Details
A-Lok Products (Pipe Connections)	Structure Details

ABBREVIATIONS

Whenever the following abbreviations are used in these Development Standards, they are to be construed the same as the respective expressions represented.

AASHTO	American Association of State Highway and Transportation Officials
ABS	acrylonitrile butadiene styrene
ACI	American Concrete Institute
ANSI	American Nations Standards Institute
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
C	Celsius
DMF	design mix formula
F	Fahrenheit
GFI	ground fault interrupter
HMA	hot mix asphalt
HOA	hands-off-auto
ICEA	Insulated Cable Engineers Association
INDOT	Indiana Department of Transportation
ITM	Indiana Test Method or Procedure
JMF	job mix formula
kPa	kilopascal
lb	pound
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
OSHA	U.S. Occupational Safety and Health Agency
PCCP	portland cement concrete pavement
PG	performance grade asphalt
psf	pounds per square foot
psi	pounds per square inch
PVC	polyvinyl chloride
SDR	standard dimension ratio
Town	Town of Cedar Lake

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SECTION A SANITARY SEWER SYSTEMS

PART 1 GENERAL

1.1 General Requirements

- A. Comply with all requirements specified in Subdivision Ordinance No. 498, current edition.
- B. Submittals: At the time of application for required permits, submit all information required in Subdivision Ordinance No. 498 to the Town of Cedar Lake Plan Commission.
- C. All manholes and structures shall conform to the requirements of Section C.
- D. All products specified shall use English units of measure unless otherwise specified or approved.

1.2 References

- A. ANSI / AWWA C104 / A21.3-03 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- B. ANSI / AWWA C104 / A21.4 -
- C. ANSI / AWWA C105 / A21.5-05 – American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
- D. ANSI / AWWA C110 / A21.10 – Ductile-Iron and Gray-Iron Fittings for Water
- E. ANSI / AWWA C111 / A21.11 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- F. ANSI / AWWA C151/ A21.51 – American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water
- G. ANSI / AWWA C600-05 –Installation of Ductile-Iron Water Mains and Their Appurtenances
- H. ANSI / AWWA C900-97 – Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution
- I. ASTM C969 – Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
- J. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

- K. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
- L. ASTM D1784 – Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds
- M. ASTM D2167 – Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
- N. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
- O. ASTM D2680 – Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Polyvinyl Chloride (PVC) Composite Sewer Piping
- P. ASTM D2992 – Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings
- Q. ASTM D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
- R. ASTM D3034 – Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
- S. ASTM D5926 – Standard Specification for Polyvinyl Chloride (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems
- T. ASTM F794 – Standard Specification for Polyvinyl Chloride (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
- U. ASTM F1417 – Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
- V. Indiana Department of Transportation (INDOT) Standard Specifications, current edition

PART 2 PRODUCTS

2.1 Gravity Sewer Pipe

- A. All pipe shall conform to the applicable specifications and requirements set forth herein.
- B. Pipe used in sanitary sewer construction shall be of PVC truss (ABS), solid PVC, spiral wound PVC or corrugated smooth walled interior PVC; unless otherwise approved by the Town Engineer, whereby this will be the only acceptable type of

pipe installed. All sanitary sewer pipes shall have flexible gasketed (solvent weld for truss pipe) joints.

- C. Sanitary Sewer Pipe up to fifteen inches (15") in diameter shall comply with one of the following:
 - 1. PVC sewers shall be Type PSM conforming to ASTM D3034, current edition, EXCEPT, no reworked material shall be used and shall have a cell classification of 12454-B as defined in ASTM D1784, current edition, and shall have an SDR (Standard Dimension Ratio) of not greater than twenty-six (26).
 - 2. Truss Pipe shall conform in all respects to ASTM D2680, current edition, (non-pressure pipe), and shall have an SDR of not greater than twenty-six (26) as defined in ASTM D3034.

- D. Sanitary Sewer Pipe greater than fifteen inches (15") in diameter shall comply with the following:
 - 1. Spiral Wound or Corrugated Smooth Walled Interior PVC shall conform in all respects to ASTM F794, current edition.

- E. Joints for Gravity Sanitary Sewers
 - 1. Joints shall be rubber gasketed, unless otherwise specified.
 - 2. Elastomeric seals for gasketed joints for corrugated and spiral wound PVC shall meet ASTM F477 and ASTM D3212.
 - 3. The PVC joint shall conform to ASTM D3212 "push on" type with a confined rubber gasket conforming to ASTM F477.

- F. Fittings
 - 1. Unless otherwise specified, tee or wye fittings shall be provided in the sanitary sewer main for service sewer connections. Tees or wyes shall be six inches (6") minimum inside diameter, unless otherwise specified or noted. All fittings shall be of the same material as the pipe. Material joining the fittings to the pipe shall be free from cracks and shall adhere tightly to each joining surface.
 - 2. PVC sewer fittings shall conform to the requirements of ASTM D3034 specifications. Six- and eight- inch (6"- and 8"-) fittings shall be molded in one (1) piece, with elastomeric joints and minimum socket depths as specified in Section 6.2 and 7.3.2 of the ASTM D3034 specification. Fittings ten inches (10") in diameter and larger shall be molded or fabricated from pipe meeting ASTM D3034 with manufacturer's standard pipe bells and gaskets.
 - 3. Tapping saddles shall conform to the requirements of ASTM D5926 specifications. Tapping saddles shall only be used for connections to existing PVC sanitary sewers. Tapping saddles shall be as manufactured by Fernco or approved equal.

- G. Plug for Fittings
 - 1. All fittings shall be capped with a plug of the same material as the pipe and gasketed with the same gasket material as the pipe joint, or be of material approved by the Town Engineer. The plug shall be able to withstand all test pressures involved without leakage.

- H. All flexible sanitary sewer pipe must meet a deflection test (Mandrel test) of five percent (5%).

2.2 Force Main Pipe and Fittings

A Ductile Iron Pipe and Fittings

1. Pipe

- a. Ductile iron pipe shall meet the requirements of ANSI / AWWA C151/ A21.51. Design and manufacture pipe for a working pressure of one hundred fifty pounds per square inch (150 psi) plus one hundred pounds per square inch (100 psi) surge and a safety factor of two (2) and a depth of cover indicated on the Drawings and specified in this Section. Minimum pressure class shall be as follows:

<u>Size Range</u>	<u>Pressure Class</u>
3" - 12"	350
14" and Larger	250

- b. Pipe joints shall be push-on type. Joints shall meet the requirements of ANSI / AWWA C111/A21.11. Restrained joints shall be Lok-Ring as manufactured by American Cast Iron Pipe Co., or Lok-Tyte, as manufactured by U.S. Pipe, or equal.
- c. Pipe with rubber gasket slip joints shall be furnished and installed with at least two (2) serrated brass wedges in each joint to effect conductivity of electricity across the joint for thawing purposes. The wedges shall be of sufficient size and number to carry a minimum of four hundred (400) amperes of direct current and voltage drop not to exceed one-tenth (1/10) of one (1) volt per joint, and there shall be no perceptible temperature rise and no evidence of smoking, arcing, or fuming.

2. Fittings

- a. Fittings shall be ductile iron. Fittings shall meet the requirements of ANSI / AWWA C110 / A21.10. Design and manufacture fittings for a pressure rating of one hundred fifty pounds per square inch (150 psi).
- b. Fitting joints shall be mechanical joints or restrained push-on joints. Joints shall meet the requirements of ANSI / AWWA C111 / A21.11. Thrust block mechanical joints shall be as indicated on the Drawings and specified in this Section. Restrained joints may be used instead of mechanical joints and thrust blocking. Provide stainless steel nuts, bolts, and rods for restraint of joints, fittings, bends, and valves below grade. Stainless steel Star tie bolt restraining system shall be used.

3. Adapters

- a. Adapters from ductile iron pipe to Victaulic or flange joint valves or fittings shall be ductile iron. Adapters shall meet the requirements of ANSI / AWWA C110 / A21.10. Design and manufacture adapters for a pressure rating of one hundred fifty pounds per square inch (150 psi).
- b. Adapter ends connecting to ductile iron pipe shall have plain ends, push-on joints, mechanical joints, or restrained push-on joints.

Adapters with plain ends, push-on joints, or mechanical joints may be used where restrained joints are not required. Adapters shall have restrained push-on joints where restrained joint piping is required. Mechanical joints and push-on joints shall meet the requirements of ANSI / AWWA C111 / A21.11. Restrained joints shall be Lok-Ring, Lok-Tyte, or equal.

- c. Adapter ends connecting to Victaulic or flange joint valves or fittings shall have joints complying with the specifications for the applicable valves or fittings.
4. Lining and Coating
 - a. Line the inside surfaces of all pipe, fittings, and adapters with cement mortar lining and bituminous seal coat. Cement mortar lining and bituminous seal coat shall meet the requirements of ANSI / AWWA C104 / A21.4. Coat the outside surfaces of all pipe, fittings, and adapters with bituminous coating. Outside coating shall meet the requirements of ANSI / AWWA C151/ A21.51.
 5. Gaskets
 - a. Gaskets for mechanical joints and push-on joints shall meet the requirements of ANSI / AWWA C111 / A21.11.
 6. Nuts and Bolts
 - a. Nuts and bolts for mechanical joints shall be high strength, carbon steel. Sacrificial zinc caps shall be used in combination with carbon steel materials. For new force mains, the Developer shall provide soil borings and testing by a Town approved geotechnical consultant, to document the corrosivity of the soils in the area of the proposed sanitary sewer system. Where corrosive soils are found, only stainless steel materials shall be used. Nuts and bolts shall meet the requirements of ANSI / AWWA C111 / A21.11.
 - b. Nuts shall be hexagon nuts. Bolts shall be tee head bolts.
 - c. Nuts and bolts for restrained push-on joints shall meet the requirements of the joint manufacturer.
 7. Polyethylene Encasement
 - a. Polyethylene encasement for ductile iron pipe, fittings, and adapters shall meet the requirements of ANSI / AWWA C105 / A21.5-05.
- B. Polyvinyl Chloride Pipe and Fittings, Four Inch (4") & Larger
1. Pipe
 - a. Polyvinyl chloride pipe, four inch (4") and larger, shall meet the requirements of ANSI / AWWA C900-97. Design and manufacture pipe for a working pressure of one hundred fifty pounds per square inch (150 psi) plus one hundred pounds per square inch (100 psi) surge and a safety factor of two (2) and a depth of cover indicated on the Drawings and specified in this Section. The dimension ratio shall not be greater than eighteen (18).
 - b. Polyvinyl chloride pipe shall have cast-iron-pipe-equivalent outside diameter.

- c. Pipe joints shall be push-on type. Joints shall meet the requirements of ANSI / AWWA C900-97. Do not use solvent-cement joints.

2. Fittings

- a. Fittings shall be ductile iron. Fittings shall meet the requirements of ANSI / AWWA C110 / A21.10. Design and manufacture fittings for a pressure rating of one hundred fifty pounds per square inch (150 psi).
- b. Line the inside surfaces of fittings with cement mortar lining and bituminous seal coating. Cement mortar lining and bituminous seal coating shall meet the requirements of ANSI / AWWA C104 / A21.4 . Coat outside surfaces of fittings with bituminous coating. Outside coating shall meet the requirements of ANSI / AWWA C110 / A21.10.
- c. Fitting joints shall be mechanical joints. Mechanical joints shall meet the requirements of ANSI / AWWA C111 / A21.11. Provide stainless steel nuts, bolts, and rods for restraint of joints, fittings, bends, and valves below grade. Stainless steel star tie bolt restraining system shall be used.

3. Adapters

- a. Adapters from polyvinyl chloride pipe to Victaulic or flange joint valves or fittings shall be ductile iron. Adapters shall meet the requirements of ANSI / AWWA C110 / A21.10. Design and manufacture adapters for a pressure rating of one hundred fifty pounds per square inch (150 psi).
- b. Line the inside surfaces of adapters with cement mortar lining and bituminous seal coating. Cement mortar lining and bituminous seal coating shall meet the requirements of ANSI / AWWA C104 / A21.4. Coat outside surfaces of adapters with bituminous coating. Outside coating shall meet the requirements of ANSI / AWWA C110 / A21.10.
- c. Adapter ends connecting to polyvinyl chloride pipe shall have plain ends or mechanical joints. Mechanical joints shall meet the requirements of ANSI / AWWA C111 / A21.11.
- d. Adapter ends connecting to Victaulic or flange joint valves or fittings shall have joints complying with the specifications for the applicable valves or fittings.

4. Gaskets

- a. Gaskets for polyvinyl chloride push-on joints shall meet the requirements of ANSI / AWWA C900-97.
- b. Gaskets for mechanical joints shall meet the requirements of ANSI / AWWA C111 / A21.11.

5. Nuts and Bolts

- a. Nuts and bolts for mechanical joints shall be high strength, carbon steel. Sacrificial zinc caps shall be used in combination with carbon steel materials. For new force mains, the Developer shall provide soil borings and testing by a Town approved geotechnical consultant, to document the corrosivity of the soils in the area of the proposed sanitary sewer system. Where corrosive soils are found, only stainless steel materials shall be used. Nuts and bolts shall meet the requirements of ANSI / AWWA C111 / A21.11.

- b. Nuts shall be hexagon nuts. Bolts shall be tee head bolts.
 - c. All nuts and bolts shall be Standard English sizes unless otherwise approved.
6. Tracer Wire
- a. Provide an electrically continuous type TW insulated #10 tracer wire. The wire shall be installed along the pipe, fastened to the pipe at twenty-foot (20') intervals and terminating above ground with the lead taped around each structure.
 - b. The electrically continuous type TW insulated #10 tracer wire shall also be installed along the length of all service lateral pipes. For new construction, no less than seventy-five feet (75') of slack shall be left at the stub end of the service lateral and wrapped loosely around the buried 2" x 4" location stake.
- C. Polyvinyl Chloride Pipe and Fittings, Smaller than Four-Inch (4")
1. Requirements for this section shall be determined on a case-by-case basis, as approved by the Town.
- D. Combination Sewage Air Valves (CSA)
1. Shall be dual function: venting large volumes of air through the large orifice and small pockets of air through the small orifice before shutting off. Thereafter, while the air valve is pressurized, pockets of air collected will be vented through the small orifice automatically.
 2. The combination sewage air valve shall consist of an independent large orifice air and vacuum valve with an independent small orifice air release valve. The small orifice air valve shall be separated from the large orifice air valve by a two- inch (2") bronze gate valve. The large orifice air valve shall incorporate one (1) upper and one (1) lower stainless steel float, thereby maintaining an air gap between the bottom float and upper shut-off float.
 3. The combination sewage air valve shall be fitted with inlet isolation valves to isolate the air release valve from the air and vacuum valve, and to isolate the air and vacuum valve from the force main. The combination sewage air valve shall also be fitted with two (2) blow-off valves, two (2) flush valves, and a minimum of five feet (5') of rubber hose with quick disconnects for back-flushing.
 4. Materials

a. Body, Cover & Baffle -	Cast Iron
b. Internal Parts & Linkage -	Stainless Steel (Series 300)
c. Float & Float Guide -	Stainless Steel (Series 300)
d. Seats and Needles -	Buna-N
e. Exterior Paint -	Phenolic Primer Red Oxide

2.3 Lift Stations – Submersible Wet Well

- A. Pumps
1. Pumps shall be submersible, non-clog wastewater pumps manufactured by Hydromatic Pump, or approved equal. The pump manufacturer shall be approved by the Director of Operations during the project design.
 2. Each pump shall be furnished with a submersible electric motor connected for operation with submersible cable suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet P-MSHA approval.
 3. All pumping systems shall incorporate a redundant pump.
 4. For all lift stations a spare pump (3rd pump), spare bulbs and spare fuses shall be supplied to the Public Works Department at the time of acceptance of the lift station by the Town.
- B. Level control floats shall be as manufactured by Hydromatic, or approved equal.
- C. Slide Rail System
1. The pump(s) shall automatically connect to discharge connection(s) when lowered into place on an all stainless steel single guide rail system. The guide rail system shall require no bolts, nuts, or fasteners to affect proper sealing.
 2. Each system shall consist of no more than one guide rail supported at the top by an upper guide bracket and at the bottom by the discharge connection. The guide rail base shall be equipped with a vertical-straightening vane, which properly aligns the slot in the pump bracket and centers the pump just prior to final seating. Ease and quick removal of pumps from other than the vertical direction over the center of the pump shall be a requirement of the system.
- D. Control System
1. The raw sewage pump system shall be controlled with one pump being available for service at any time.
 2. The pump control system shall be of the duplex type consisting, at a minimum, of the following components:
 - a. Pump short-circuit protection
 - b. Pump thermal overload protection
 - c. Motor contactor
 - d. Control transformer
 - e. Control transformer short-circuit protection
 - f. Control relays
 - g. Pump and control terminal blocks
 - h. Door-mounted run lights and HOA switches
 - i. NEMA 4 enclosure and mounting components
 - j. One hundred twenty volt (120 V) GFI receptacle with fifteen amperage (15 amp) circuit breaker
 - k. Pump seal leak detector probe
 3. The control system shall be designed to operate two (2) submersible pumps based on wet well level monitored by level sensors. The control system shall include automatic pump alternation, auxiliary contacts for pump thermal overload protection, and door-mounted pilot lights. Additionally, pump hour-

meters for each pump shall be provided.

4. The entire control system shall be housed in a NEMA 4 enclosure suitable for out-of-doors mounting near the pump station as directed by the Town. The enclosure shall also house all circuit breakers, disconnect switches, elapsed time meters, lights, transformers, relays, and other devices necessary to provide a complete working installation.
5. The control system shall also provide audio and visual alarm indication of high water condition and/or pump failure. Alarm indication shall be panel-mounted flashing red light and audible horn.
6. The control system shall also include a Town approved dialer for alarm call-out. The proposed dialer shall be approved by the Director of Operations during project design.

E. Access Hatch

1. Access hatches for wet well and valve vault shall be constructed of aluminum diamond plate reinforced on the underside to be capable of withstanding a live load of three hundred pounds (300) per square foot.
2. Access cover shall be equipped with hinges bolted to underside of cover with tamperproof fasteners. The cover shall open to ninety degrees (90° F) and lock automatically in that position by a positive locking arm.
3. Access cover shall be equipped with a locking hasp, locking bar, or a slam latch with removable key for locking of cover in closed position. Covers shall have a lifting handle for opening and closing of cover. All hardware shall be of stainless steel (where applicable).
4. All aluminum frame and covers shall be furnished with a bituminous coating applied to the exterior of the frame that comes in contact with concrete.
5. Acceptable manufacturers: Bilco, Halliday, or approved equal.

F. Emergency Operation Accessories

1. Bypass pump connection: Provide an auxiliary pump connection riser to permit connection of a portable bypass pump discharge directly to the force main. Provide a six-inch (6") diameter quick connect coupling (Cam Lock type as manufactured by MMC International), check valve and plug valve and adequate pipe support for the bypass pump connection.
2. Provide a properly sized standby generator with each lift station to be installed. The first annual servicing of the generator shall be the responsibility of the Developer and shall be performed by a representative of the manufacturer. All proposed equipment shall be approved by the Director of Operations during project design.
3. Provide safety netting (three hundred pound (300 lb) capacity, minimum in all wet wells in excess of five foot (5') in depth.
4. Provide a portable OSHA approved crane connection for man-entry. Crane connection size and type shall be coordinated with the Town.

PART 3 EXECUTION

3.1 Surface Conditions

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 Field Measurements, Survey Lines, Reference Points & Grades

- A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 Installation of Pipe

- A. Trenching
 1. All poles, fences, sewer, gas, water or other pipes, wires, conduits, manholes, buildings, structures and property in the proximity of any excavation shall be supported and protected from damage by the Contractor during construction.
 2. Wherever sewer, gas, water or other pipes or conduits cross the excavation, the Contractor shall support said pipes and conduits without damage to them and without interrupting their use during the progress of the Work. The manner of supporting such pipes, etc., shall be subject to review by Town.
 3. All property shall be thoroughly cleaned of all surplus materials, earth and rubbish placed thereon by the Contractor.
 4. The Contractor shall notify Town and the appropriate utility companies at least seventy-two (72) hours prior to the start of construction.
 - a. The Contractor shall coordinate all utility companies' location of any existing underground utilities and structures within the site limits.
 - b. The Contractor, prior to the start of construction, shall verify the location of any existing underground utilities and structures within the site limits. It is the Contractor's responsibility to make any and all exploratory investigation, which may be necessary to verify or locate the utility pipe, wires, structures and appurtenances of others.
- B. Location:
 1. Locate gravity sewers:
 - a. Not closer than ten feet (10') from a public water supply main or service line (measured edge to edge). The edge of manholes shall not be less than eight feet (8') from the edge of any water supply main or water service line.
 - b. Where the bottom of the water pipe will be at least eighteen inches (18") above the top of the sewer pipe, the horizontal spacing shall be a minimum of ten feet (10').
 - c. Where the gravity flow sewers cross above waterlines, the Contractor shall use pressure pipe with no joint closer horizontally than sixty inches (60") from the crossing.
 2. Locate force mains:
 - a. As indicated for gravity sewers above.
 - b. For special conditions where ten-foot (10') separation of force main and water main is not possible, this requirement may be waived provided the water main is in a separate trench or on an undisturbed earth shelf

on one (1) side of the force main and at an elevation so the bottom of the water main is at least eighteen inches (18") above the top of the sewer, as approved by the Town.

C. Laying Pipe

1. All pipe shall be reinspected for soundness and damage due to handling immediately before being lowered into the trench. Any pipe found to be unsound or damaged will be rejected and shall be removed immediately from the site of the work.
2. All pipe shall be laid accurately to the required line and grade and in such manner as to form a close, concentric joint with the adjoining pipe and to bring the invert of each section to the required grade. Bell holes shall be dug in advance of the pipe being laid as required. The supporting of the pipe on blocks will not be permitted.
3. Gravity sewer pipe laying shall proceed upgrade, beginning at the lower end of the sewer.
4. All open ends of pipes and branches shall be sealed with plugs or bulkheads firmly held in place.
5. At the end of each day's work, the open ends of all pipes shall be satisfactorily protected against the entrance of animals, children, earth or other materials.
6. Each length of section shall be properly pulled or shoved "home" with a winch or come-a-long against the section previously laid to make a proper joint. The pipe shall then be securely held in position during the backfill operations. Joints shall not be pulled or cramped more than the design of the joint will permit and so as not to injure the conduit.
7. Lay force main pipe to a depth of not less than 5 feet of cover over pipe ten inches (10") and smaller, and four feet (4') of cover over pipe twelve inches (12") and greater. Cover shall be measured from the top of the pipe to the finish grade elevation.
8. Lower pipe, fittings, and valves into the trench by hand, by means of hoists or ropes, or by other suitable tools or equipment which will not damage products, coatings, or linings. Do not drop or dump pipe, fittings, or valves into the trench.
9. Provide thrust restraint at horizontal and vertical deflection fittings and at tees, plugs, tapping sleeves, and tapping saddles.
10. Laying of ductile iron piping shall meet the requirements of ANSI / AWWA C600-05, unless otherwise specified in this Section.
11. Open excavation shall be satisfactorily protected at all times. At the end of each day's work, the open ends of all pipes shall be protected against the entrance of animals, children, earth, or debris by bulkheads or stoppers. The bulkheads or stoppers shall be perforated to allow passage of water into the installed pipe line to prevent flotation of the pipe line. Any earth or other material that may find entrance into the main sewer or into any lateral sewer through any such open end of unplugged branch must be removed at the Contractor's expense.
12. Pipe found not to comply with these standards shall be removed and replaced.

D. Setting Valves and Valve Boxes

1. Clean the interior of valves of foreign matter before installation. Tighten stuffing boxes. Inspect valves in opened and closed positions to ensure all parts are in working conditions.
2. Set buried valves and valve boxes plumb. Center valve boxes on the valves or valve operators. Locate valves outside the area of roads and streets where feasible, or where shown on the drawings. Tamp backfill around each valve box to a distance of four feet (4') on all sides of the box, or to the undisturbed trench face if less than four feet (4').

E. Dewatering

1. Dewatering sufficient to maintain the water level below the surface of the trench bottom shall be accomplished prior to pipe laying and jointing, if not done prior to excavation and placement of the bedding as called for. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench. When the dewatering operation is ended, the trench shall be replaced in such a manner so as not to disturb the pipe and its foundation.

F. Backfill Materials

1. B-Borrow shall comply with INDOT Standard Specifications, current edition. Maximum stone size shall not exceed one inch (1") or the maximum size recommended by the pipe manufacturer, whichever is smaller.
2. Earth backfill material shall contain no more than five percent (5%) organic material, no particles larger than four- inches (4") and shall be free of trash, rubble and debris. The Plastic Index of the fraction passing the No. 40 sieve shall not be more than twenty-five (25).
3. Coarse aggregate material shall be No. 53 or 73 complying with INDOT Standard Specifications, current edition.
4. Backfill materials may vary from those specified depending upon utility company requirements when trenches cross existing utilities.

G. Bedding, Rigid Pipe

1. Each pipe shall be laid in Class "B" bedding unless otherwise approved.
 - a. Definition of Terms for Bedding Explanation

Bc = Outside diameter of pipe, in inches
 D = Inside diameter of pipe, in inches
 d = Depth of bedding material below the pipe bell,
 in = inches

The values of "d", depth of bedding material below the bell of the pipe shall be as follows:

"D" (inside diameter of pipe, in.)	"d" (depth of bedding material) Minimum Requirements
27" and smaller	3"
30" and larger	4"

- b. Class "B" bedding is that method of bedding in which the conduit is set on "d" inches of a fine granular material (sand cushion) in an earth foundation, carefully shaped to fit the lower part of the conduit exterior for a width of at least sixty percent (60%) of the conduit's breadth. The remainder of the conduit is to be surrounded to a height of at least twelve inches (12") above its top by densely compacted granular backfill material carefully placed by hand to completely fill all spaces under and adjacent to the conduit. The fill to be tamped thoroughly on each side and under the conduit, as far as practicable, in layers not to exceed six inches (6") in thickness. Bell excavation is to be provided. Refer to "Pipe Bedding Details", Drawing. No. BB-2, of the Development Standards Manual for further details on Class "B" Bedding.
 - c. Class "B" bedding material shall meet the gradation as set forth in the Indiana Dept. of Transportation Standard Specifications, current edition, Section 211, Special Fill & Backfill ("B" Borrow), except that no more than twelve percent (12%) or less than five percent (5%) shall pass the No. 200 sieve (silt or clay).
2. Class "A" Bedding (Concrete Cradle)
 - a. Class "A" bedding is that method of bedding in which the conduit is set on "d" inches of concrete in an earth foundation and encased in concrete up to one-quarter inch (1/4") of "Bc" to fit the lower part of the conduit's exterior breadth. The remainder of the conduit is to be surrounded to a height of at least twelve inches (12") above its top by densely compacted granular backfill material carefully placed by hand to completely fill all spaces under and adjacent to the conduit. The fill to be tamped thoroughly on each side of the conduit, as far as practicable, shall be in layers not to exceed six inches (6") in thickness.
 - b. The concrete used for Class "A" bedding shall be plain concrete with a twenty-eight (28)-day compressive strength of three thousand pounds per square inch (3,000 psi), unless otherwise specified. Refer to "Pipe Bedding Details", Drawing. No. BB-1, of the Development Standards Manual for further details on Class "A" bedding.
 3. Class "C" Bedding
 - a. Class "C" bedding is that method of bedding in which the conduit is set on an earth foundation, carefully shaped to fit the lower part of the conduit exterior for a width of at least fifty (50%) of the conduit's breadth. The remainder of the conduit is to be surrounded to a height of at least twelve inches (12") above its top by lightly compacted granular backfill material carefully around the exterior of the conduit. Bell excavation is to be provided.
 4. Bedding materials may vary from those specified depending upon utility company requirements when trenches cross existing utilities.

H. Bedding, Flexible Pipe

1. Each pipe shall be laid in a Class I or Class II bedding, as shown on the Development Standards Manual, Drawing. No. BB-3. Pipe bedding material and installation shall conform to ASTM D2321.

I Sewer Line Connections

1. Sewer line connections to trunks, mains, laterals or side sewers shall be left uncovered until after an acceptance inspection has been made by the Town. After approval of the connection, the bare pipe shall be covered with compacted granular material to a minimum depth of twelve inches (12") above the crown of the pipe. The trench shall then be fully backfilled as required. No existing storm sewer, storm drain, drain tile, or sump type tile shall be connected to a sanitary sewer.

J. Sheet Piling

1. Sheet piling (permanent or temporary) shall be provided as required for construction in areas where wide excavation cannot be permitted, or for an excavation that is open for an extended period, or where soil conditions dictate to protect adjacent structures, roadways and utilities.
2. The section modulus of piling sections shall be as required to function properly as intended.
3. Piling sections shall be marked for length and sorted and stacked at the job site to prevent distortion and to facilitate proper sequence of setting and driving.
4. Interlocks shall be protected from becoming obstructed by sand, gravel, mud or other materials.
5. Pile tips are approved for use at the Contractor's option.

K. Certifications

1. The Developer shall submit Manufacturer's Certificate of Compliance with applicable ASTM Standards to the Town Engineer for all materials delivered and installed on site.

3.4 General Trenching

- A. Unless otherwise directed or permitted, not more than one hundred feet (100') of any trench shall be open at any time.
- B. Surface encumbrances, located so as to create a hazard to employees involved in excavation work or in the vicinity thereof at any time during operations, shall be removed or made safe before excavating is begun.
- C. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench sufficient to avoid overloading and to prevent slides and cave-ins. Adequate drainage shall be provided for the stockpiles and surrounding areas by means of ditches, dikes, or other approved methods. The stockpiles shall also be protected from contamination with unsatisfactory excavated material or other material that may destroy the quality and fitness of the suitable stockpiled material. If the Contractor fails to protect the stockpiles and any material becomes unsatisfactory as a result, such material, if directed by the Town Engineer, shall be removed and replaced with satisfactory on-site or imported material from approved sources.
- D. Grading shall be done as may be necessary to prevent surface water from flowing

into the excavation, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavation is maintained. In wet trenches dewatering equipment shall be operated ahead of pipe laying and the water level kept below the pipe invert.

- E. The trench shall be excavated as shown in these Standards or as recommended by the manufacturer of the pipe to be installed, whichever is more stringent. Trench walls below and above the top of the pipe shall be sloped, or made vertical, as recommended in the manufacturer's installation manual. The trench width below an elevation one foot (1') above the top of pipe shall not exceed that recommended in the installation manual. Where no manufacturer's installation manual is available, trench walls below an elevation one foot (1') above the top of pipe shall be vertical and trench walls one foot (1') or more above the top of pipe shall be adequately sloped as required to prevent slides and cave-ins unless proper precautions, as stipulated by OSHA, are taken. If adequate trench slopes cannot be provided in the available work space and right-of-way limits, then use of sheeting and shoring and/or a trench box is mandatory.
- F. Excavation for manholes or similar structures shall be sufficient to leave at least twelve inches (12") clear between the outer structure surfaces and the face of the excavation or support members and be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations. When concrete is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete is to be placed.
- G. Dust conditions shall be kept to a minimum by the use of water. The use of salt, or calcium chloride will not be permitted.

3.5 Removal of Material

- A. As trenches are backfilled, the Contractor shall remove all surplus material, regrade and leave clear, free, and in good order all roadways and sidewalks affected by the construction of the work. During the progress of and until the expiration of the guarantee period, he shall maintain in good and safe conditions the surface or any street over the trenches and promptly fill all depressions over and adjacent to trenches caused by settlement of backfilling.
- B. Surplus or unsatisfactory excavated material shall be properly disposed of at a location off the property limits.

3.6 Stabilization

- A. If portions of the bottom of trenches or excavations consist of material unstable to such a degree that, in the opinion of the Town, it cannot adequately support the pipe or structure, the bottom shall be overexcavated and stabilized with granular material in compliance with the INDOT Standard Specifications, current edition. Depth of stabilization shall be as directed by the Town.

3.7 Backfilling

- A. Pipe bedding and initial backfill shall be clean granular material to a depth as shown on the Drawings. Initial backfill shall be placed in lifts of a maximum of six inches (6") loose thickness. The method for placing and compacting the backfill shall comply with the INDOT Standard Specifications as applicable. At a minimum, the Contractor shall use a vibrating plate compactor with adequate passes to achieve compaction. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. Care shall be taken to ensure thorough compaction of the fill under pipe haunches.
- B. Final backfill for the remainder of the trenches shall be as follows:
1. Backfill for trenches under sidewalks, under turfed or seeded areas, and in miscellaneous areas shall be of approved earth material and contain no stones over four inches (4") in their largest dimensions. Stones which are used in backfilling shall be distributed among the earth backfill so that all interspaces are filled with fine material. All such backfilling shall be deposited in lifts of a maximum twelve inches (12") loose thickness and compacted with a vibrating plate compactor or approved mechanical tamping devices. Excess earth to the amount required to replace settlement shall be neatly rounded over the trench and the remainder hauled off the work site. Trenches shall be maintained by the Contractor until settlement has ceased and trenches remain level with the adjacent ground.
 2. Backfill of all trenches under existing or proposed roadways and structural footings or slabs shall be approved granular material only. In addition, the top six inches (6") below the base of the pavement shall be backfilled with No. 53 crushed stone. The backfill shall be placed in six inch (6") maximum lifts and the method of placing and compacting the backfill shall comply with the INDOT Standard Specifications, as applicable. At a minimum, the Contractor shall use a vibrating plate compactor with adequate passes to achieve compaction.
- C. Pipe bedding and each backfill lift shall be compacted to a dry density not less than the following percentage of maximum dry density as determined by the Modified Proctor Test (ASTM D1557):

<u>Usage</u>	<u>Compaction %</u>
Beneath piping	95
Upper two feet (2') of backfill under roadways	95
Under roadways (except upper two feet (2') of backfill)	92
Under haunches and up to springline of pipe	95
From springline to twelve inches (12") above top of pipe	90
Adjacent to (or behind) vertical walls	90
Under turfed or seeded areas below topsoil, and	85
Miscellaneous area (from twelve inch [12"] above pipe to surface)	

- D. No fill shall be placed against any manhole or other structure until placed concrete has been allowed to cure for at least three (3) days. Backfill shall be

placed in such a manner that the structure will not be damaged by shock from falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be placed in such a manner as to prevent eccentric loading and excessive stress on the structure. Heavy equipment for spreading and compacting shall not operate closer to foundation walls than set forth as follows.

1. Fill placed adjacent to vertical or near vertical walls (within a zone defined by imaginary lines extending horizontally away from the base of the wall for a distance of three feet and thence upward and outward on a one to one (1:1) slope to the elevation of the top of the wall) shall be compacted to the specified density with light equipment not exceeding fifteen hundred (1500) pounds in static weight or dynamic rated impact.

3.8 Compaction Testing

- A. Sampling and testing shall be the responsibility of the Contractor. Tests shall be performed by a Town approved commercial testing laboratory or may be tested with approved facilities furnished by the Contractor.
- B. Laboratory tests for moisture-density relations shall be determined in accordance with ASTM D1557. A minimum of one test shall be performed on each different type of material used for backfill, or as directed by the Town.
- C. Field In-Place Density Tests:
 1. Shall be performed in sufficient numbers to ensure that the specified compaction is being obtained. A minimum of one test per lift of backfill for every two hundred feet (200') of installation shall be performed. Locations for performing the density tests will be coordinated with the Town
 2. Shall be determined in accordance with ASTM D1556, ASTM D2167 or ASTM D2922. When ASTM D2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as per ASTM D1556. ASTM D2922 results in a wet unit weight of soil and when using this method, ASTM D3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gages shall be checked along with density calibration checks as described in ASTM D3017. The calibration checks of both the density and moisture gages shall be made at the beginning of a job, on each different type of material encountered and at intervals as directed by the Town. Copies of calibration curves and results of calibration tests shall be furnished to the Town.
- D. All test results shall be submitted to the Town.
- E. Trenches improperly compacted shall be reopened to the depth directed by the Town and then refilled and compacted to the density specified. Field in-place density tests shall also be repeated for improperly compacted trenches that are reopened, refilled and recompact. A minimum of one (1) repeat test per lift of backfill for every two hundred feet (200') of improperly compacted trench that is reopened, refilled and recompact shall be performed.

3.9 Tests for Gravity Sanitary Sewers

- A. All gravity sewer pipe shall be leak tested using one of the following methods
 - 1. Hydrostatic Test
 - a. Hydrostatic test shall be performed with a minimum of two feet (2') of positive head as measured above the crown of the pipe. The rate of infiltration/exfiltration shall not exceed two hundred (200) gallons/inch diameter/linear mile/day.
 - b. Hydrostatic testing shall comply with all applicable provisions of ASTM C969.
 - 2. Air Test
 - a. An air test shall be performed in strict conformance to ASTM F1417.

- B. Vertical Deflection Testing
 - 1. For flexible sewer pipe, the entire length of installed pipe shall be tested for acceptance with an approved go-no-go mandrel under the observation of the Town. The testing shall be conducted by the Contractor after the final backfill has been in place for at least thirty (30) days. No pipe shall exceed a deflection of five percent (5%). The deflection test shall be run using a mandrel having a measured diameter equal to ninety-five percent (95%) of the actual inside diameter of the pipe. The test shall be performed without a mechanical pulling device. All pipe exceeding the allowable deflection shall be replaced, repaired, and retested.

- C. Sewer Camera Inspection
 - 1. All sewer line shall be inspected using a pipeline sewer camera prior to acceptance. A one-half inch (½") VHS video tape shall be supplied to the Town with an audio log by station between structures.

3.10 Tests for Force Mains

- A. Test procedures shall meet the requirements of ANSI / AWWA C600-05 .

- B. The piping shall be complete, and thrust blocks shall have been in place for not less than ten (10) days prior to being tested.

- C. Test closed-end pressure piping as follows:
 - 1. Expel all air from the piping prior to the application of test pressure. Tap the piping at high points, if necessary, to release all air from the piping. Plug taps after the test is successfully completed. Plugs shall be watertight.
 - 2. Test piping at a static pressure of one hundred and fifty pounds per square inch (150 psi) over a period of not less than eight (8) consecutive hours. The test will be considered successful when the pressure drop over the test period is two pounds per square inch (2 psi) or less. Repair leaks and repeat the test until the pressure drop over the test period is two pounds per square inch (2 psi) or less.

- D. Test open-end pressure piping as follows:
 - 1. The ends of piping being tested shall have test plugs or caps adapted with a tap of adequate diameter to fill and pressurize the system with water.

2. When a section is terminated at a manhole with a plain end (spigot), the pipe must extend into the manhole of sufficient length to accommodate a restraining cap. The benchwall shall be formed in the manhole after the test section has been approved.
3. Water shall be introduced into the section to be tested at the lower end. The upper end shall have an orifice at the top of the plug or cap to expel air when filling the system with water. All air shall be expelled from the pipe.
4. The test plugs or caps shall be capable of withstanding an internal pressure of one hundred seventy-five pounds per square inch (175 psi).
5. Gravity flow systems shall be tested in conformance with Section 13 of ANSI / AWWA C600-05 , at fifty pounds per square inch (50 psi) over a period of not less than one (1) hour. The system will not be acceptable until all leaks have been repaired.
6. Pumped flow systems shall be subjected to an internal pressure equal to twice the operating head pressure divided by 2.31; and maintain this pressure over a period of not less than two (2) hours. In no case shall the pressure be less than fifty pounds per square inch (50 psi).
7. Hydrostatic test may be dangerous if, because of ignorance or carelessness, a line is improperly prepared. It is extremely important that the various plugs be installed in such a way as to prevent blowouts. Inasmuch as a force of twenty-five hundred (2500) pounds is exerted on an eight –inch (8”) plug by an internal pipe pressure of fifty pounds per square inch (50 psi), it should be realized that sudden expulsion of a poorly installed plug or cap can be dangerous. As a safety precaution, no one shall be allowed in or around the manholes when the pipe is pressurized.

3.11 Restraining (for Force Mains)

A. General:

1. Provide stainless steel nuts, bolts, and rods for restraint of joints, fittings, bends, and valves below grade. Stainless steel Star tie bolt restraining system shall be used.
2. Concrete thrust blocking will not be allowed unless approved by the Town Engineer.

B. Installation:

1. Unless otherwise shown or directed by the Town, place the base and thrust bearing sides of thrust blocking directly against undisturbed earth.
2. Protect steel rods and clamps by galvanizing or by coating with bituminous paint.

3.12 Installation of Pumps in Lift Stations

- #### **A.**
1. Pumps shall be installed in accordance with shop drawings furnished by the manufacturer and approved by the Town and in accordance with the construction drawings.

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SECTION B STORM SEWER SYSTEMS

PART 1 GENERAL

1.1 General Requirements

- A. Comply with all requirements specified in Storm Drainage Ordinance No. 983, as amended from time to time.
- B. "Town Engineer" as used in this Chapter, which shall mean the Town Engineer, Town Manager/Administrator, or designee of either.

1.2 Submittals

- A. At the time of application for required permits, submit all information required in Storm Drainage Ordinance No. 983, as amended from time to time, to the Town of Cedar Lake Plan Commission.

1.3 References

- A. AASHTO M170 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- B. ANSI / AWWA C111 / A21.11-00 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- C. AWWA C151 – Standard Specification for 3" to 64" (76 mm through 1,600 mm) Centrifugally Cast Ductile Iron Pipe with Push-On or Mechanical Joints
- D. Federal SS-P-375 – Federal Specification for Reinforced Concrete Sewer Pipe
- E. ASTM C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- F. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- G. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
- H. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³(2,700 kN-m/m³))
- I. ASTM D1784 – Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds
- J. ASTM D2167 – Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

- K. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
- L. ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- M. ASTM D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
- N. ASTM D3034 – Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
- O. ASTM D3212 – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
- P. ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- Q. ASTM F 2306 – Standard Specification for 12” to 60” (300 to 1500 mm) Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications
- R. AASHTO M 294 - Standard Specification for Corrugated Polyethylene Pipe, 12” to 60” (300 to 1500 mm) Diameter, Couplings, and Fittings for use in Surface and Subsurface Drainage Applications
- S. ASTM F 2487 – Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene Pipelines
- T. ASTM F 1417 – Standard Test Method of Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
- U. ASTM F 2736 - Standard Specification for 6” to 30” (152 to 762 mm) Polypropylene (PP) Corrugated Double Wall Pipe
- V. ASTM F 2881 - Standard Specification for 12” to 60” (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications
- W. AASHTO MP 21-11 - Standard Specification for Polypropylene Pipe, 12” to 60” (300 to 1500 mm) Diameter, Couplings, and Fittings for use in Surface and Subsurface Drainage Applications
- X. Indiana Department of Transportation (INDOT) Standard Specifications, current edition
- Y. 29 CFR Part 1926 – Occupational Safety and Health Administration – Standards for Safety and Health Regulations for Construction

PART 2 PRODUCTS

2.1 Sewer Pipe

- A. All pipes shall conform to the applicable specifications and requirements set forth herein.
- B. Pipe used in storm sewer construction shall be reinforced concrete pipe (RCP), ductile iron pipe (DI), polyvinyl chloride (PVC), dual wall high density polyethylene (HDPE) or dual wall high performance polypropylene (PP) pipe. Other pipe and fittings not specified herein may be used only when specifically authorized by the Town Engineer. All storm sewer pipes shall have flexible gasketed joints.
- C. All flexible sewer pipes must meet a deflection test of five percent (5%).

2.2 Pipe Materials

- A. Storm sewer pipe shall comply with the following:
 - 1. PVC storm sewers shall be Type PSM conforming to ASTM D3034 (current edition) EXCEPT, no reworked material shall be used and shall have a cell classification of 12454-B as defined in ASTM D1782 (current edition), and shall be SDR (Standard Dimension Ratio) 26 as defined in Section 4.4.1 of ASTM D3034. PVC storm sewers shall not be used in the road right-of-way.
 - 2. Reinforced concrete pipe shall conform in all respects with ASTM C76, AASHTO M170 and Federal SS-P-375 for Reinforced Concrete Pipe.
 - 3. Ductile iron pipe shall comply with AWWA C151.
 - 4. High density polyethylene (HDPE) dual wall pipe shall conform to ASTM F 2306 and AASHTO M294.
 - 5. High performance polypropylene (PP) dual wall pipe shall conform to ASTM F 2736, AASHTO MP-21-11 and ASTM F 2881.

2.3 Joints, Fittings and Appurtenances

- A. Joints for Storm Sewers
 - 1. Flexible gasketed joints shall be rubber gasketed, unless otherwise specified.
 - 2. Flexible rubber gasket joints for concrete sewer pipe shall conform to the requirements of ASTM C443, joints for circular concrete sewer and culvert pipe, using flexible watertight, rubber gaskets. Storm sewer pipe larger than twenty-four inch (24") diameter may be tongue and groove plain joint unless the sewer is under a pavement or specifically called for otherwise on the plans.

3. If plain joint is used, an approved bitumastic material shall be applied to each joint.
4. Flexible rubber gaskets for ductile iron pipe joints shall be manufactured in compliance with all requirements of ANSI / AWWA C111 / A21.11.
5. The PVC joint shall conform to ASTM D3212 "push on" type with a confined rubber gasket conforming to ASTM F477.
6. HDPE and PP joints shall conform to ASTM F2306, ASTM F2736, ASTM F2881 or AASHTO MP 21-11 utilizing an integral bell and spigot with gaskets conforming to ASTM F477. Bell and spigot fitting joints shall meet ASTM F2306 for soil-tight joints and when deemed necessary, water-tight joint performance requirements of ASTM D3212 and watertight field test requirements of ASTM F2487.

B. Fittings

1. Unless otherwise specified, tee or wye fittings shall be provided in the storm sewer main for individual storm service connections. Tees or wyes shall be six inches (6") minimum inside diameter, unless otherwise specified or noted. All fittings shall be of the same material as the pipe. Material joining the fittings to the pipe shall be free from cracks and shall adhere tightly to each joining surface.
2. PVC sewer fittings shall conform to the requirements of ASTM D3034 specifications. Four-, six-, and eight- inch (4", 6" and 8") fittings shall be molded in one (1) piece, with elastomeric joints and minimum socket depths as specified in Section 6.2 and 7.3.2 of the D3034 specification). Fittings ten inches (10") and larger shall be molded or fabricated from pipe meeting ASTM D3034 with manufacturer's standard pipe bells and gaskets.

C. Plug for Fittings

1. All fittings shall be capped with a plug of the same material as the pipe, and gasketed with the same gasket material as the pipe joint, or be of material approved by the Town Engineer. The plug shall be able to withstand all test pressures involved without leakage.

D. Tracer Wire

1. Provide an electrically continuous type TW insulated #10 tracer wire for all storm sewers. For pipe lengths less than 100 ft., #12 or #14 tracer wire is also acceptable. The wire shall be installed along the pipe, fastened to the pipe at twenty foot (20') intervals and terminated above ground with the lead taped around each structure.

2.4. Backfill Material

- A. "B" Borrow shall comply with INDOT Standard Specifications, current edition. Maximum stone size shall not exceed one inch (1") or the maximum size recommended by the pipe manufacturer, whichever is smaller.

- B. Earth backfill material shall contain no more than five percent (5%) organic material, no particles larger than four inches (4") and shall be free of trash, rubble and debris. The Plastic Index of the fraction passing the No. 40 sieve shall not be more than twenty-five (25).
- C. Coarse aggregate shall be No. 53 or 73 complying with INDOT Standard Specifications, current edition.
- D. Backfill materials may vary from those specified depending upon utility company requirements when trenches cross existing utilities.

PART 3 EXECUTION

3.1 Surface Conditions

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions, as determined by the Town Engineer, are corrected.

3.2 Field Measurements, Survey Lines, Reference Points and Grades

- A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 Clearing

- A. Areas within the project limits shall be cleared of logs, stumps, brush, vegetation, rubbish and other perishable matter. All rubbish or unsuitable material shall be removed completely. Material unsuitable for filling may not be disposed of on the project site. All suitable topsoil shall be stripped along the construction zone and suitably stockpiled for re-use in final grading and site restoration.
- B. Trees shall not be damaged or removed unless the trunks of such trees interfere with the construction of the work. In such cases, the trees shall be removed completely at the expense of the Contractor.
- C. No burning of trees or other debris will be allowed.

3.4 Installation of Pipe

- A. Location:
 - 1. Locate the sewer:
 - a. Not closer than ten feet from a water supply main or service line.
 - b. Where the bottom of the water pipe will be at least eighteen inches (18") above the top of the sewer pipe, the horizontal spacing shall be a

minimum of ten feet (10').

Where the gravity flow sewers cross above water lines:

- c. Use acceptable water-quality pressure pipe with no joint closer horizontally than three feet (3') from the crossing, or;
- d. Where concrete encased pipe is used, provide not less than four inch (4") thickness including that on pipe joints for a distance of ten feet (10') on each side of the crossing.

B. Laying Pipe

1. All pipe shall be reinspected for soundness and damage due to handling immediately before being lowered into the trench. Any pipe found to be unsound or damaged will be rejected and shall be removed immediately from the site of the work.
2. All pipe shall be laid accurately to the required line and grade per approved plans and in such manner as to form a close, concentric joint with the adjoining pipe and to bring the invert of each section to the required grade. Bell holes shall be dug in advance of the pipe being laid as required. The supporting of the pipe on blocks will not be permitted.
3. Pipe laying shall proceed upgrade, beginning at the lower end of the sewer, unless otherwise approved by the Town Engineer.
4. Open ends of pipes and branches shall be sealed with plugs or bulkheads firmly held in place in a manner acceptable to the Town Engineer.
5. At the end of each day's work, the open ends of all pipes shall be satisfactorily protected against the entrance of animals, earth or other materials.
6. Pipe found not to comply with these standards shall be removed and replaced.

C. Dewatering

1. Dewatering sufficient to maintain the water level below the surface of the trench bottom shall be accomplished prior to pipe laying and jointing. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench. When the dewatering operation is ended, the trench shall be replaced in such a manner so as not to disturb the pipe and its foundation.

D. Abandoning Pipe or Structures

1. Sewers or structures required to be abandoned shall be filled with flowable backfill for the full section to be abandoned. The flowable backfill mix design shall be submitted to the Town Engineer for approval prior to use. Plugging only of exposed pipe ends will not be allowed.

E. Bedding, Rigid Pipe

1. Each pipe shall be laid in Class "B" bedding unless otherwise approved by the Town Engineer.
 - a. Definition of Terms for Bedding Explanation

Bc = Outside diameter of pipe, in inches
 D = Inside diameter of pipe, in inches
 d = Depth of bedding material below the pipe bell,
 in = inches

The values of "d", depth of bedding material below the bell of the pipe shall be as follows:

"D" (inside diameter of pipe, in.)	"d" (depth of bedding material) Minimum Requirements
27" and smaller	3"
30" and larger	4"

- b. Class "B" bedding is that method of bedding in which the conduit is set on "d" inches of a fine granular material (sand cushion) in an earth foundation, carefully shaped to fit the lower part of the conduit exterior for a width of at least sixty percent (60%) of the conduit's breadth. The remainder of the conduit is to be surrounded to a height of at least twelve inches (12") above its top by densely compacted granular backfill material carefully placed by hand to completely fill all spaces under and adjacent to the conduit. The fill to be tamped thoroughly on each side and under the conduit, as far as practicable, in layers not to exceed six inches (6") in thickness. Bell excavation is to be provided. Refer to "Pipe Bedding Details", Drawing No. BB-2, of the Development Standards Manual for further details on Class "B" Bedding.
 - c. Class "B" bedding material shall meet the gradation as set forth in the Indiana Dept. of Transportation Standard Specifications, current edition, Section 211, Special Fill & Backfill ("B" Borrow), except that no more than twelve percent (12%) or less than five percent (5%) shall pass the No. 200 sieve (silt or clay).
2. Class "A" Bedding (Concrete Cradle)
 - a. Class "A" bedding is that method of bedding in which the conduit is set on "d" inches of concrete in an earth foundation and encased in concrete up to one-quarter inch (1/4") of "Bc" to fit the lower part of the conduit's exterior breadth. The remainder of the conduit is to be surrounded to a height of at least twelve inches (12") above its top by densely compacted granular backfill material carefully placed by hand to completely fill all spaces under and adjacent to the conduit. The fill to be tamped thoroughly on each side of the conduit, as far as practicable, shall be in layers not to exceed six inches (6") in thickness.
 - b. The concrete used for Class "A" bedding shall be plain concrete with a

twenty-eight (28)-day compressive strength of three thousand pounds per square inch (3,000 psi), unless otherwise specified. Refer to "Pipe Bedding Details", Drawing No. BB-1, of the Development Standards Manual for further details on Class "A" bedding.

3. Class "C" Bedding
 - a. Class "C" bedding is that method of bedding in which the conduit is set on an earth foundation, carefully shaped to fit the lower part of the conduit exterior for a width of at least fifty percent (50%) of the conduit's breadth. The remainder of the conduit is to be surrounded to a height of at least twelve inches (12") above its top by lightly compacted granular backfill material carefully around the exterior of the conduit. Bell excavation is to be provided.
4. Bedding materials may vary from those specified depending upon utility company requirements when trenches cross existing utilities.

F. Bedding, Flexible Pipe

1. Each pipe shall be laid in a Class I or Class II bedding, as shown on the Development Standards Manual, Drawing No. BB-3. Pipe bedding material and installation shall conform to ASTM D2321.

G. Backfilling

1. Pipe bedding and initial backfill shall be clean granular material to a depth as shown on the drawings. Initial backfill shall be placed in lifts of a maximum of 6 inches (6") loose thickness. The method for placing and compacting the backfill shall comply with the INDOT Standard Specifications as applicable. At a minimum, the Contractor shall use a vibrating plate compactor with adequate passes to achieve compaction. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. Care shall be taken to ensure thorough compaction of the fill under pipe haunches.
2. Final backfill for the remainder of the trenches shall be as follows:
 - a. Backfill for trenches under sidewalks, under turfed or seeded areas, and in miscellaneous areas shall be of approved earth material and contain no stones over four inches (4") in their largest dimensions. Stones which are used in backfilling shall be distributed among the earth backfill so that all interspaces are filled with fine material. All such backfilling shall be deposited in lifts of a maximum twelve inches (12") loose thickness and compacted with a vibrating plate compactor or approved mechanical tamping devices. Excess earth to the amount required to replace settlement shall be neatly rounded over the trench and the remainder hauled off the work site. Trenches shall be maintained by the Contractor until settlement has ceased and trenches remain level with the adjacent ground.
 - b. Backfill of all trenches under existing or proposed roadways and structural footings or slabs shall be approved granular material only. In addition, the top six inches (6") below the base of the pavement shall be backfilled with no. 53 crushed stone. The backfill shall be placed in six

inches (6") maximum lifts and the method of placing and compacting the backfill shall comply with the INDOT Standard Specifications, as applicable. At a minimum, the Contractor shall use a vibrating plate compactor with adequate passes to achieve compaction.

- c. Pipe bedding and each backfill lift shall be compacted to a dry density not less than the following percentage of maximum dry density as determined by the Modified Proctor Test (ASTM D1557):

Usage	Compaction %
Beneath piping	95
Upper two feet (2') of backfill under roadways	95
Under roadways (except upper 2 feet (2') of backfill)	92
Under haunches and up to springline of pipe	95
From springline to twelve inches (12") above top of pipe	90
Adjacent to (or behind) vertical walls	90
Under turfed or seeded areas below topsoil, and miscellaneous area (from twelve inches [12"] above pipe to surface)	85

- d. No fill shall be placed against any manhole or other structure until placed concrete has been allowed to cure for at least three (3) days. Backfill shall be placed in such a manner that the structure will not be damaged by shock from falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be placed in such a manner as to prevent eccentric loading and excessive stress on the structure. Heavy equipment for spreading and compacting shall not operate closer to foundation walls than set forth as follows.
 - 1). Fill placed adjacent to vertical or near vertical walls (within a zone defined by imaginary lines extending horizontally away from the base of the wall for a distance of three feet (3') and thence upward and outward on a one to one (1:1) slope to the elevation of the top of the wall) shall be compacted to the specified density with light equipment not exceeding fifteen hundred (1500) pounds in static weight or dynamic rated impact.

H. Sewer Line Connections

- 1. Sewer line connections to existing storm sewers shall be left uncovered until after an acceptance inspection has been made by the Town's Public Works Department. After approval of the connection, the bare pipe shall be covered with compacted granular material to a minimum depth of twelve inches (12") above the crown of the pipe. The trench shall then be fully backfilled as required. No storm sewer shall be connected to any sanitary sewer.

I. Existing Sewer Removal and Replacement

- 1. Where called for on the plans, existing sewer lines shall be completely removed and replaced with new. The Contractor is required to maintain service during said removal and replacement, which may entail bypass

pumping.

J. Trench Safety

1. All work involving trench safety will require the Contractor to provide for the safety of the workmen in strict compliance with 29 CFR Part 1926 latest edition.
2. Sheet piling, trench boxes, shoring, shielding (permanent or temporary) shall be provided as required for construction in areas where wide excavations cannot be permitted, or for an excavation that is open for an extended period, or where soil conditions dictate to protect adjacent structures, roadways and utilities.
3. The Town Engineer has the right to request that the Contractor submit the manufacturer's "Certificate of Compliance," stating that the devices (trench boxes, piling, sheeting, shielding, etc.) to be used for trench safety be in compliance for the work that will be involved. The certificate should show the design assumptions and limitations of the device and should be sealed by an engineer registered and licensed to practice in the State of Indiana.
4. The Contractor shall have a "Competent Person" with regard to OSHA standards, on site at all times. Competent person is generally defined as an individual who, by training and experience, is knowledgeable of applicable standards, capable of identifying hazards, is designated by the employer, and has the authority to take actions as needed.
5. The contractor shall provide the supervisory personnel at each trench while work is in progress to ensure the Contractor's methods, procedures, equipment and materials pertaining to the safety systems are sufficient to meet the requirements of OSHA Standards.

K. Certifications

1. The Developer shall submit Manufacturer's Certificate of Compliance with applicable ASTM Standards to the Town Engineer for all materials delivered and installed on site.

3.5 Tests for Storm Sewers

A. Compaction Testing

1. Sampling and testing shall be the responsibility of the Contractor. Tests shall be performed by a Town approved commercial testing laboratory or may be tested with Town approved facilities furnished by the Contractor.
2. Laboratory tests for moisture-density relations shall be determined in accordance with ASTM D1557. A minimum of one test shall be performed on each different type of material used for backfill, or as directed by the Town.

3. Field In-Place Density Tests:
 - a. Shall be performed in sufficient numbers to ensure that the specified compaction is being obtained. A minimum of one test per lift of backfill for every two hundred (200') of installation shall be performed. Locations for performing the density tests will be coordinated with the Town.
 - b. Shall be determined in accordance with ASTM D1556, ASTM D2167 or ASTM D2922. When ASTM D2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as per ASTM D1556. ASTM D2922 results in a wet unit weight of soil and when using this method, ASTM D3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gages shall be checked along with density calibration checks as described in ASTM D3017. The calibration checks of both the density and moisture gages shall be made at the beginning of a job, on each different type of material encountered and at intervals as directed by the Town. Copies of calibration curves and results of calibration tests shall be furnished to the Town.
4. All test results shall be submitted to the Town.
5. Trenches improperly compacted shall be reopened to the depth directed by the Town and then refilled and compacted to the density specified. Field in-place density tests shall also be repeated for improperly compacted trenches that are reopened, refilled and recompactd. A minimum of one (1) repeat test per lift of backfill for every two hundred feet (200') of improperly compacted trench that is reopened, refilled and recompactd shall be performed.

B. Vertical Deflection Testing

1. For flexible sewer pipe, the entire length of installed pipe shall be tested for acceptance with an approved go-no-go mandrel under the observation of the Town Engineer. The testing shall be conducted by the Contractor after the final backfill has been in place for at least thirty (30) days. No pipe shall exceed a deflection of five percent (5%). The deflection test shall be run using a mandrel having a measured diameter equal to ninety-five percent (95%) of the actual inside diameter of the pipe. The test shall be performed without a mechanical pulling device. All pipes exceeding the allowable deflection shall be replaced, repaired, and retested.

END OF SECTION

SECTION C MANHOLES, INLETS AND CASTINGS

PART 1 GENERAL

1.1 Section Includes

- A. Monolithic concrete manholes, catch basins, and inlets with transition to lid frame, covers, anchorage, and accessories.
- B. Modular precast concrete manhole, inlets, and catch basin sections with tongue-and-groove joints, covers, anchorage, and accessories.

1.2 References

- A. ASTM A48 - Gray Iron Castings.
- B. ASTM A240 - Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
- C. ASTM A536 - Ductile Cast Iron.
- D. ASTM C387 - Packaged, Dry, Combined Materials for Mortar and Concrete.
- E. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- F. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
- G. ASTM C923 - Resilient Connectors between Reinforced Concrete Manhole Structures and Pipes.
- H. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- I. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum)
- J. AASHTO M 198 – Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections using Preformed Flexible Joint Sealants
- K. Indiana Department of Transportation (INDOT) Standard Specifications, current edition

PART 2 PRODUCTS

2.1 Materials

A. Reinforced Concrete

1. Structures shall be fabricated of precast, or cast in place, reinforced concrete sections. Steps shall be cast in place in accordance with the Development Standards Manual for structures four inches (4") in depth and greater. All concrete, reinforcing and wall thickness shall be in accordance with ASTM Designation C478, current edition. All structure joints shall be watertight and constructed in accordance with ASTM Specification C443, current edition. The bottom of the structures shall be of either precast, cast in place, or monolithic bottom stack, with three thousand pounds per square inch (3,000 psi) concrete to conform to the plans and shall be at least eight inches (8") thick and shall be reinforced as shown on the construction standards. Cones and sections shall be substantially free from fractures, large or deep cracks and surface roughness. Slabs shall be sound and free from gravel pockets. All precast structure components shall be manufactured by an INDOT Certified Precast Concrete Producer.

B. Precast Manhole Components

1. Shall conform with ASTM C478, latest edition, and with design dimensions. Cones and sections shall be substantially free from fractures, large or deep cracks and surface roughness. Slabs shall be sound and free from gravel pockets. All precast structure components shall be manufactured by an INDOT Certified Precast Concrete Producer.

C. Precast Concrete End Sections

1. Pipe end sections shall be constructed in accordance with Section 715 of the INDOT Standard Specifications, current edition, and INDOT Standard Drawings for Precast Concrete End Sections. All precast structure components shall be manufactured by an INDOT Certified Precast Concrete Producer.
2. All end sections shall be installed with trash racks. Refer to "Trash Rack for 12" Dia. Concrete Pipe", Drawing No. S-10 of the Development Standards Manual for further details. Trash racks shall be manufactured in accordance with Section 715.02(j) of the INDOT Standard Specifications, current edition.

D. Adjustment Risers and shims

1. Rubber adjustment risers and shims shall be Infra-Riser as manufactured by GNR Technologies, or approved equal.
2. Adjustment risers shall be installed and properly adjusted in accordance with the Manufacturer's Specifications.

E. Monolithic Concrete Manholes

1. Shall conform to the Development Standards Manual. Walls and base dimensions shall be of approved thickness and the maximum step spacing shall be sixteen inches (16”).

F. Manhole Joints

1. Manholes shall have flexible rubber gasket joints in accordance with ASTM C443.

G. Cast Iron Frames & Covers

1. Shall conform to the requirements of ASTM A48 for Gray Cast Iron, current edition. The dimensions, weights and finish preparation shall be as follows:

<u>STRUCTURE USE</u>	<u>CASTING TYPE</u>	
	<u>East Jordan Iron Works</u>	<u>Neenah Foundry Co.</u>
Curb Inlet/ Catch Basin (Residential Streets)	1045 with M1 grate	R-2370
Storm or Sanitary Sewer Manhole	1045 with Type A solid cover *	R-1642
Yard Drain Inlet/ Catch Basin	1040 with C2 grate	R-2560-E1
Sanitary Sewer Manhole -Watertite (bolted frame & lid)	1045 WT	R-1916-F

* lid shall be heavy-duty with self-sealing gaskets

2. All manhole lid castings shall be stamped either “Sanitary Sewer” or Storm Sewer”.
3. All inlet castings must be pre-stamped with an appropriate “clean water” message.

H. Ductile Cast Iron Frames, Covers and Grates

1. Shall conform to the requirements of ASTM A536 for Ductile Cast Iron, latest edition. The dimensions shall conform to the appropriate details in the Development Standards Manual.

I. Steps

1. Shall be polypropylene injection molded around steel reinforcing. All materials used in the manufacture of steps shall conform to the current edition of ASTM A48 and the Development Standards Manual, Drawing No. C-10.

J. External Chimney Seals

1. Chimney seals shall be a rubber sleeve conforming to ASTM C923 with a minimum three-sixteenth inch (3/16") thickness. Sleeve shall be corrugated to provide a minimum of two inch (2") vertical movement. Provide seal extensions of the same material where chimney exceeds nine inches (9") in height.
2. Adjustable compression bands shall be used to secure the sleeve to the exterior of the chimney. Bands shall be sixteen-(16) gauge stainless steel conforming to ASTM A240, type 304.
3. External Chimney seals shall be manufactured by Cretex Specialty Products, Waukesha, WI, or approved equal.

K. Finger Drains

1. All roadway inlets and catch basins shall have three perforated finger drains: one located a minimum length of fifteen feet (15') across the roadway and two located a minimum of fifty feet (50') along the curb line, in opposite directions. The finger drains shall be a minimum of 6" diameter in sag conditions and a minimum of 4" diameter elsewhere. Refer to "Finger Drain", Drawing No. S-11 of the Development Standards Manual for further details.
2. Finger drains shall be in accordance with Section 718 of the INDOT Standard Specifications, current edition.

PART 3 EXECUTION**3.1 Location**

- A. No more than two (2) inlets shall be interconnected; a catch basin (structure with a sump) shall be installed inline prior to discharge into a storm water manhole.

3.2 Installation of Structures**A. Dewatering**

1. Shall conform to the same requirements as for sewer trench dewatering.

B. Sheet Piling

1. Shall conform to the same requirements as for sewer trench piling.

C. Bedding for Structures

1. Precast base sections shall be placed on a well-graded granular bedding course conforming to the requirements for sewer bedding, but not less than four inches (4") in thickness and extending to the limits of the excavation. The bedding course shall be firmly tamped and made smooth and level to assure uniform contact and support of the precast element.

D. Cast-in-Place Bases

1. Unless otherwise specified, cast-in-place bases shall be at least eight inches (8") in thickness and shall extend at least six inches (6") radially outside of the outside dimensions of the structure section. The cast-in-place base shall be made of three thousand pounds per square inch (3,000 psi) concrete, twenty-eight (28)-day compression test, and shall be reinforced as shown on the construction standards.

E. Lift Holes

1. All lift holes in precast elements shall be thoroughly wetted and then be completely filled with non-shrinking concrete grout, smoothed and coated with bituminous waterproofing material, both inside and out, to ensure water tightness.

F. Placing Precast Sections

1. Precast sections shall be placed and aligned to provide vertical sides and vertical alignment of the ladder rungs. The completed structure shall be rigid, true to dimensions and be watertight.

G. Manhole Weep Holes

1. Four inch (4") weep holes shall be constructed in all manholes where water jetting of the sewer trench is required. The weep holes shall be plugged with non-shrinking concrete grout after the compaction has been completed for the trench backfill material.

H. Placing of Castings

1. Castings shall be placed on precast concrete base section. Base sections shall conform in all respects to ASTM C478. Castings shall be set accurately to the finished elevation so that no subsequent adjustment will be necessary, or unless otherwise specified by the Engineer.
2. Use an external structure chimney seal around the outside of casting and risers to ensure water tightness.
3. Where work is in paved streets or areas which have been brought to grade, not more than fifteen inches (15") shall be provided between the top of the cone or slab and the underside of the structure casting for adjustment of the casting to street grade.
4. Where work is in an unimproved street or alley, not less than twelve inches (12") of adjusting rings shall be provided between the top of the cone or slab and the underside of the structure casting for adjustment of the casting to finished grade. The top of the structure casting shall be flush with the finished grade, unless otherwise directed by the Town Engineer.
5. Where work is in cultivated areas, the top of the structure casting shall be exposed a maximum of two feet (2'), and in non-cultivated areas, the casting shall be flush with the finished grade, unless otherwise approved by the Town Engineer.
6. When adjusting rings are used to set the castings to grade, they shall be installed in conformance to the manufacturer's recommendations. Install an external chimney seal.

I. Channels and Inverts

1. Channels and inverts shall be made to conform accurately to the sewer characteristics and grades, and shall be brought together smoothly with well-rounded junctions. Channels and inverts shall be made satisfactory to the Town Engineer and in conformance with the construction standards, unless otherwise directed.

J. Pipe Connections to Existing Manholes

1. Special care shall be taken to see that the opening through which pipes enter the manhole have all pipe ends sawed and smoothed completely. Pipes are to be firmly full of jointing material at entrance to manhole to ensure watertightness. The pipes shall not protrude farther than three inches (3") into the inside face of the structure, measured along the horizontal center of the pipe, unless otherwise approved by the Town Engineer.
2. When new holes are required in the structure, they shall be core drilled. In no instance shall new holes be sledge-hammered out.
3. For pipes less than twelve-inches (12") in diameter, a mechanical rubber seal shall be used for core-drilled holes. Core-drilled pipe connections twelve- inches (12") in diameter and larger shall be grouted in place using a WS Series grouting ring as manufactured by Press-Seal Gasket Corporation, or approved equal.

K. Grade Adjustment of Existing Structures

1. Both adjusting castings to grade and reconstruction of structures shall conform with the applicable provisions of the Indiana Department of Transportation Standard Specifications, current edition.

L. Sanitary Sewer Drop Manhole Connections

1. An exterior drop pipe shall be provided for a sewer entering a manhole at an elevation of greater than twenty-four (24) inches or more above the manhole downstream invert. The minimum diameter of a drop manhole shall be forty-eight inches (48"). The diameter of the drop pipe shall be a minimum of eight inches (8") and a maximum of twelve inches (12") in diameter, unless otherwise specified. Drop manhole connections shall conform in all respects to the Development Standards Manual, otherwise, as stated herein or approved by the Town Engineer.

M. Testing Sanitary Sewer Manholes

1. Sanitary manholes shall be vacuum air tested per ASTM C1244.

N. Certifications

1. The Developer shall submit Manufacturer's Certificate of Compliance with applicable ASTM Standards to the Town Engineer for all materials delivered and installed on site.

END OF SECTION

SECTION D1 AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 General Requirements

- A. Comply with all requirements specified in Subdivision Ordinance No. 498, current edition.
- B. SUBMITTALS: At the time of application for required permits, submit all information required in Subdivision Ordinance No. 498 to the Town of Cedar Lake Plan Commission.

1.2 Section Includes

- A. Aggregate Base Course

1.3 References

- A. AASHTO T99 – The Moisture – Density Relations of Soils using a two and a half kilograms (2.5 kg)/ five and a half pounds (5.5 lb.) Rammer and a three hundred and five millimeter (305 mm)/ twelve inch (12”) Drop.
- B. Indiana Department of Transportation (INDOT) Standard Specifications, current edition.

PART 2 - PRODUCTS

2.1 Materials

- A. Materials shall be course aggregate, class D or higher, size No. 53 in accordance with Section 904 of the INDOT Standard Specifications, current edition. The use of slag materials is not an acceptable alternative.

PART 3 - EXECUTION

3.1 Preparation of Subgrade

- A. All subgrades shall be compacted to at least ninety-five percent (95%) of their maximum dry density. The moisture content shall be controlled within negative two and positive one (-2 and +1) percentage points of optimum moisture content.
- B. Immediately prior to placing the base course on the subgrade, proof-rolling in accordance with Section 203.26 of the INDOT Standard Specifications shall be completed. Roller marks, tire marks, irregularities, or failures are required

to be corrected. Any depressions in the subgrade that hold water are required to be eliminated.

- C. The subgrade preparation and its shaping to receive the base course shall be done to the complete satisfaction of the Director of Operations and the Town Engineer and in accordance with the requirements noted in the INDOT Standard Specifications, current edition.

3.2 Geotextile Pavement Fabric

- A. The use of a geotextile material is required and shall be in accordance with the requirements noted in the INDOT Standard Specifications, current edition.
- B. The geotextile material shall be placed immediately below the compacted aggregate base.
- C. The geotextile material shall typically be an INDOT approved nonwoven geotextile fabric as manufactured by Mirafi Products or approved equal. There may be some instances where an INDOT approved bi-axial geogrid as manufactured by Tensar Corporation or approved equal will be required. This recommendation will be made by the Director of Operations or the Town Engineer.

3.3 Temperature Limitations

- A. Aggregate shall not be placed when the air temperature is less than thirty-five degrees Fahrenheit (35° F)[two degrees Celsius (2° C)]. Aggregate shall not be placed on a frozen subgrade. Frozen aggregates shall not be placed.

3.4 Spreading

- A. Aggregate shall be spread in uniform lifts with a spreading and leveling device approved by the Director of Operations and the Town Engineer. The spreading and leveling device shall be capable of placing aggregate to the depth, width, and slope specified. The compacted depth of each lift shall be a minimum of three inches (3") and a maximum of six inches (6"). The aggregate shall be handled and transported to minimize segregation and the loss of moisture. In areas inaccessible to mechanical equipment, approved hand spreading and compacting methods may be used subject to the depth limits above.

3.5 Compacting

- A. Aggregates shall be immediately compacted to the maximum dry density in accordance with AASHTO T99. Compaction equipment shall be in accordance with 409.03(d). Density will be determined by proof-rolling and/or density tests in accordance with 203.24(b). All displacement, or rutting of the aggregates shall be repaired prior to placing subsequent material. Placement of the asphalt intermediate course shall occur within five (5) working days

following proof-roll acceptance of the aggregate base course.

3.5 Protection of Aggregate Base Course

- A. The contractor shall protect all sections of newly compacted base course after they have been inspected and accepted. Any disturbance to the base course for any reason shall be recompacted by the Contractor and reinspected by the Director of Operations and the Town Engineer prior to placement of the asphalt intermediate course. There shall be no open cuts to any roadway after passing inspection of the base course.

END OF SECTION

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SECTION D2 HOT MIX ASPHALTS

PART 1 GENERAL

1.1 General Requirements

- A. Comply with all requirements specified in Subdivision Ordinance No. 498, current edition.
- B. SUBMITTALS: At the time of application for required permits, submit all information required in Subdivision Ordinance No. 498 to the Town of Cedar Lake Plan Commission.

1.2 Section Includes

- A. Hot Mix Asphalt Paving

1.3 References

- A. ITM 571 - Quantitative Extraction of Asphalt/Binder and Gradation of Extracted Aggregate from HMA Mixtures.
- B. ITM 580 - Sampling HMA
- C. Indiana Department of Transportation (INDOT) Standard Specifications, current edition

PART 2 PRODUCTS

2.1 Materials

- A. Hot Mix Asphalt, HMA, Pavement
 - 1. Materials shall be in accordance with the following sections of the INDOT Standard Specifications, current edition:
 - a. Asphalt Materials
 - 1.) PG Binder, PG 64-22, PG 58-28 902.01(a)
 - 2.) Asphalt Emulsions, AE-60, AE-90 902.01(b)
 - b. Coarse Aggregates 904
 - 1.) Base Mixtures - Class D or Higher
 - 2.) Intermediate Mixtures - Class C or Higher
 - 3.) Surface Mixtures - Class B or Higher
 - c. Fine Aggregates 904

2.2 Design Mix Formula and Job Mix Formula

- A. The design mix formula (DMF) and the job mix formula (JMF) shall be in accordance with Sections 402.04 and 402.06 of the INDOT Standard Specifications, current edition.

2.3 Tack Coat

- A. The tack coat on intermediate course shall conform to requirements of Section 406 of the INDOT Standard Specifications, current edition.

2.4 HMA Mixing Plant

- A. The HMA mixing plant shall be in accordance with Section 409 of the INDOT Standard Specification, current edition.

2.5 HMA Laydown Equipment

- A. The HMA laydown equipment shall be in accordance with Section 409 of the INDOT Standard Specifications, current edition.

PART 3 EXECUTION

3.1 Weather Limitations

- A. Weather limitations for bituminous mixtures shall conform to Section 402.12 of the INDOT Standard Specifications, current edition.

3.2 Conditioning of Existing Surfaces

- A. When the surface of the existing pavement or old base is irregular, it shall be brought to uniform grade and cross section.
- B. All longitudinal and transverse joints and all cracks shall be sealed by the application of an approved joint sealing compound before spreading the mixture upon a Portland cement concrete surface.
- C. Tack coat shall be applied to all PCCP, milled asphalt surfaces, and asphalt surfaces before placement of the bituminous mixture.
- D. Contact surfaces of curbing, gutters, manholes and other structures shall be painted with a thin, uniform coating of tack coat prior to the bituminous mixture being placed against them.

3.3 Preparation of Subgrade or Base

- A. Mixtures for base may be placed on an earth subgrade or an existing pavement surface to be used as a base, or on a previously prepared base or subbase, as specified and shall conform to the lines, grades and cross sections shown on the plans or as otherwise specified. Earth subgrade shall be proof-rolled in accordance with Section D1 prior to placement of base materials.
- B. Immediately prior to placing the initial hot asphalt intermediate course, the area on which it is to be placed shall be proof-rolled in accordance with Section D1. Proof-rolling will not be required on resurfacing or widening and other areas inaccessible to the roller. Any roller marks, irregularities or failures shall be corrected as noted by the Town.
- C. The depth of asphalt for patching shall be determined by the larger value of six inches (6") or the depth of the existing pavement.
- D. Install binder/base materials within five (5) working days of preparation of the subgrade. Subgrade and base that have been prepared for over five (5) working days without placement of the base/binder materials will require a re-inspection and proof-roll. Weather conditions could cause a need for re-inspection and proof-roll less than five (5) working days after the initial preparation at the discretion of the Director of Operations and the Town Engineer.

3.4 Preparation of Intermediate Course

- A. Prior to placement of any surface course, the intermediate/binder course and the curb and gutter shall be inspected by the Town for any deficiencies. Any intermediate/binder course and curb and gutter found to be deficient shall be repaired or removed and replaced prior to placement of the surface course. The base course and subgrade below the deficient intermediate asphalt course may also be in poor condition. A full depth replacement of both the base course and intermediate course may be required. The replacement of the intermediate course shall not take place until the Director of Operations and the Town Engineer have inspected below the intermediate course at the repair area.
- B. No surface course can be applied until eighty percent (80%) of housing construction per unit and/or development is complete, or on streets that are designated as construction thoroughfare for future developments.
- C. All surfaces shall be swept and cleaned prior to placement of the surface course. Surfaces on which a mixture is placed shall be free from objectionable or foreign materials at the time of placement.

3.5 Spreading Mixtures

- A. Spreading and finishing shall be per the area density specified on the plans and per Section 402.13 and 402.14 of the INDOT Standard Specifications, current edition.

3.6 Compaction

- A. Compaction shall be per Section 402.15 of the INDOT Standard Specifications, current edition.

3.7 Tolerances

- A. Pavement smoothness for roadways, driveways, and other lanes or paths with clearly defined, longitudinal boundaries shall be per Section 402.18 of the INDOT Standard Specifications, current edition.
- B. Parking areas or other similar large paved areas shall be within one-half inch (1/2") of the grades and elevations shown on the plans and shall be free from depressions that retain stormwater runoff.
- C. Patching areas shall not vary more than one-quarter inch (1/4") measured across the patching area from each edge of the existing pavement using a straightedge in accordance with Section 409.03 of the of the INDOT Standard Specifications, current edition.
- D. Areas outside the allowable tolerance shall be corrected. If corrective methods are ineffective, the pavement shall be removed and replaced to proper tolerances prior to acceptance by the Town.

3.8 Testing

- A. Sampling of the HMA mixture shall be in accordance with ITM 580. Acceptance of the mixtures for binder content and gradations shall be determined based on extractions in accordance with ITM 571 and coarse aggregate angularity with Section 904.03(b) of the current INDOT Standard Specifications.
- B. Sampling for binder content, gradation, and coarse angularity shall be per the following frequency:

<u>Total contract quantity of base, intermediate and surface</u>	<u>No. of Tests</u>
Less than 250 Ton	No test unless directed.
More than 250 Ton	1 test per every 700 Ton each mix, minimum one test each mix.

- C. Asphalt tests shall be performed by an INDOT Certified Hot Mix Technician and an INDOT Certified Hot Mix Asphalt Producer.
- D. Test results shall be submitted to the Director of Operations and the Town Engineer within five (5) working days of the placement of the bituminous mixture.
- E. Asphalt test results which are more than $\pm 0.5\%$ from the JMF shall be considered as failed material. Failed material shall be removed and new material installed prior to acceptance by the Town.

3.9 Protection of Pavement

- A. The contractor shall protect all sections of newly compacted intermediate and surface courses from traffic until they have hardened to the satisfaction of the Director of Operations and the Town Engineer. Minimum curing time shall be twenty-four (24) hours.

END OF SECTION

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SECTION D3 CONCRETE PAVING

PART 1 GENERAL

1.1 General Requirements

- A. Comply with all requirements specified in Subdivision Ordinance No. 498, current edition.
- B. SUBMITTALS: At the time of application for required permits, submit all information required in Subdivision Ordinance No. 498 to the Town of Cedar Lake Plan Commission.

1.2 Section Includes

- A. Concrete paving for streets, alleys, driveways, sidewalks, and curbs.

1.3 References

- A. Indiana Department of Transportation (INDOT) Standard Specifications, current edition.
- B. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
- C. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- D. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- E. ASTM C33 - Concrete Aggregates.
- F. ASTM C94 - Ready Mix Concrete.
- G. ASTM C150 - Portland Cement.
- H. ASTM C260 - Air-Entraining Admixtures for Concrete.
- I. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- J. ASTM C494 - Chemical Admixtures for Concrete.
- K. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- L. ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

PART 2 PRODUCTS

2.1 Materials

A. CONCRETE SIDEWALKS, DRIVEWAYS, CURB, AND CURB RAMPS

1. Materials shall be in accordance with all applicable provisions of Article 604.02 of the Indiana Department of Transportation (INDOT) Standard Specifications and other applicable Articles called for therein.
 - a. Unless otherwise specified on the Development Standards Manual details, steel reinforcing fabric for sidewalks and driveways shall be 6x6-W1.4xW1.4 welded wire fabric.
 - b. Refer to the details in the Development Standards Manual.

B. REINFORCING STEEL

1. This work shall consist of furnishing and placing reinforcing steel in accordance with Section 703 of the INDOT Standard Specifications, current edition.

C. CONCRETE PAVEMENT FOR RESIDENTIAL DRIVES – Six Inch (6")

1. This item will consist of the construction of six-inch (6") concrete drive approaches. Sawing, general-purpose two-inch (2") rigid conduit (with end caps) joint material and fill material shall be required unless otherwise approved by the Town. The concrete drives shall be removed to the nearest joint when possible; if not, they should be sawed as directed by the Town.

D. CONCRETE PAVEMENT FOR COMMERCIAL OR PUBLIC DRIVES – Eight-Inch (8") [Including Alley Approaches]

1. All existing commercial Portland Cement Concrete driveways and alley approaches, which are removed entirely for construction of the sewer, shall be replaced with eight inches (8") of plain concrete.
2. Portland Cement Concrete for commercial driveways and alley approaches shall be in accordance with Section 501 of the INDOT Standard Specifications, current edition. Sawing, general-purpose two-inch (2") rigid conduit (with end caps), joint material and fill material shall be required unless otherwise approved by the Town.

PART 3 EXECUTION

3.1 Conditioning of Existing Surfaces

- A. When the surface of the existing pavement or old base is irregular, it shall be brought to uniform grade and cross section.
- B. All longitudinal and transverse joints and all cracks shall be sealed by the application of an approved joint sealing compound before spreading the mixture

upon a Portland Cement concrete surface.

- C. Contact surfaces of curbing, gutters, manholes and other structures shall be painted with a thin, uniform coating of tack coat prior to the bituminous mixture being placed against them.

3.2 Preparation of Subgrade or Base

- A. Mixtures for base may be placed on an earth subgrade or an existing pavement surface to be used as a base, or on a previously prepared base or subbase, as specified and shall conform to the lines, grades and cross sections shown on the plans or as otherwise specified. Each subgrade shall be proof-rolled prior to placement of base materials.
- B. Just prior to placing the concrete pavement, the area on which it is to be placed shall be proof-rolled with a pneumatic tire roller. Proof-rolling will not be required on resurfacing or other areas inaccessible to the roller. Any roller marks, irregularities or failures shall be corrected as directed.
- C. The depth for patching shall be determined by the larger value of six inches (6") or the depth of the existing pavement.
- D. Install concrete/base materials within five (5) working days of preparation and Town acceptance of the subgrade/base. Subgrade and base that have been prepared for over five (5) working days without the placement of the intermediate base materials will require a re-inspection and proof-roll. Weather conditions could cause a need for re-inspection and proof-roll less than five (5) working days after the initial preparation at the discretion of the Director of Operations or the Town Engineer.

3.3 Concrete Sidewalk & Driveway Removal

- A. Items requiring removal of concrete shall consist of the removal and disposal of Portland Cement Concrete sidewalks and driveways. Concrete Sidewalk and Driveway Removal shall include only the removal and disposal of existing public road, street, sidewalks and driveways required for the planned construction. Prior to performing removal work on existing driveways, sidewalks, curb and gutter, all cement concrete removal items shall be cut with a power driven, concrete saw along designated (neat) lines.

3.4 Examination

- A. Verify compacted aggregate base is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.5 Joints

- A. Place expansion and contraction joints as shown on the details in the Development Standards Manual.
- B. Place joint filler between paving components and building or other appurtenances.

3.6 Paving

- A. All paving shall meet or exceed all applicable provisions of the INDOT Standard Specifications, current edition.
- B. Placement of concrete sidewalks, driveways, curb, shall be in accordance with standards set forth in Section 501 and Section 502 of the INDOT Standard Specifications, current edition and as indicated on the plans.

END OF SECTION

SECTION D4 RECYCLED ASPHALT PAVEMENT

PART 1 GENERAL

1.1 General Requirements

- A. Comply with all requirements specified in Subdivision Ordinance No. 498, current edition.
- B. SUBMITTALS: At the time of application for required permits, submit all information required in Subdivision Ordinance No. 498 to the Town of Cedar Lake Plan Commission.

1.2 Section Includes

- A. Asphalt paving for streets, alleys, driveways and sidewalks.

1.3 References

- A. Indiana Department of Transportation (INDOT) Standard Specifications, current edition.
- B. ASTM D244 – Standard Test Methods and Practices for Emulsified Asphalts
- C. ASTM D445 – Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
- D. ASTM D2006-70

1.4 Description

- A. This work consists of rehabilitating an asphalt pavement by heating, scarifying, reshaping, rejuvenating and compacting the existing surface with the addition of a new bituminous surface conforming to the required thickness as specified.

1.5 Procedure

- A. The entire surface to be rehabilitated shall be cleaned of water, earth and foreign material. All base failures shall be repaired in accordance with local specifications. Rehabilitation work shall be performed only when the air temperature in the shade is at least forty-five degrees Fahrenheit (45° F) and the forecast is for rising temperatures.

PART 2 PRODUCTS

2.1 Materials

- A. The materials comply with all applicable provisions of Article 401.03 of the Indiana Department of Transportation Standard Specifications, current edition, and other applicable Articles called for therein.

<u>Specification Designation</u>	<u>Test Method</u>	<u>Requirement</u>	
		<u>Min.</u>	<u>Max.</u>
Viscosity S.F., At 77 F, Sec	ASTM D244	15	- 40
Residue, % W	ASTM D244 (Mod A)	60	- 65
Sieve Test, % Max.	ASTM D244 (Mod B)	0.10	
Particle Charge Test	ASTM D244	Positive	
Tests on Residue Distillation	ASTM D244 (Mod C)		
Viscosity cst, 60 C	ASTM D445	100	- 200
Asphaltenes, % W, MAX.	ASTM D2006-70	1.0	

B. TESTS:

1. 1. ASTM D244 Modified Evaporation Test for percent of residue is made by heating a fifty (50) gram sample to three hundred degrees Fahrenheit (300 ° F) until foaming ceases, then cool immediately and calculate results.
2. 2. Test procedure identical with ASTM D244 except that distilled water shall be used in place of two percent (2%) sodium oleate solution.

PART 3 - EXECUTION

3.1 Procedure

- A. The surface of the existing pavement shall be heated with a continuously moving heater to allow the pavement to be scarified to a three-quarter inch ($\frac{3}{4}$ ") in. average depth with the surface temperature of the old pavement not to exceed three hundred seventy-five degrees Fahrenheit (375°F). Heat shall be applied under an enclosed or shielded hood and shall extend at least four inches (4") beyond the width of scarification on both sides. Scarifying shall be accomplished with pressure scarifiers. The scarifying unit shall be equipped to scarify and move material away from the gutter flags for a depth of one –half inch ($\frac{1}{2}$ ") by four inches (4") wide. The heating-scarifying operation shall not exceed thirty feet (30') per minute. When a repaving pass is being made adjacent to a previously placed mat, the longitudinal repaving seam shall extend at least two inches (2") into the previously placed mat.
- 3.

4. 1. The depth of scarification will be determined by scraping out and weighing the heated and scarified material from a one (1) square foot area. This weight shall be seventy-five percent (75%) of the theoretical weight of one (1) square foot by one inch (1") of compacted bituminous surface course.
- B. Immediately after the scarifying operation, an approved asphalt modifier shall be applied at the approximate rate of one-tenth (0.10) gallon per square yard. The engineer may waive or adjust the requirement for the asphalt modifier if the existing pavement condition warrants this action. The surface shall then be leveled, by distributing the heated, scarified and treated (HST) material over the width being processed, so as to produce a uniform cross section. The minimum temperature of the HST material after leveling shall be one hundred seventy-five degrees Fahrenheit (175° F). Compaction shall be accomplished with a self-propelled pneumatic-tired roller meeting the following requirements:
5. 1. Self-Propelled Pneumatic – Tired Roller; The roller shall be of the oscillating wheel type consisting of not less than seven (7) pneumatic-tired wheels revolving on two (2) axles, and capable of being ballasted to the mass (weight) required.
 6. 2. The tires on the front and rear wheels shall be staggered so that the tire sidewalls will have a minimum overlap of fifteen millimeters (one-half inch) [15mm (1/2")]. The roller shall provide for a smooth operation when starting, stopping or reversing direction. The tires shall withstand inflation pressures between four hundred fifteen and eight hundred twenty-five kilopascal (415 and 825 kPa) [sixty and one hundred twenty pounds per square inch (60 and 120 psi)].
 7. 3. The roller shall be equipped with an adequate scraping or cleaning device on each tire to prevent the accumulation of material on the tires. When used for the compaction of bituminous mixtures, the roller shall be equipped with a water system, which will keep all tires uniformly wet to prevent material pickup when required.
 8. 4. The Contractor shall provide means for determining the mass (weight) of the roller as distributed on each wheel. Ballast shall be included in determining the mass (weight).

END OF SECTION

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SECTION E WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.1 General Requirements

- A. Comply with all requirements specified by all applicable Town Ordinances.
- B. Submittals: At the time of application for required permits, submit all information required by all applicable Town Ordinances.
- C. All products specified shall use English units of measure unless otherwise specified or approved.

1.2 References

- A. ANSI / AWWA C104 / A21.3-03 - Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- B. ANSI / AWWA C105 / A21.5-05 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe System
- C. ANSI / AWWA C110 / A21.10 - Ductile-Iron and Gray-Iron Fittings for Water
- D. ANSI / AWWA C111 / A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- E. ANSI / AWWA C151 / A21.51 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water
- F. ANSI / AWWA C600-05 - Installation of Ductile-Iron Water Mains and Their Appurtenances
- G. ANSI / AWWA C509-01 - Resilient-Seated Gate Valves for Water-Supply Service
- H. ANSI / AWWA C500-02 - Standard for Metal-Seated Gate Valves for Water Supply Service
- I. ANSI / AWWA C502-05 - Dry-Barrel Fire Hydrants
- J. AWWA C651-05 - Disinfecting Water Mains
- K. ASTM A48 / A48M-03 - Standard Specification for Gray Iron Castings
- L. ASTM C478-09 - Standard Specification for Precast Reinforced Concrete Manhole Sections

- M. ASTM D1556-07 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
- N. ASTM D1557-07 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
- O. ASTM D2167-08 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
- P. ASTM D6938-08a - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods
- Q. Indiana Department of Transportation (INDOT) Standard Specifications Manual

Follow current edition of all references.

PART 2 PRODUCTS

2.1 Ductile-Iron Pipe

- A. All pipe shall conform to the applicable specifications and requirements set forth herein.
- B. Pipe used in water main construction shall be Ductile-Iron Pipe and conform to AWWA C151 / ANSI A21.51. Class 52 thickness designation, casting, marking, testing, etc. shall be provided in accordance with applicable ANSI or AWWA standards; unless otherwise approved by the Director of Operations or the Town Engineer whereby this will be the only acceptable type of pipe installed.
- C. Ductile-Iron pipe shall be lined with double thickness cement lining in accordance with AWWA C104 / ANSI A21.3-03.
- D. Pipe Fittings
 - 1. All ductile iron fittings shall conform to the latest ANSI A21.10 for short body, cast iron fittings twelve inches (12") and less, and AWWA C110 for fittings fourteen inches (14") and larger.
 - 2. Lining, or other special items, shall be specified in special provision.
- E. Minimum Size: The minimum permissible sizes for water main are, as follows:
 - 1. Residential: 8" \varnothing = 0.3491 ft²
 - 2. Commercial: 10" \varnothing = 0.5454 ft²
 - 3. Industrial: 12" \varnothing = 0.7854 ft²

2.2 Polyethylene Encasement

- A. Polyethylene encasements shall be required of all underground installations of newly constructed ductile-iron pipe water mains and fittings and other related appurtenances, in accordance with AWWA-C105 / ANSI A21.5-05. The installation method shall be approved by the Director of Operations or Town Engineer.

2.3 Valves for Water Mains

- A. 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.
- B. The minimum requirements for all valves shall, in design, material and workmanship, conform to the standards of the latest 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.
- C. Materials:
 - 1. **Manufacture and Marking:** The valves shall be standard pattern and shall have the name or make of the manufacturer, size and working pressure plainly cast in raised letters on the valve body. Valves from one of the following manufacturers are acceptable: Mueller, U.S. Valve, Clow, or East Jordan Iron Works.
 - 2. **Type and Mounting:** The valve bodies shall be cast iron, mounted with approved non-corrosive metals. All wearing surfaces shall be bronze, or other approved non-corrosive materials and there shall be no moving bearing or contact surfaces or iron in contact with iron. Contact surfaces shall be machined and finished in the best workmanlike manner, and all wearing surfaces shall be easily renewable.
 - 3. Butterfly valves may not be used in the Town of Cedar Lake, except as authorized by the Director of Operations or Town Engineer.
- D. **Gate Valves:** All gate valves shall meet the standards of AWWA C509. The stem shall be of high tensile strength bronze or other approved non-corrosive metal. All nonferrous bushings shall be of substantial thickness tightly fitted and pressed into machined seats. All valves shall open by turning to the left, counterclockwise.
 - 1. **Manufacture** – Mueller, U.S. Valve, East Jordan Iron Works or McWane (Clow) or approved equal
 - 2. **Resilient Seated Wedge** - ANSI/AWWA C509
 - 3. **Working Pressure:** 200 psi
 - 4. **Ends:**
 - a. Mechanical Joint
 - b. Push-On (Rubber Gasket) Joint
 - c. Flange Joint
 - 5. **Bolts:** Stainless Steel, Class 304 or 314
 - 6. **Epoxy Coated**

7. Operating Stem: Non-Rising with "O" Ring Seals.
 8. Operating Nut: Two inches (2") square at the bottom, one and fifteen sixteenths inches (1-15/16") at the top and one and three quarter inches (1-3/4") high; Open Left
 9. Markings to be cast on the bonnet or body:
 - a. Open indicating arrow
 - b. Manufacturer's name
 - c. Pressure rating
 - d. Year of manufacture
 - e. Size
 10. Hydrostatic Test Pressure at Factory: Each gate valve shall be tested at the factory for performance and operation prior to painting and shall be subjected to the following hydrostatic pressure tests: each three-inch (3") to twelve-inch (12") valve, inclusive, shall be subjected to hydrostatic pressure test under pressures of both three hundred pounds per square inch (300 psi) and one hundred seventy-five pounds per square inch (175 psi) and each sixteen-inch (16") to forty-eight-inch (48") valve, inclusive, shall be subjected to test pressures of three hundred pounds per square inch (300 psi) and one hundred fifty pounds per square inch (150 psi). These tests shall be conducted in accordance with provisions of AWWA C500. Tests for special valves shall be made as provided in the special provisions.
- E. Tapping Valves: Tapping valves shall be furnished with flanged inlet and connections having a machined projection on the flanges to mate with a machined recess on the outlet flanges of the tapping sleeves and crosses.
- The outlet ends shall conform in dimensions to the AWWA Standards for the hub or mechanical joint connections, except that the outside of the hub shall have a large flange for attaching a drilling machine. The seat opening of the valves shall be larger than normal size to permit full diameter cuts. Tapping sleeve or cross shall be of the same manufacture as the tapping valve.
1. McWane (Clow) resilient wedge tapping valve.
 2. Seat Opening larger than normal valve to permit full diameter cuts.
 3. Flanged inlet by mechanical joint.
 4. Tapping sleeve or cross:
 - a. Same manufacturer as tapping valve.
 - b. Sleeve, nuts and bolts for buried installations to be minimum type 304 stainless steel.
- F. Valves sixteen inches (16") and larger installed in vertical or inclined lines shall be equipped with hard-babbitt tracks secured to the valve body and bonnet to support the lower disc during the operation, and equipped with slides to assist the travel of the gate assembly.
- G. Gate Valve Stem Seals: Unless otherwise designated in the special provisions all gate valves up to and including twelve inch in size, shall be furnished with O-ring stem seals. Number, size and design shall conform to the AWWA standard for gate valve O-ring Stem Seals. Valves larger than twelve inches (12") shall be equipped with packing glands.

- H. Wrench nuts on gate valves shall be made of cast iron and shall be one and fifteen-sixteenths inches (1-15/16") square at the top, two inches (2") square at the base, one and three quarter inches (1-3/4") high, unless otherwise designated in the special provisions. Nuts shall have a flanged base upon which shall be cast an arrow at least two inches (2") long showing the direction of the opening. The word "Open" in one-half inch (1/2") or larger letters shall be cast on the nut to clearly indicate the direction of opening the valve.
- I. Boxes for Water Mains and Water Services: Standard valve vaults, special valve vaults, cast iron valve boxes, curb boxes and meter boxes, all in accordance with the Cedar Lake standards.
 - 1. Material: Ring and Cover and Valve Box Castings. Castings for cast iron ring and cover and for cast iron parts of valve boxes shall conform to the requirements of Standard Specifications for Gray Iron Castings, ASTM Designation A-48.

2.4 Fire Hydrants

- A. These specifications are to be used in conjunction with the AWWA Standard C502 for fire hydrants for ordinary water works service and follow standard drawing number W - 2.
- B. Material:
 - 1. 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.
 - 2. The hydrant shall be East Jordan Iron Works, 5CD250 (three nozzle with operating cap dust shield) traffic model, or approved equal and of a pattern approved by the Director of Operations or Town Engineer. The name or make of the manufacturer and 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.
 - 3. As a minimum requirement, all hydrants shall be designed for a working pressure of one hundred fifty pounds per square inch (150 psi) and in either bronze or other approved noncorrodible material, and there shall be no moving bearing or contact surfaces of iron in contact with iron or steel. All contact surfaces shall be finished or machined in the best workmanlike manner and all wearing surfaces shall be easily renewable.
 - 4. The design of the hydrant shall be such that all working parts may be removed through the top of the hydrant and shall have the required AWWA specified number of turns of the stem to open the gate an ear equal to the area of the valve opening. Any change in area equal to the area of the valve opening. Any change in area of the water passage through the valve must have an easy curve, and all outlets must have round corners of good radius.
 - 5. Lugs, if required for harnessing the hydrant to the connecting pipe from the main in the street, shall be provided on the bell of the elbow or on the hydrant bottom casting. A drawing of the lug construction shall be submitted for approval, on request of the Director of Operations.

6. Hydrants shall be provided with a sidewalk or breakaway flange. Breaking devices shall be at the sidewalk flange, which will allow the hydrant barrel to separate at this point with a minimum breakage of hydrant parts in case of damage. There shall also be provided at this point, a safety stem coupling on the operating stem that will shear at the time of impact. Unless otherwise specified, all hydrants shall be equipped with O-ring stem seals.
7. All bolts and nuts for water main fittings shall be class 304 or 314 stainless steel.

C. Hydrant Details:

1. The dimensions and details of hydrants and nozzles, unless otherwise noted, shall be as follows:
 - a. Hydrant six inches (6") connection (East Jordan Iron Works, 5BR250, C-Dome)
 - b. Hydrant connection pipe size diameter - six inches (6")
 - c. Standpipe, minimum inside diameter - eight inches (8")
 - d. Hydrant base shall include bottom and rear support shoe.
 - e. Female type base restrained mechanical joint is recommended for connection to the auxiliary valve.
 - f. Length of hydrant from bottom of hydrant connection to sidewalk ring - As required by Director of Operations or Town Engineer.
 - g. Valve opening - six inches (6")
 - h. Size of auxiliary gate valve - six inches (6")
 - i. Hose nozzles, number and size: Two (2) - two and one half inches (2-1/2") & One (1) - four inches (4")
 - j. Thread pattern - National Standard
2. All nozzles shall be fitted with cast iron threaded caps with operating nut of the same design and proportions as the hydrant stem nut. Caps shall be threaded to fit the corresponding nozzles and shall be fitted with suitable gaskets for positive water tightness under test pressures.
3. The operating nuts on hydrants stem and nozzle caps shall be the same for all sizes of hydrants.

Dimensions shall be as follows:

Pattern of nut - Tapered pentagonal

Height - One and one sixteenth inches (1-1/16")

Size of pentagon - One and thirty five one hundredths inches (1.35") at bottom of nut

(As measured from point of flange)

4. The hydrant valve shall open by turning to the left (counterclockwise).
5. All bolts and nuts below grade must be class 304 or 314.

D. Factory Hydrostatic Test: Before the hydrant is painted at the factory, it shall be subjected to an internal hydrostatic test of three hundred pounds per square inch (300 psi) with the hydrant valve in a closed position and again with the hydrant valve in an open position.

E. Painting: All exposed parts of the hydrant shall be painted red.

- F. Marking: All hydrants shall have a location marker rod and hydrant tag number per drawing number W - 2. Location rod shall be five feet tall, corrosion resistant, top flange mounted with a spring base and shall not interfere with hydrant operation. Tag number designation to be provided by the Cedar Lake Public Works Department.

2.5 Fire Flow Requirements

- A. 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.
- B. Fire flow calculations shall be prepared in accordance with the Guide for Determination of Required Fire Flow, published by Insurance Services Office, Inc. (ISO). Fire flow for sprinkler buildings shall be reviewed for approval under part D of this section.
- C. The design engineer shall show that the water system can supply the required fire flow.

The minimum fire flow requirement shall be as noted below:

- Residential – 1,500 GPM
- Industrial/Commercial – 3,500 GPM

- D. The Cedar Lake Town Council or its Designee and Fire Chief, jointly, shall review and approve plans and specifications related to fire flows.

PART 3 EXECUTION

3.1 Surface Conditions

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Erosion and sediment control shall be provided to and approved by the Director of Operations or Town Engineer.

3.2 Field Measurements, Survey Lines, Reference Points & Grades

- A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 Installation of Pipe

- A. Trenching

1. All poles, fences, sewer, gas, water or other pipes, wires, conduits, manholes, buildings, structures and property in the proximity of any excavation shall be supported and protected from damage by the Contractor during construction.
2. Wherever sewer, gas, water or other pipes or conduits cross the excavation, the Contractor shall support said pipes and conduits without damage to them and without interrupting their use during the progress of the Work. The manner of supporting such pipes, etc., shall be subject to review by Town.
3. All property shall be thoroughly cleaned of all surplus materials, earth and rubbish placed thereon by the Contractor.
4. The Contractor shall notify Town and the appropriate utility companies at least seventy-two (72) hours prior to the start of construction.
 - a. The Contractor shall coordinate all utility companies' location of any existing underground utilities and structures within the site limits.
 - b. The Contractor, prior to the start of construction, shall verify the location of any existing underground utilities and structures within the site limits. It is the Contractor's responsibility to make any and all exploratory investigation, which may be necessary to verify or locate the utility pipe, wires, structures and appurtenances of others.

B. Location:

1. 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 Cedar Lake Town Council or its Designee.
2. Not closer than ten feet (10') from a public sewer system or service line (measured edge to edge). The edge of any water main or water service line shall not be less than eight feet (8') from the edge of manholes.
3. Where the bottom of the water pipe will be at least eighteen inches (18") above the top of the sewer pipe.
 - a. If eighteen inches (18") of separation is not allowable, encase the lower elevation pipe per standard drawing W – 9.
4. Where the top of the water pipe will be at least eighteen inches (18") below the bottom of the sewer pipe.
 - a. If eighteen inches (18") of separation is not allowable, encase the lower elevation pipe per standard drawing W – 9.
5. The Contractor shall use pressure pipe with no joint closer horizontally than sixty inches (60") from the crossing of gravity flow sewers above waterlines.
6. Unless otherwise shown on the plans or indicated in the special provision, all pipe shall be laid to a minimum depth of five feet (5') measured from the existing ground surface 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 plans.
7. A hydrant shall be placed on dead end water mains. Water mains shall extend to the subdivision or property boundary line and shall be located in a public Right-of-Way or Easement.
8. Dead end mains shall not be allowed except with the direct permission of the Director of Operations or Town Engineer.

9. Water mains shall be installed in casing pipes below street crossings where directed by the Director of Operations of Town Engineer.

C. Laying Pipe

1. All pipe shall be reinspected for soundness and damage due to handling immediately before being lowered into the trench. Any pipe found to be unsound or damaged will be rejected and shall be removed immediately from the site of the work. All material shall be new and of first quality.
2. All pipe shall be laid accurately to the required line and grade and in such manner as to form a close, concentric joint with the adjoining pipe and to bring the invert of each section to the required grade. Bell holes shall be dug in advance of the pipe being laid as required. The supporting of the pipe on blocks will not be permitted.
3. All open ends of pipes and branches shall be sealed with plugs or bulkheads firmly held in place.
4. At the end of each day's work, the open ends of all pipes shall be protected against the entrance of animals, children, earth, or debris by bulkheads or stoppers.
5. Each length of section shall be properly pulled or shoved "home" with a winch or come-a-long against the section previously laid to make a proper joint. The pipe shall then be securely held in position during the backfill operations. Joints shall not be pulled or cramped more than the design of the joint will permit and so as not to injure the conduit.
6. Lower pipe, fittings, and valves into the trench by hand, by means of hoists or ropes, or by other suitable tools or equipment which will not damage products, coatings, or linings. Do not drop or dump pipe, fittings, or valves into the trench.
7. Provide thrust restraint at horizontal and vertical deflection fittings and at tees, plugs, tapping sleeves, and tapping saddles, only with the direct permission of the Director of Operations.
8. Laying of ductile iron piping shall meet the requirements of ANSI / AWWA C600-05, unless otherwise specified in this Section.
9. Open excavation shall be satisfactorily protected at all times.
10. Pipe found not to comply with these standards shall be removed and replaced.

D. Dewatering

1. Dewatering sufficient to maintain the water level below the surface of the trench bottom shall be accomplished prior to pipe laying and jointing, if not done prior to excavation and placement of the bedding as called for.
2. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench.
3. When the dewatering operation is ended, the trench shall be replaced in such a manner so as not to disturb the pipe and its foundation.

E. Backfill Materials

1. B-Borrow shall comply with INDOT Standard Specifications, current edition. Maximum stone size shall not exceed one inch (1") or the maximum size recommended by the pipe manufacturer, whichever is smaller.

2. Earth backfill material shall contain no more than five percent (5%) organic material, no particles larger than four- inches (4") and shall be free of trash, rubble and debris. The Plastic Index of the fraction passing the No. 40 sieve shall not be more than twenty-five (25).
3. Coarse aggregate material shall be No. 53 or 73 complying with INDOT Standard Specifications, current edition. Coarse aggregate is required for all pipe installed below pavement and sidewalks.
4. Backfill materials may vary from those specified depending upon utility company requirements when trenches cross existing utilities.
5. The use of slag material as backfill is not an acceptable alternative in the Town of Cedar Lake.

F. Bedding

1. Each pipe shall be laid and bedding with INDOT No. 8 coarse aggregate limestone, unless otherwise approved.
 - a. There shall be a minimum of 6 inches beneath the pipe.
 - b. The lower half of the laid pipe shall be haunched to eliminate voids.
 - c. There shall be a minimum of 12 inches of bedding above the laid pipe.

G. Sheet Piling

1. Sheet piling (permanent or temporary) shall be provided as required for construction in areas where wide excavation cannot be permitted, or for an excavation that is open for an extended period, or where soil conditions dictate to protect adjacent structures, roadways and utilities.
2. The section modulus of piling sections shall be as required to function properly as intended.
3. Piling sections shall be marked for length and sorted and stacked at the job site to prevent distortion and to facilitate proper sequence of setting and driving.
4. Interlocks shall be protected from becoming obstructed by sand, gravel, mud or other materials.
5. Pile tips are approved for use at the Contractor's option.

H. Certifications

1. The Developer shall submit Manufacturer's Certificate of Compliance with applicable ASTM Standards to the Town Engineer for all materials delivered and installed on site.

3.4 General Trenching

- A. Follow the standard drawing number W – 7 for pipe trench.
- B. Unless otherwise directed or permitted, not more than one hundred feet (100') of any trench shall be open at any time.
- C. Surface encumbrances, located so as to create a hazard to employees involved in excavation work or in the vicinity thereof at any time during operations, shall be removed or made safe before excavating is begun.

- D. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench sufficient to avoid overloading and to prevent slides and cave-ins. Adequate drainage shall be provided for the stockpiles and surrounding areas by means of ditches, dikes, or other approved methods. The stockpiles shall also be protected from contamination with unsatisfactory excavated material or other material that may destroy the quality and fitness of the suitable stockpiled material. If the Contractor fails to protect the stockpiles and any material becomes unsatisfactory as a result, such material, if directed by the Town Engineer, shall be removed and replaced with satisfactory on-site or imported material from approved sources.
- E. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavation is maintained. In wet trenches dewatering equipment shall be operated ahead of pipe laying and the water level kept below the pipe invert.
- F. The trench shall be excavated as shown in these Standards or as recommended by the manufacturer of the pipe to be installed, whichever is more stringent. Trench walls below and above the top of the pipe shall be sloped, or made vertical, as recommended in the manufacturer's installation manual. The trench width below an elevation one foot (1') above the top of pipe shall not exceed that recommended in the installation manual. Where no manufacturer's installation manual is available, trench walls below an elevation one foot (1') above the top of pipe shall be vertical and trench walls one foot (1') or more above the top of pipe shall be adequately sloped as required to prevent slides and cave-ins unless proper precautions, as stipulated by OSHA, are taken. If adequate trench slopes cannot be provided in the available work space and right-of-way limits, then use of sheeting and shoring and/or a trench box is mandatory.
- G. Excavation for manholes or similar structures shall be sufficient to leave at least twelve inches (12") clear between the outer structure surfaces and the face of the excavation or support members and be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations. When concrete is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete is to be placed.
- H. Dust conditions shall be kept to a minimum by the use of water. The use of salt or calcium chloride will not be permitted.

3.5 Removal of Material

- A. As trenches are backfilled, the Contractor shall remove all surplus material, regrade and leave clear, free, and in good order all roadways and sidewalks affected by the construction of the work. During the progress of and until the expiration of the guarantee period, he shall maintain in good and safe

conditions the surface or any street over the trenches and promptly fill all depressions over and adjacent to trenches caused by settlement of backfilling.

- B. Surplus or unsatisfactory excavated material shall be properly disposed of at a location off the property limits.

3.6 Stabilization

- A. If portions of the bottom of trenches or excavations consist of material unstable to such a degree that, in the opinion of the Town, it cannot adequately support the pipe or structure, the bottom shall be overexcavated and stabilized with granular material in compliance with the INDOT Standard Specifications, current edition. Depth of stabilization shall be as directed by the Town.

3.7 Backfilling

- A. Pipe bedding and initial backfill shall be clean granular material to a depth per standard drawing number W - 7. Initial backfill shall be placed in lifts of a maximum of six inches (6") loose thickness. The method for placing and compacting the backfill shall comply with the INDOT Standard Specifications as applicable. At a minimum, the Contractor shall use a vibrating plate compactor with adequate passes to achieve compaction. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. Care shall be taken to ensure thorough compaction of the fill under pipe haunches.
- B. Final backfill for the remainder of the trenches shall be as follows:
 - 1. Backfill for trenches under sidewalks, under turfed or seeded areas, and in miscellaneous areas shall be of approved earth material and contain no stones over four inches (4") in their largest dimensions. Stones which are used in backfilling shall be distributed among the earth backfill so that all interspaces are filled with fine material. All such backfilling shall be deposited in lifts of a maximum twelve inches (12") loose thickness and compacted with a vibrating plate compactor or approved mechanical tamping devices. Excess earth to the amount required to replace settlement shall be neatly rounded over the trench and the remainder hauled off the work site. Trenches shall be maintained by the Contractor until settlement has ceased and trenches remain level with the adjacent ground.
 - 2. Backfill of all trenches under existing or proposed roadways and structural footings or slabs shall be approved granular material only. In addition, the top six inches (6") below the base of the pavement shall be backfilled with No. 53 crushed limestone. The backfill shall be placed in six inch (6") maximum lifts and the method of placing and compacting the backfill shall comply with the INDOT Standard Specifications, as applicable. At a minimum, the Contractor shall use a vibrating plate compactor with adequate passes to achieve compaction.

- C. Pipe bedding and each backfill lift shall be compacted to a dry density not less than the following percentage of maximum dry density as determined by the Modified Proctor Test (ASTM D1557):

Usage	Compaction %
Beneath piping	95
Upper two feet (2') of backfill under roadways	95
Under roadways (except upper two feet (2') of backfill)	92
Under haunches and up to springline of pipe	95
From springline to twelve inches (12") above top of pipe	90
Adjacent to (or behind) vertical walls	90
Under turfed or seeded areas below topsoil, and	85
Miscellaneous area (from twelve inch [12"] above pipe to surface)	

- D. No fill shall be placed against any manhole or other structure until placed concrete has been allowed to cure for at least three (3) days. Backfill shall be placed in such a manner that the structure will not be damaged by shock from falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be placed in such a manner as to prevent eccentric loading and excessive stress on the structure. Heavy equipment for spreading and compacting shall not operate closer to foundation walls than set forth as follows.
1. Fill placed adjacent to vertical or near vertical walls (within a zone defined by imaginary lines extending horizontally away from the base of the wall for a distance of three feet and thence upward and outward on a one to one (1:1) slope to the elevation of the top of the wall) shall be compacted to the specified density with light equipment not exceeding fifteen hundred (1500) pounds in static weight or dynamic rated impact.

3.8 Compaction Testing

- A. Sampling and testing shall be the responsibility of the Contractor. Tests shall be performed by a Town approved commercial testing laboratory or may be tested with approved facilities furnished by the Contractor.
- B. Laboratory tests for moisture-density relations shall be determined in accordance with ASTM D1557. A minimum of one test shall be performed on each different type of material used for backfill, or as directed by the Town.
- C. Field In-Place Density Tests:
1. Shall be performed in sufficient numbers to ensure that the specified compaction is being obtained. A minimum of one test per lift of backfill for every two hundred feet (200') of installation shall be performed. Locations for performing the density tests will be coordinated with the Town.
 2. Shall be determined in accordance with ASTM D1556, ASTM D2167 or ASTM D6938.

- C. Pipe bedding and each backfill lift shall be compacted to a dry density not less than the following percentage of maximum dry density as determined by the Modified Proctor Test (ASTM D1557):

Usage	Compaction %
Beneath piping	95
Upper two feet (2') of backfill under roadways	95
Under roadways (except upper two feet (2') of backfill)	92
Under haunches and up to springline of pipe	95
From springline to twelve inches (12") above top of pipe	90
Adjacent to (or behind) vertical walls	90
Under turfed or seeded areas below topsoil, and	85
Miscellaneous area (from twelve inch [12"] above pipe to surface)	

- D. No fill shall be placed against any manhole or other structure until placed concrete has been allowed to cure for at least three (3) days. Backfill shall be placed in such a manner that the structure will not be damaged by shock from falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be placed in such a manner as to prevent eccentric loading and excessive stress on the structure. Heavy equipment for spreading and compacting shall not operate closer to foundation walls than set forth as follows.
1. Fill placed adjacent to vertical or near vertical walls (within a zone defined by imaginary lines extending horizontally away from the base of the wall for a distance of three feet and thence upward and outward on a one to one (1:1) slope to the elevation of the top of the wall) shall be compacted to the specified density with light equipment not exceeding fifteen hundred (1500) pounds in static weight or dynamic rated impact.

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- A. Sampling and testing shall be the responsibility of the Contractor. Tests shall be performed by a Town approved commercial testing laboratory or may be tested with approved facilities furnished by the Contractor.
- B. Laboratory tests for moisture-density relations shall be determined in accordance with ASTM D1557. A minimum of one test shall be performed on each different type of material used for backfill, or as directed by the Town.
- C. Field In-Place Density Tests:
 1. Shall be performed in sufficient numbers to ensure that the specified compaction is being obtained. A minimum of one test per lift of backfill for every two hundred feet (200') of installation shall be performed. Locations for performing the density tests will be coordinated with the Town.
 2. Shall be determined in accordance with ASTM D1556, ASTM D2167 or ASTM D6938.

When ASTM D6938 is used, the calibration curves shall be checked and adjusted using only the sand cone method as per ASTM D1556. ASTM D6938 results in a wet unit weight of soil and the moisture content of the soil. The calibration curves furnished with the moisture gages shall be checked along with density calibration checks as described in ASTM D6938. The calibration checks of both the density and moisture gages shall be made at the beginning of a job, on each different type of material encountered and at intervals as directed by the Town. Copies of calibration curves and results of calibration tests shall be submitted to the Town.

- D. All test results shall be submitted to the Town.
- E. Trenches improperly compacted shall be reopened to the depth directed by the Town and then refilled and compacted to the density specified. Field in-place density tests shall also be repeated for improperly compacted trenches that are reopened, refilled and recompact. A minimum of one (1) repeat test per lift of backfill for every two hundred feet (200') of improperly compacted trench that is reopened, refilled and recompact shall be performed.

3.9 Connections to Existing Water Mains

- A. Connections to existing water mains shall be accomplished without interruption of service. Tap and valves will be provided at the point of connection to the existing system.

3.10 Laying of Pipe on Curves

- A. Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflections at the joints.
- B. Where deflection of curves is required, the Director of Operations or Town Engineer will approve the methods to be used.
- C. Maximum deflections at pipe joints and laying radius for various pipe lengths are as found in the following standards:

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

- D. When rubber gasketed pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected, as required. Trenches shall be made wider on curves for this purpose.

3.11 Fire Hydrants

- A. Locate Fire Hydrant: Per standard drawing number W - 2
 1. Where public water supplies may be extended, fire hydrants shall be installed along public streets.
 2. Hydrants shall be installed in residential districts on the basis of serving one hundred twenty thousand square feet (120,000 sf) of area and not be

more than three hundred fifty feet (350') apart. Hydrants shall be located within the public right of way or easement, at the side property lines.

3. In commercial and industrial districts, hydrants shall be installed on the basis of serving eighty thousand square feet (80,000 sf) of area and not be more than two hundred fifty feet (250') apart. The farthest distance from a hydrant to any point on a building it services shall be three hundred fifty linear feet (350'). The closest edge of an installed hydrant shall be no closer than approximately forty-two inches (42") from the back of the street curb and no further than approximately forty-eight inches (48") distant.

B. Hydrant Construction Details

1. Hydrant shall be plumb and shall be set so that the lowest hose connections are at least eighteen inches (18") and no more than twenty four inches (24") above the surrounding finished grade.
2. All hydrants shall be inspected in the field upon delivery to the job to ensure proper operations before installation.
3. 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 ensure proper drainage of the hydrant after use.
4. Care shall be taken to ensure that weep holes are not covered by concrete.
5. The hydrant shall be set on a concrete base block to ensure a firm bearing for the hydrant base, with thrust blocking behind the elbow, per standard drawing number W - 2.
6. All joints shall be restrained by retainer glands, as approved by the Director of Operations or Town Engineer.
7. The resetting of existing hydrants and moving and reconnection of existing hydrants shall be handled in a manner similar to a new installation.
8. Fire hydrant assemblies removed shall be delivered to the Cedar Lake Public Works Department.

3.12 Gate Valves

- A. Locate Water Valves:
 1. Maximum spacing of valves is four hundred feet (400') and located at the property lines.
 2. Locate a valve at each branch of a tee or crossing, unless otherwise directed by the Director of Operations or the Town Engineer.
- B. All gate valves shall be inspected upon delivery in the field to ensure 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.
- C. All valves shall be installed in a vertical position and be provided with a standard valve box and valve box stabilizer, as shown in Cedar Lake Standard Detail.
- D. After installation, all valves shall be subjected to the field test for piping and valves.

- E. Setting Valves and Valve Boxes
 1. Clean the interior of valves of foreign matter before installation. Tighten stuffing boxes. Inspect valves in opened and closed positions to ensure all parts are in working conditions.
 2. Set buried valves and valve boxes plumb. Center valve boxes on the valves or valve operators. Locate valves outside the area of roads and streets where feasible, or where shown on the drawings. Tamp backfill around each valve box to a distance of four feet (4') on all sides of the box, or to the undisturbed trench face if less than four feet (4').

- F. Construction Details of Cast Iron Valve Boxes for Gate Valves. Per standard drawing number W - 3.
 1. 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 Director of Operations or Town Engineer.

- G. Concrete Valve Vaults shall be installed in paved areas and in accordance with ASTM C-478 per standard drawing number W - 4 and W - 5.

3.13 Water Services

- A. Installation: Per standard drawing number W -1.
 1. The minimum size of water service connections in the Town of Cedar Lake shall be one inch (1") and shall be copper tube type "K". Water service connections four-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.
 2. The corporation stop shall be Mueller Company H-1500 Ori-seal III 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 one foot (1') separation.
 3. The round way ground key stop shall be Mueller Company H-1504-2 Ori-seal III with quarter turn check or approved equal. Buffalo box shall be Mueller Company H-10334 Arch Type with thirty three inch (33") minimum rod length or approved equal five and one half feet (5-1/2') in length having an inside diameter of the upper section of not less than one inch (1"). All water services shall have a minimum of five feet (5') of cover over the service. All buffalo boxes shall be installed approximately eighteen inches (18") from the street side of the sidewalk and as near to the common lot line as possible.

4. 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.
5. 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.
6. 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 in the current version of the Cedar Lake Development Standards, materials and thickness to be approved by the Town.
7. Installation of a water service in the same trench as the sanitary sewer service will not be allowed. A ten-foot (10') horizontal separation between a sanitary sewer and water service shall be maintained.
8. The buffalo box shall not be placed within a hard surface sidewalk, driveway or access drive.
9. Water service corporation valves shall not be installed on dead end mains.

B. Meters:

1. All water services shall be metered as close to the point where the service enters the building as possible. All meters shall be provided by the Town and purchased by the owner and installed by a licensed contractor. Water meter must be installed so that it is easily accessible, without obstruction either temporary or permanent, for normal reading and maintenance. Water service shall be installed in such a manner that all meters shall be centered eighteen inches (18") above the floor and spaced from the outside wall as follows:
 - a. One inch (1") meter span shall be ten inches (10") from outside wall.
 - b. One and one half inch (1-1/2") meter span shall be twelve inches (12") from outside wall.
 - c. Two inches (2") and larger meter spans shall be not less than fifteen inches (15") from outside wall.
2. 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.

C. Back Flow Preventers:

1. Residential back flow preventers up to one and one half inches shall be double check valve assembly style.
2. Commercial back flow preventers and those larger than one and one half inches shall be reduced Pressure Zone (RPZ) assembly style.
3. All State and Local building codes apply.

3.14 Jointing Rubber Gaskets Joint Pipe

- A. Jointing Rubber Gaskets to join pipe are to be AWWA Standard C111.

- B. 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.
- C. A thin film of gasket lubricant shall be applied to inside surface of the gasket. Gasket lubricant shall be supplied by the pipe manufacturer, or approved equal.
- D. 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.

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

3.15 Mechanical Restrained Joints for Ductile-Iron Pipe

- A. Mechanical restrained Joints shall be use for all fittings unless other wise directed by the Director of Operations or Town Engineer. Joints for ductile iron pipe shall consist of one of the two following types unless otherwise provided in the special provisions:
 - 1. Acceptable Manufacturers shall be EBBA Iron Co: Mega - Lugs or approved equal.
 - 2. Install thrust restraints at all bends, tees, hydrants, valves, dead ends and plugs per standard drawing number W - 6.
 - 3. All bolts exposed to earth in an underground location shall be type 304 or 314 stainless steel.
- B. Push on Restraints (Field Lock or approved equal) shall only be used with the approval of the Director of Operations or Town Engineer

3.16 Thrust Blocking and Restrained Joints

- A. Push on Restraints (Field Lok, as manufactured by U.S. Pipe or approved equal) shall only be used with the approval of the Director of Operations or Town Engineer.
- B. Thrust blocking shall follow standard drawing number W - 6, and shall be used only at selected locations where restrained fittings are not feasible and at the direct permission of the Director of Operations or Town Engineer.

- C. All fittings and bends of eleven and one quarter degrees (11-1/4°) or greater and all tees, plugs, valves and fire hydrants shall use restrained joints to prevent movement of the lines under pressure.
- D. If restrained joints are used the following table shall be used for length of restrained fitting.

PIPE SIZE (INCHES)	RESTRAINED PIPE LENGTH (Linear Feet)					
	TEE BRANCH*	90° ELBOW	45° ELBOW	22-1/2° ELBOW	11-1/4° ELBOW	VALVE OR DEAD END
4	0.00	26.25	10.50	5.25	3.50	35.00
6	15.75	38.50	15.75	7.00	3.50	49.00
8	31.50	47.25	19.25	8.75	5.25	64.75
10	43.75	57.75	24.20	12.25	5.25	77.00
12	57.75	68.25	28.00	14.00	7.00	91.00
14	71.75	77.00	31.50	15.75	7.00	105.00
16	84.00	87.50	36.75	17.50	8.75	119.00
18	98.00	96.25	40.25	19.25	8.75	131.25
20	110.25	106.75	43.75	21.00	10.50	143.50
24	134.75	124.25	50.75	24.50	12.25	168.00
30	169.75	150.50	63.00	29.75	14.00	203.00
36	203.00	175.00	71.75	35.00	17.50	236.25

*MINIMUM ONE FULL LENGTH (18') OF PIPE ON BOTH SIDES OF BRANCH TO BE RESTRAINED.

TEST PRESSURE BASED ON 150 PSI.

3.17 Testing for Water Main

- A. Pressure Test: Perform the following tests upon completion of the system and prior to being placed into service:
1. Pressure and Leakage Test
 - a. Perform pressure and leakage test in accordance with ANSI/AWWA C600.
 - b. Test Pressure: 150 psi.
 - c. Do not allow pressure to vary more than 5 psi during the test.
 - d. Test Duration: Not less than 2 hours.
 - e. Allowable Leakage: one-half of the volume allowed by ANSI/AWWA C600; which is equivalent to the following formula:

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

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).

2. Testing Services

- a. Perform separate pressure and leakage test on the services with the corporation stops open.
- b. Test Pressure: 100 psi.
- c. Allowable Leakage: None.
- d. At the Contractor's option, service testing may be done concurrent with main testing.

- B. Hydrant Testing: Flow test to be performed by the Contractor and witnessed by Cedar Lake Public Works staff before acceptance. Minimum acceptable flow is one thousand gallons per minute (1000gpm) at a residual pressure of twenty pounds per square inch (20 psi).

3.18 Flushing

- A. Section of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. A hydrant shall be installed at the end of the main. One two and one-half inch (2-1/2") hydrant opening will, under normal pressure, provide this velocity in pipe sizes up to and including twelve inches (12").
- B. All taps required by the Contractor for chlorination or flushing purposes or for temporary or permanent release of air shall be provided by him as a part of the construction of water mains.

3.19 Disinfection

- A. Disinfect all newly installed water mains, appurtenances and services in accordance with ANSI/AWWA C651.
- B. Flush system within twenty four (24) hours after disinfection is completed.
- C. Obtain two (2) water samples at locations to be determined by the Engineer and perform coliform test on each sample.
- D. Re-chlorinate as required if any sample tests positive for coliform.

3.20 Final Flushing and Testing

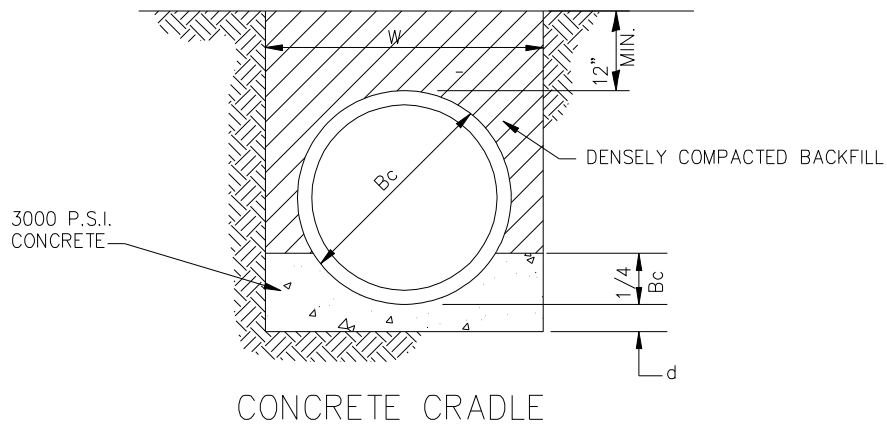
- A. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length shows, upon test, the absence of chlorine. Flushing shall discharge to a Sanitary Sewer System. Storm Sewer System discharge is not acceptable. Chlorine residual shall not be in excess of that carried in the system.

- B. After flushing, water samples collected on two (2) successive days shall show satisfactory bacteriological results. Bacteriological analysis must be performed by a laboratory certified by the State of Indiana.
- C. Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained.
- D. Results of all tests shall be provided by to the Cedar Lake Public Works Department. Acceptance of the water system shall not be made without receipt of the passing tests.

3.21 Record Drawings

- A. The record drawings must be sealed, signed, and dated by a registered Professional Engineer or Architect.
- B. The intent is to provide dimensional information to the nearest half foot (0.5 ft) for the location of water mains, valves, hydrants, and all fittings.
- C. Follow standard drawing W - 8, record drawing example.

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DEPTH OF BEDDING MATERIAL BELOW PIPE	
D	d(MIN.)
27" & SMALLER	3"
30" & LARGER	4"

LEGEND

Bc = OUTSIDE DIAMETER
D = INSIDE DIAMETER
d = DEPTH OF CONCRETE CRADLE BELOW PIPE BELL
W = MINIMUM WIDTH OF CRADLE

NOTE:
FOR ROCK OR OTHER NON-COMPRESSABLE MATERIAL:
THE TRENCH SHOULD BE OVER-EXCAVATED A MIN.
OF 6" & REFILLED WITH GRANULAR MATERIAL.

MINIMUM WIDTH OF CRADLE	
$W = Bc + 8"$ FOR $D \leq 27"$	
$W = 1.25 Bc$ FOR $D \geq 27"$	

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



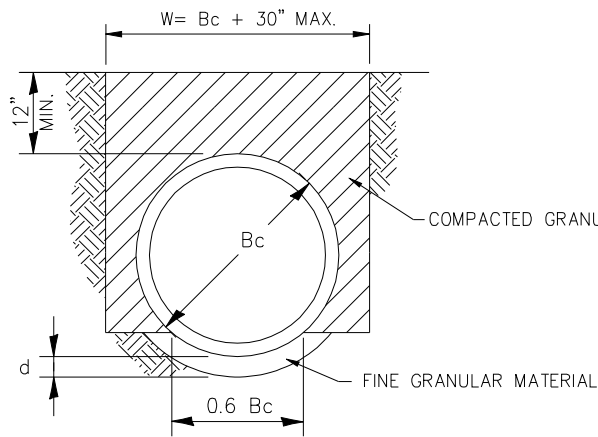
BEDDING & BACKFILL DETAILS

RIGID PIPE BEDDING DETAIL (CLASS "A")

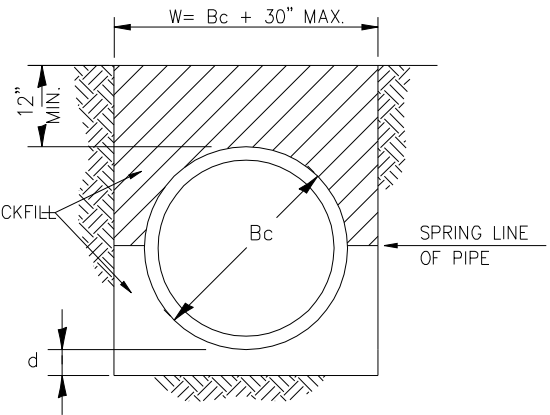
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. BB-1



SHAPED SUBGRADE WITH GRANULAR FOUNDATION



GRANULAR FOUNDATION

DEPTH OF BEDDING MATERIAL BELOW PIPE	
D	d(MIN.)
27" & SMALLER	3"
30" & LARGER	4"

- LEGEND
- Bc = OUTSIDE DIAMETER
 - D = INSIDE DIAMETER
 - d = DEPTH OF BEDDING MATERIAL BELOW PIPE BELL
 - W = WIDTH OF TRENCH

NOTE:
 FOR ROCK OR OTHER NON-COMPRESSABLE MATERIAL:
 THE TRENCH SHOULD BE OVER-EXCAVATED A MINIMUM
 OF 6" IN DEPTH & REFILLED WITH GRANULAR MATERIAL.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



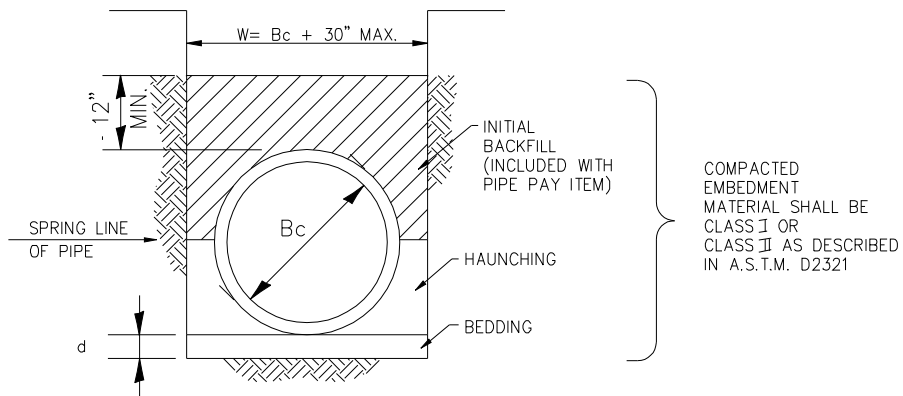
BEDDING & BACKFILL DETAILS

RIGID PIPE BEDDING DETAIL (CLASS "B")

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. BB-2



GRANULAR FOUNDATION

DEPTH OF BEDDING MATERIAL BELOW PIPE	
D	d(MIN.)
60" & SMALLER	4"
66" & LARGER	6"

- LEGEND
- Bc = OUTSIDE DIAMETER
 - D = INSIDE DIAMETER
 - d = DEPTH OF BEDDING MATERIAL BELOW PIPE BELL
 - W = WIDTH OF TRENCH

NOTE:
 FOR ROCK OR OTHER NON-COMPRESSIBLE MATERIAL:
 THE TRENCH SHOULD BE OVER-EXCAVATED A MINIMUM
 OF 6" IN DEPTH & REFILLED WITH GRANULAR MATERIAL.

CEDAR LAKE
 DEVELOPMENT STANDARDS MANUAL



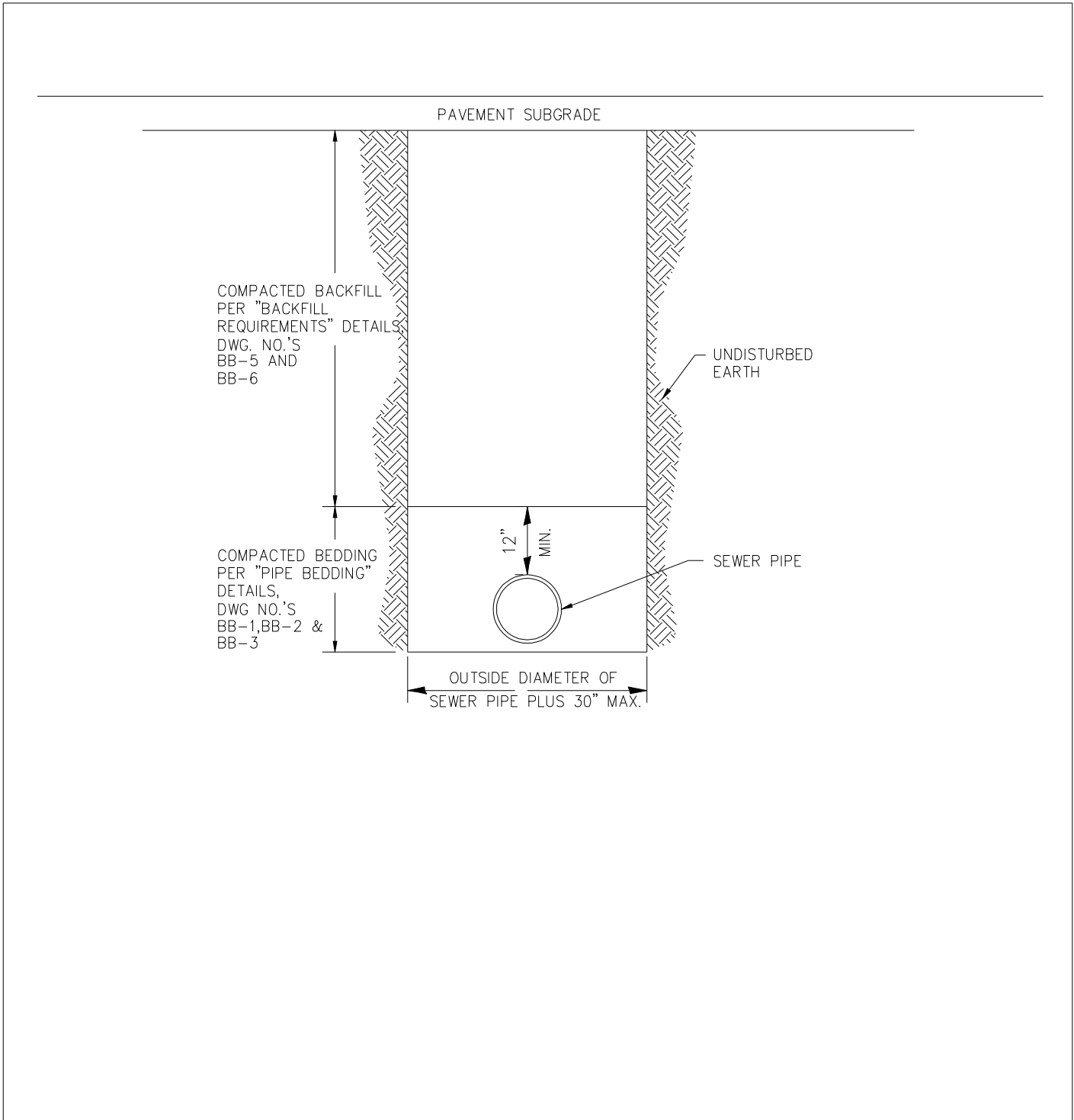
BEDDING & BACKFILL DETAILS

FLEXIBLE SEWER PIPE BEDDING DETAIL (CLASS I & II)

SCALE:
 NONE

DATE: APRIL 2007

DWG. NO. BB-3



CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



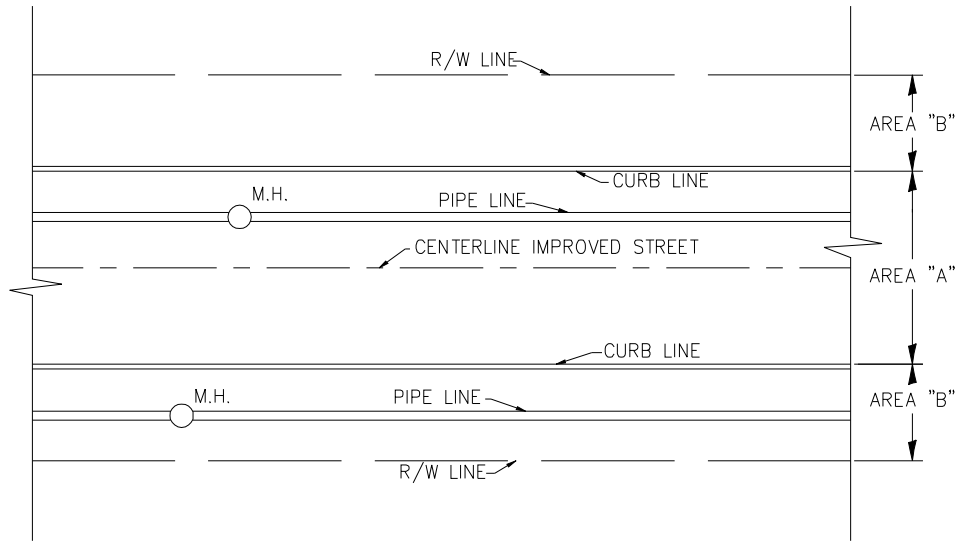
BEDDING & BACKFILL DETAILS

SEWER TRENCH DETAIL

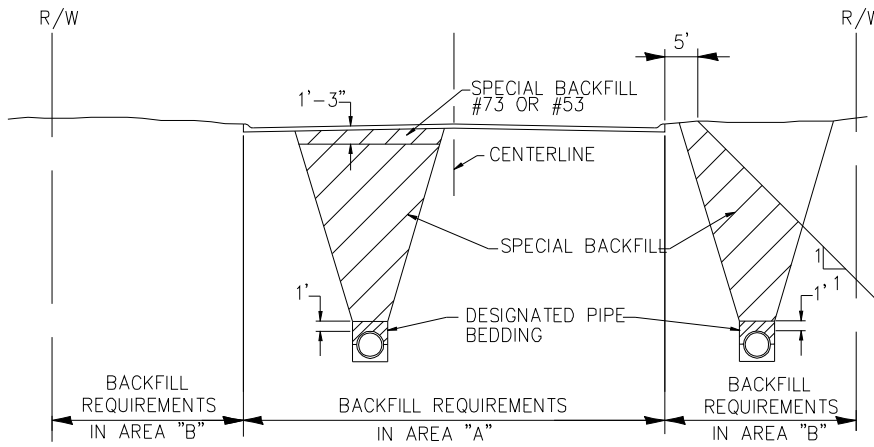
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. BB-4



PLAN



SECTION

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



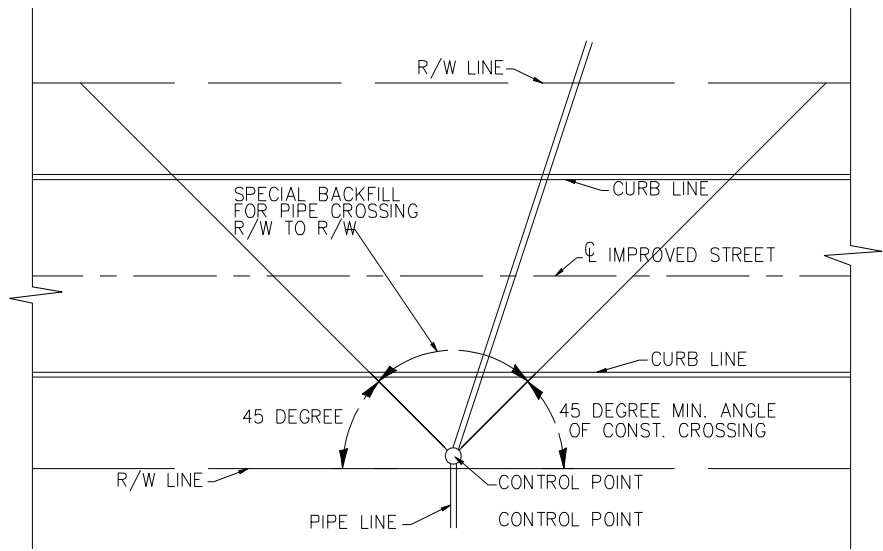
BEDDING & BACKFILL DETAILS

BACKFILL REQUIREMENTS (WITHIN R/W)

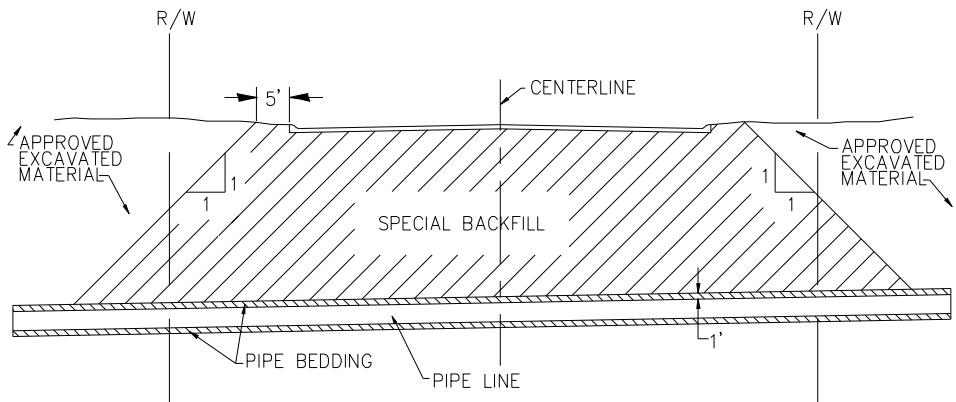
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. BB-5



PLAN



SECTION

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



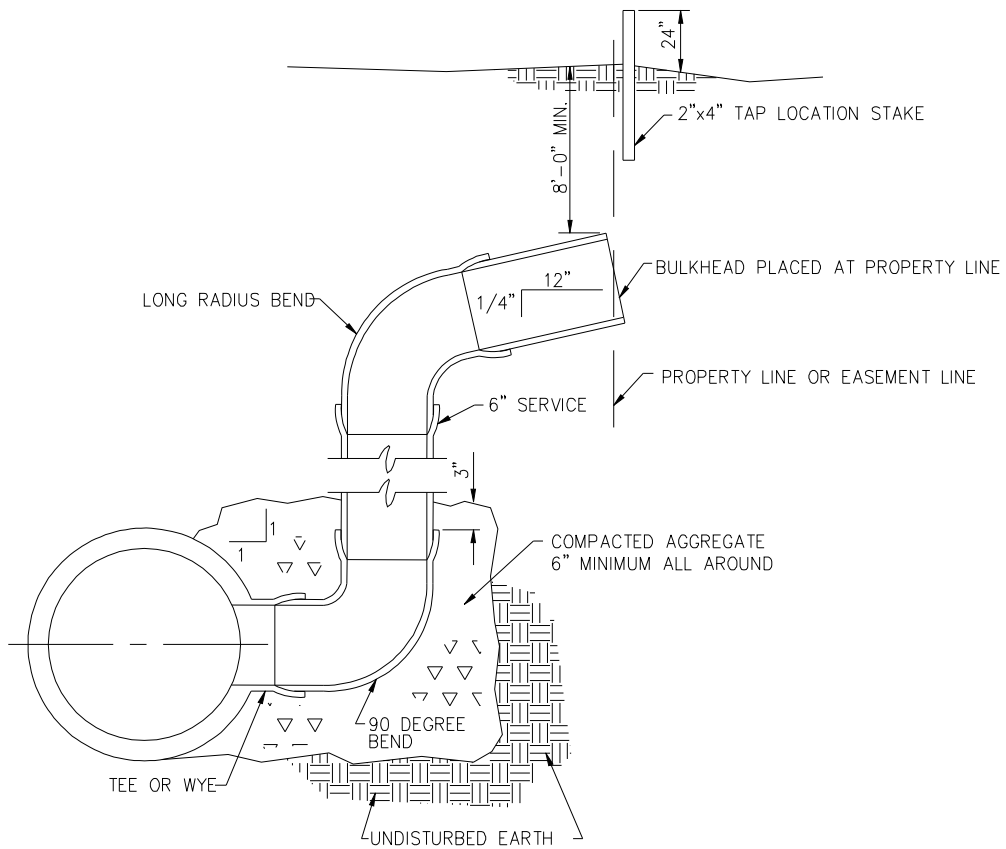
BEDDING & BACKFILL DETAILS

BACKFILL REQUIREMENTS (CROSSING R/W)

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. BB-6



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



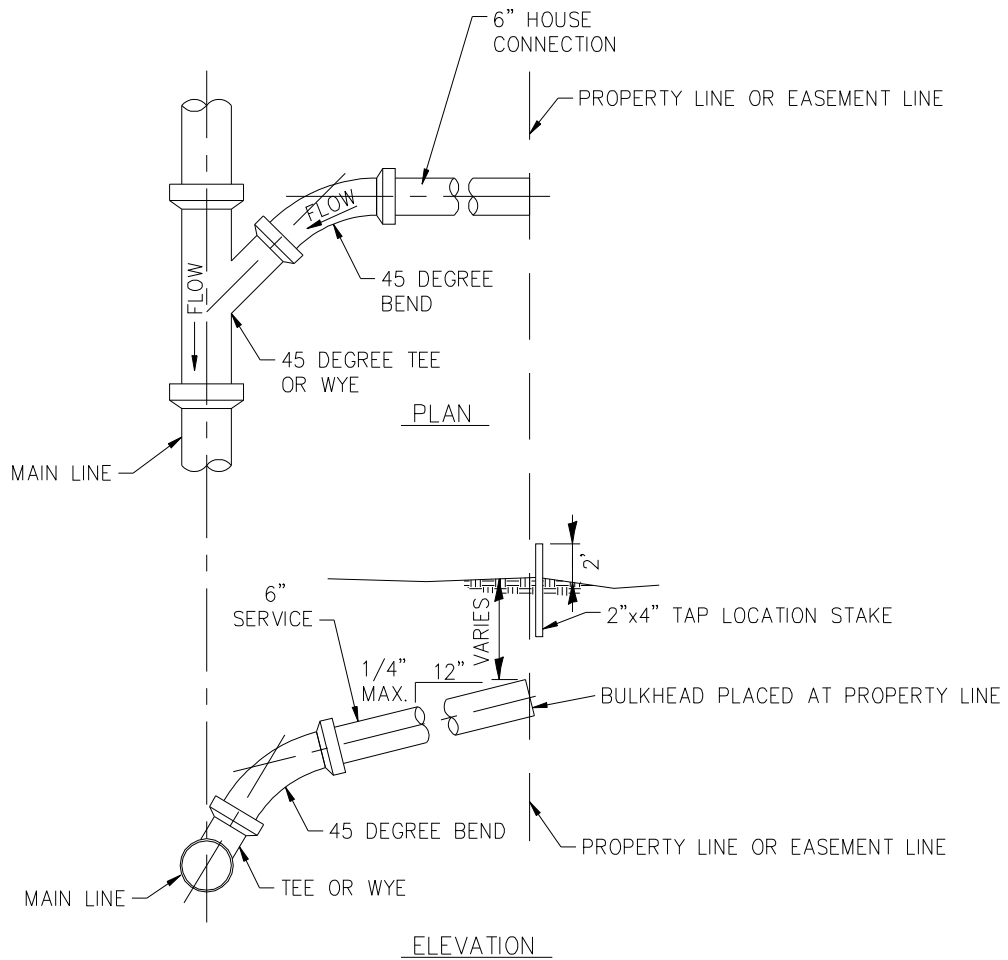
TAP & CONNECTION DETAILS

TAP CONNECTION DETAIL (DEEP 10' OR GREATER)

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. TC-1



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



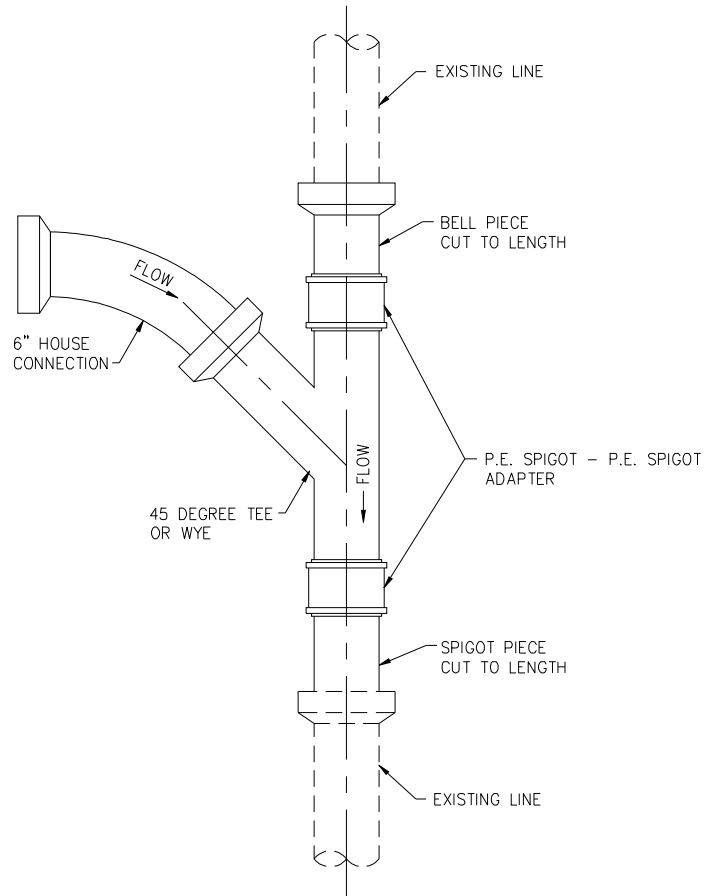
TAP & CONNECTION DETAILS

TAP CONNECTION DETAIL (SHALLOW 10' OR LESS)

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. TC-2



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



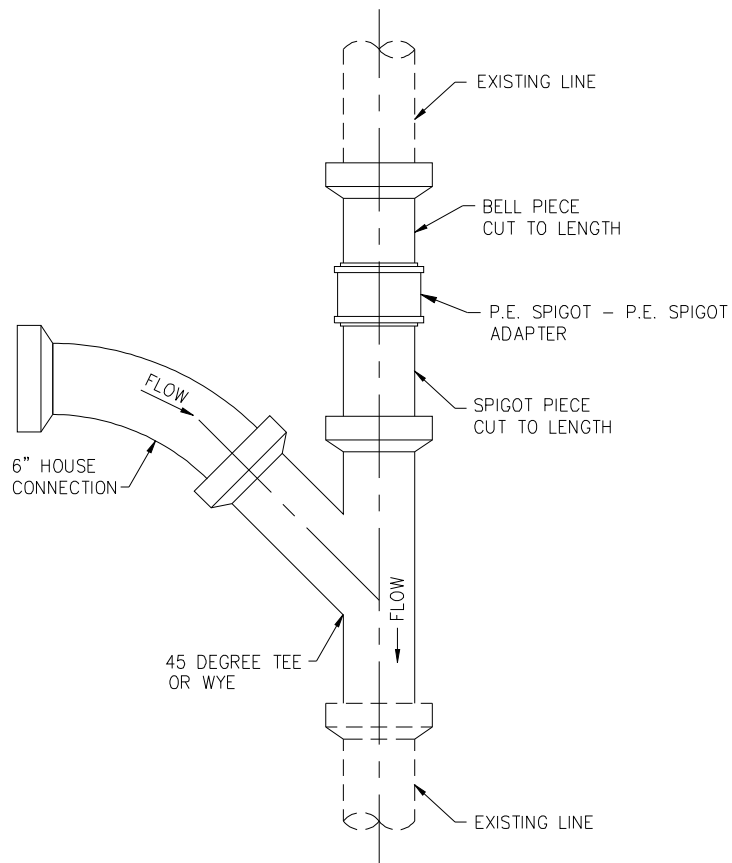
TAP & CONNECTION DETAILS

TYPICAL FULL CUT-IN WYE

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. TC-3



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



TAP & CONNECTION DETAILS

TYPICAL PARTIAL CUT-IN WYE

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. TC-4

NOTE: PVC PIPE FITTINGS ASTM D-3034 WITH A S.D.R. 26

6" PVC PIPE (LARGER SIZES SHALL BE AS APPROVED BY DIRECTOR OF OPERATIONS)

45 DEGREE PVC ELBOW (BELL x SPIGOT)

PVC JOINTS OF RUBBER RING TYPE MUST COMPLY WITH ASTM D-1869

PVC SADDLE TEE WITH O-RING GASKET AND STAINLESS STEEL BANDS OR APPROVED EQUAL

EXISTING PVC SEWER PIPE

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



TAP & CONNECTION DETAILS

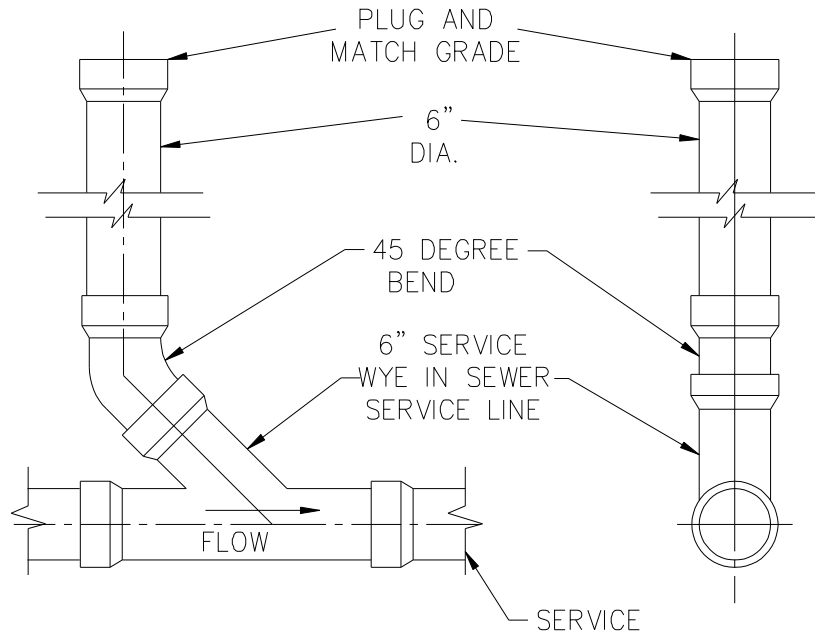
EXISTING PVC PIPE TAP CONNECTION

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. TC-5

NOTE:
USE WATERTIGHT
SCREW IN PLUGS



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



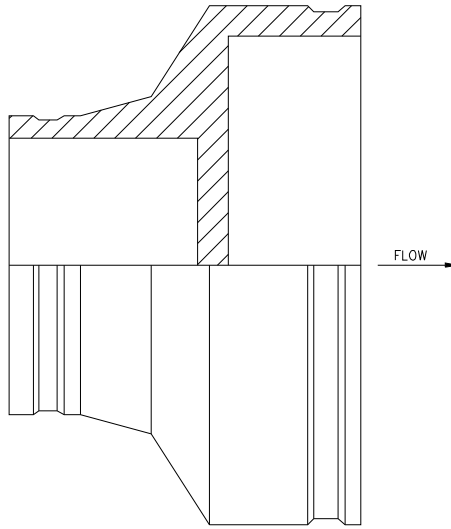
TAP & CONNECTION DETAILS

SEWER CLEANOUT DETAIL

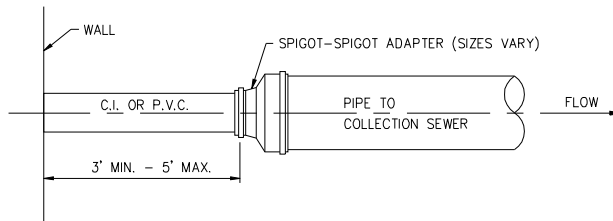
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. TC-6



NOTE:
EACH COUPLING TO HAVE TWO 302 STAINLESS STEEL ADJUSTABLE BANDS



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



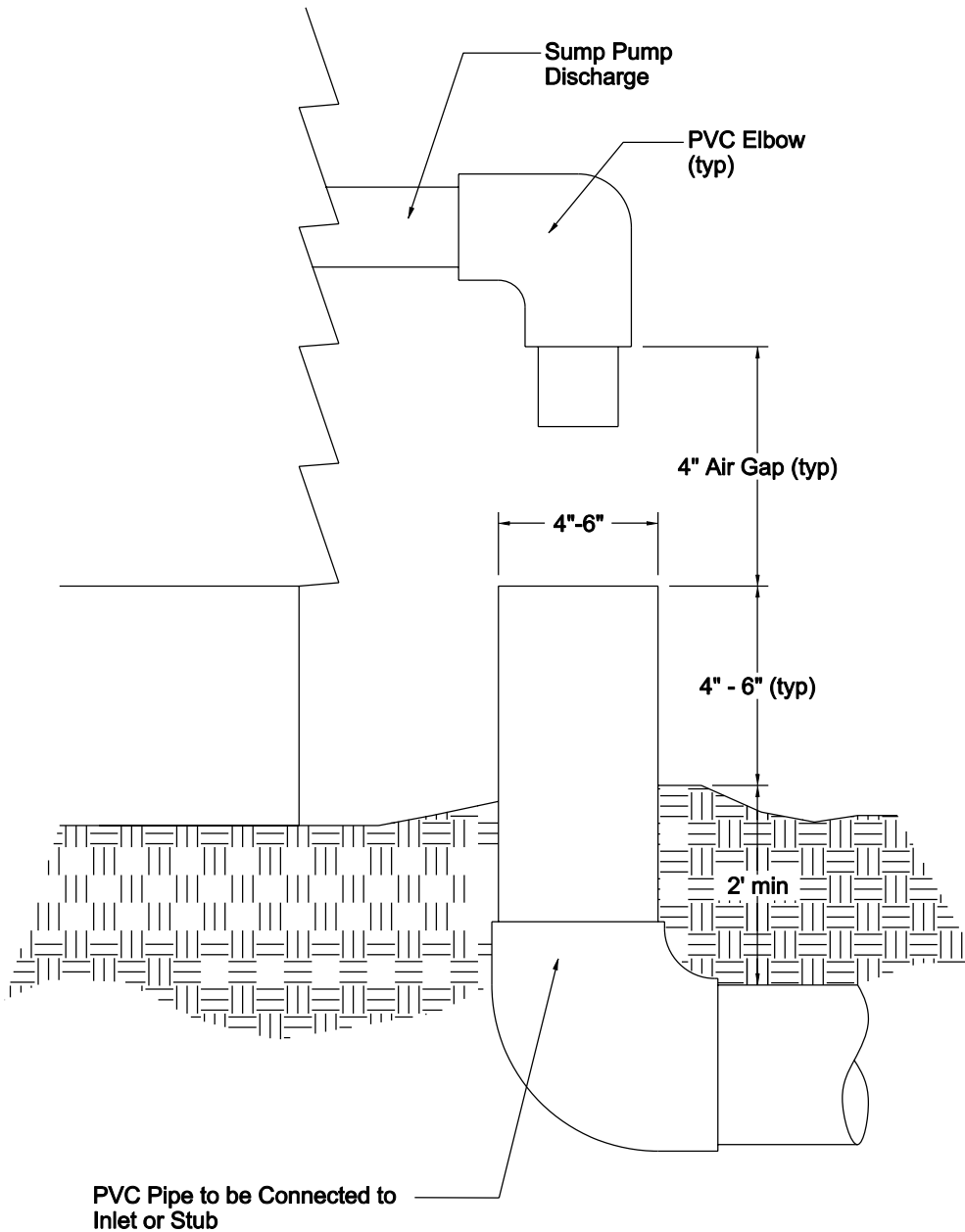
TAP & CONNECTION DETAILS

DISSIMILAR PIPE SIZE TAP CONNECTION

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. TC-7



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



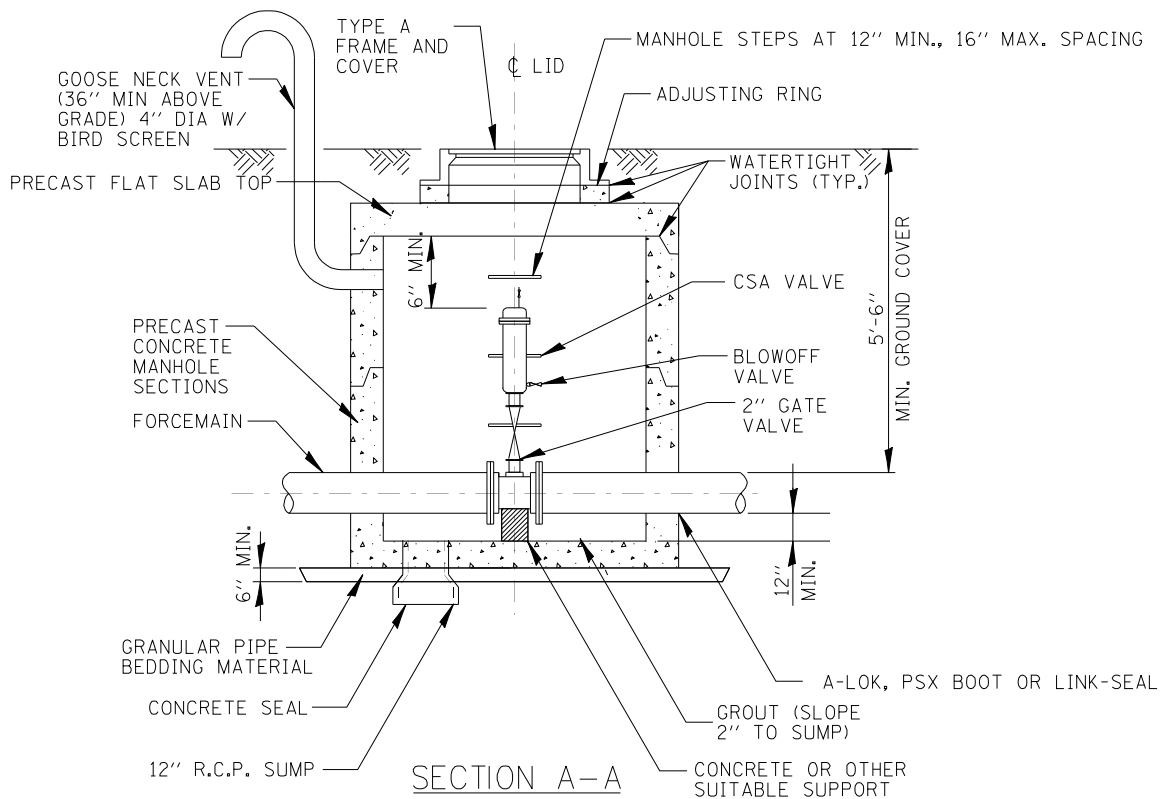
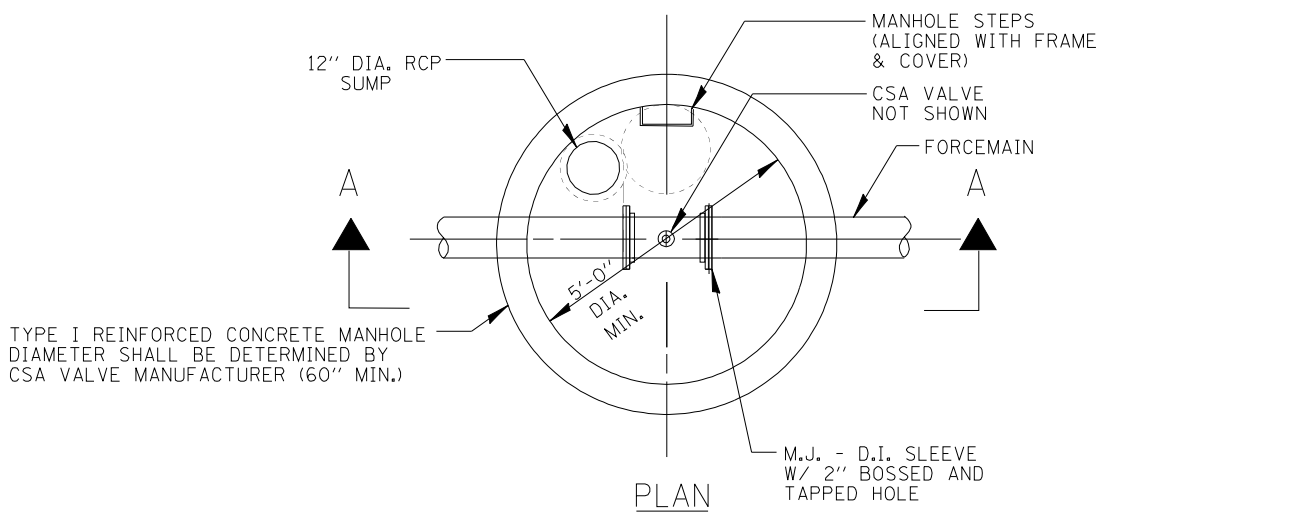
TAP & CONNECTION DETAILS

DRAIN TILE & SUMP PUMP CONNECTION AT HOUSE

SCALE:
NONE

DATE: MARCH 2009

DWG. NO. TC - 8



- NOTES:
1. ALL COMBINATION SEWAGE AIR VALVE STRUCTURES SHALL BE FIELD LOCATED ON EACH HIGH POINT ELEVATION ON THE FORCE MAIN.
 2. GENERAL CONSTRUCTION REQUIREMENTS SAME AS TYPE I MANHOLE.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL

FORCE MAIN DETAILS

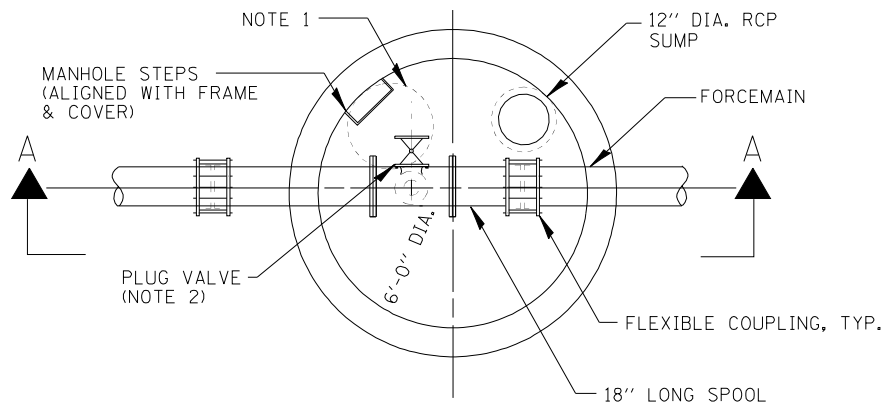
COMBINATION SEWAGE AIR (CSA) VALVE STRUCTURE



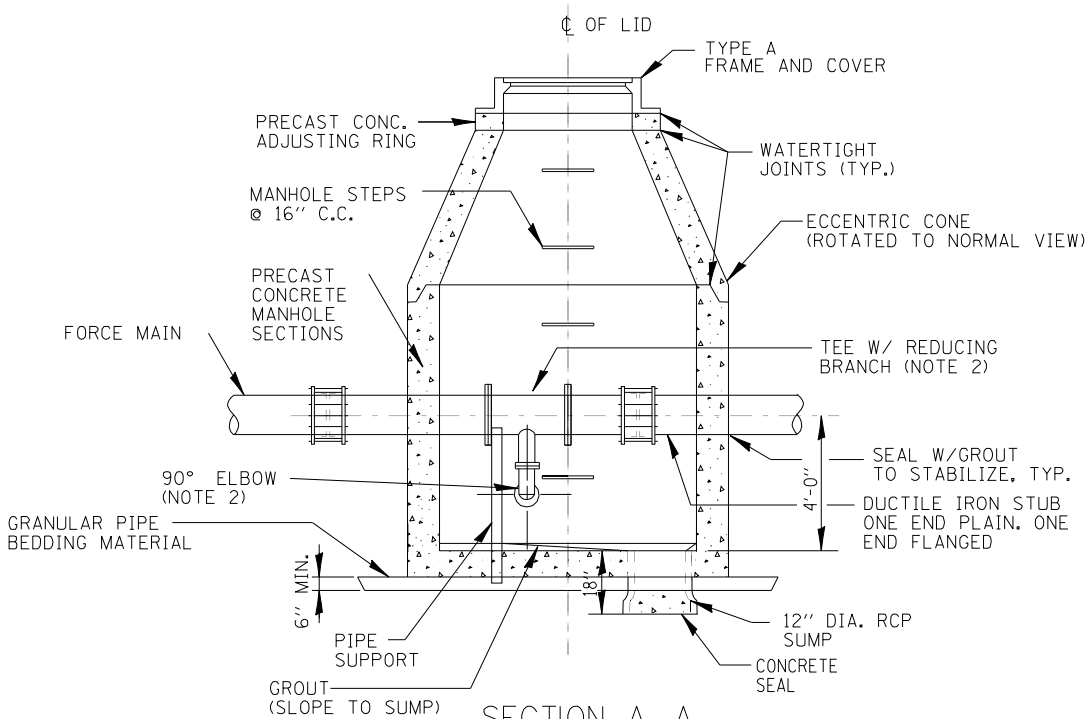
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. FM-1



PLAN



SECTION A-A

1. ROTATE ECCENTRIC CONE SECTION TO LOCATE FRAME AND COVER OPENING FOR OPERATION OF PLUG VALVE W/ HANDLE WRENCH FROM ABOVE.
2. USE 4" BRANCH, 90 DEGREE ELBOW & PLUG VALVE FOR 4" THRU 12" DIA. FORCE MAINS; 6" BRANCH, 90 DEGREE ELBOW & PLUG VALVE FOR FORCE MAINS LARGER THAN 12" DIA.
3. LINE DRAIN STRUCTURES SHALL BE FIELD LOCATED ON EACH LOW POINT ELEVATION ON THE FORCE MAIN OR AS LOCATED ON THE DRAWINGS. TO BE LOCATED AS NECESSARY AND DETERMINED BY DIRECTOR OF OPERATIONS DURING PROJECT DESIGN AND REVIEW.
4. GENERAL CONSTRUCTION REQUIREMENTS SAME AS TYPE I MANHOLE.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL

FORCE MAIN DETAILS

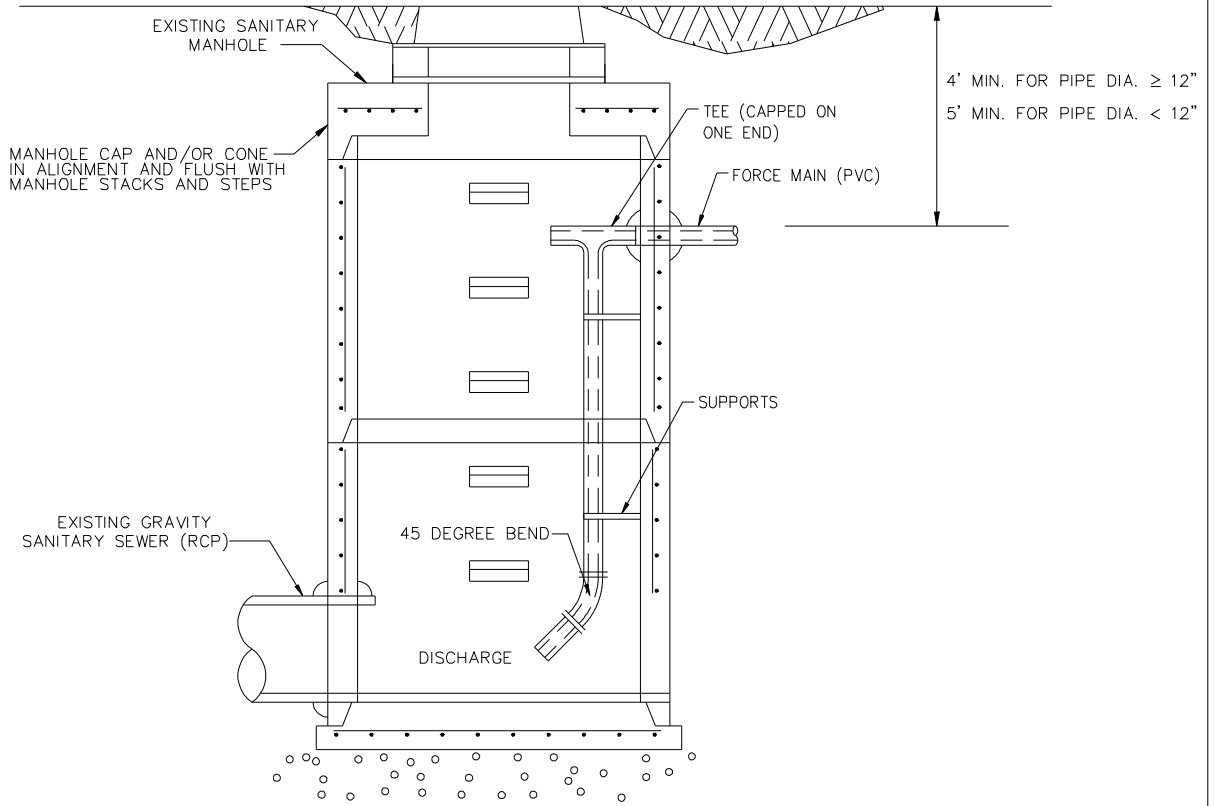
FORCE MAIN CLEANOUT STRUCTURE



SCALE:
NONE

DATE: APRIL 2007

DWG. NO. FM-2



GENERAL CONSTRUCTION REQUIREMENTS

1. EXISTING MANHOLES SHALL BE CORE DRILLED TO ACCEPT FORCE MAIN. USE A MECHANICAL SEAL TO PROVIDE A WATERTIGHT CONNECTION (LINK-SEAL OR APPROVED EQUAL).
2. END OF FORCE MAIN SHALL HAVE A SHORT RADIUS 45° BEND TO DIRECT EFFLUENT DOWNWARD.
3. SUPPORT FORCE MAIN FROM THE PIPE INVERT AND MANHOLE WALLS USING PVC OR FIBERGLASS CHANNEL OR SUPPORTS.
4. GENERAL CONSTRUCTION REQUIREMENTS SAME AS TYPE 1 MANHOLE.
5. SUBMIT PLANS TO ADDRESS POTENTIAL CORROSION AND ODOR PROBLEMS DUE TO HYDROGEN SULFIDE TO THE DIRECTOR OF OPERATIONS AND THE TOWN ENGINEER.
6. DROP TERMINATION/DISCHARGE ELEVATION SHALL BE NEAR THE CENTER OF THE DOWNSTREAM PIPE.
7. DROP SHALL BE PROVIDED FOR A FORCE MAIN ENTERING A MANHOLE AT AN ELEVATION OF GREATER THAN TWENTY FOUR (24) INCHES OR MORE ABOVE THE MANHOLE DOWNSTREAM INVERT.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



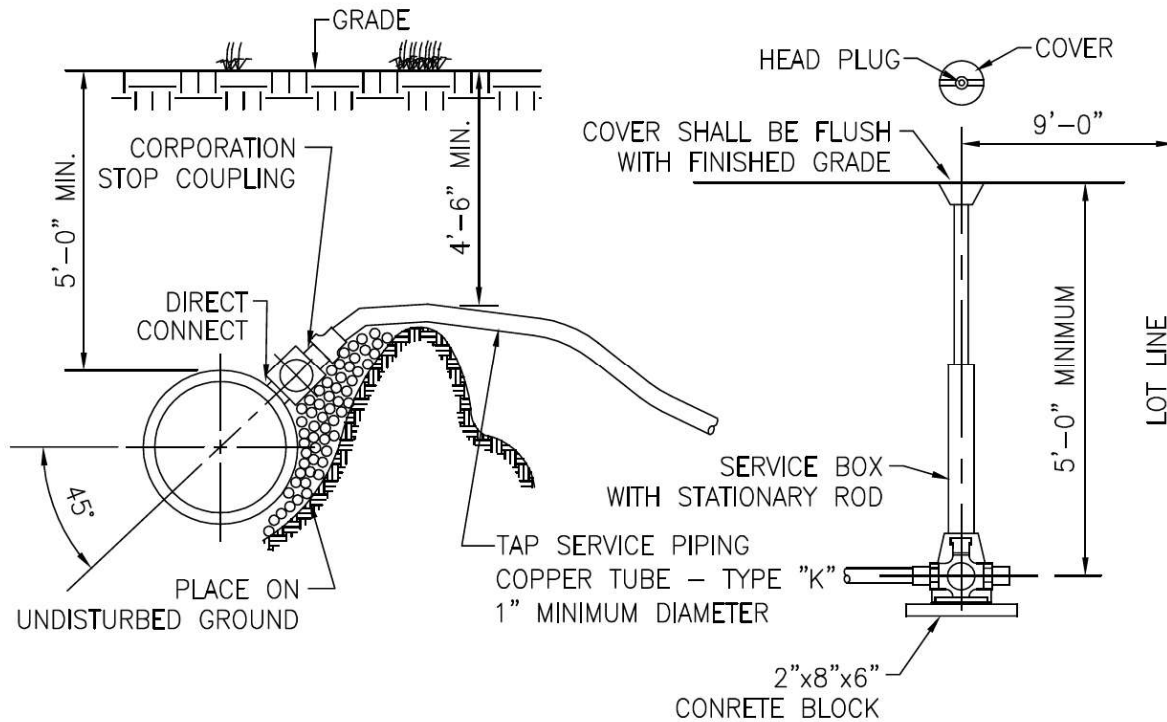
FORCE MAIN DETAILS

FORCE MAIN CONNECTION TO EXISTING STRUCTURE

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. FM-3



NOTES:

- 1) CORPORATION IS TO BE COMPRESSION TYPE (MUELLER OR APPROVED EQUAL).
- 2) 2-1/2" CURB BOX IS ARCH PATTERN, WITH STATIONARY ROD FOR 1" UPPER SECTION ONLY, WHEN USING 1" CURB STOPS.
- 3) 2-1/2" CURB BOX IS ARCH PATTERN WITH STATIONARY ROD WITH 1-1/4" UPPER IF FOR 1-1/4" TO 2" CURB STOP.
- 4) CURB BOXES SHALL BE SUITABLE FOR 6 FT DEPTH AND BE TYLER MODEL 95E, OR EQUAL.
- 5) CURB BOX IS WITH COMPRESSION COUPLINGS - (1" CURB - STOP) MUELLER OR EQUAL.
- 6) B-BOX CAP HAS 1-INCH THREADED BRASS PENTAGON PLUG WITH WORD "WATER" IN RAISED LETTERS.
- 7) SERVICE TAPS GREATER THAN 1" IN DIAMETER MUST HAVE A STAINLESS STEEL BANDED DUCTILE IRON SADDLE (FORD 101S, 202S, OR MUELLER EQUAL).
- 8) CORPORATION STOPS SHALL BE INSTALLED A MINIMUM OF 18" FROM PIPE ENDS. MULTIPLE INSTALLATIONS SHOULD BE STAGGERED AROUND THE MAIN BY 90 DEGREES AND SEPARATED BY 18".

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



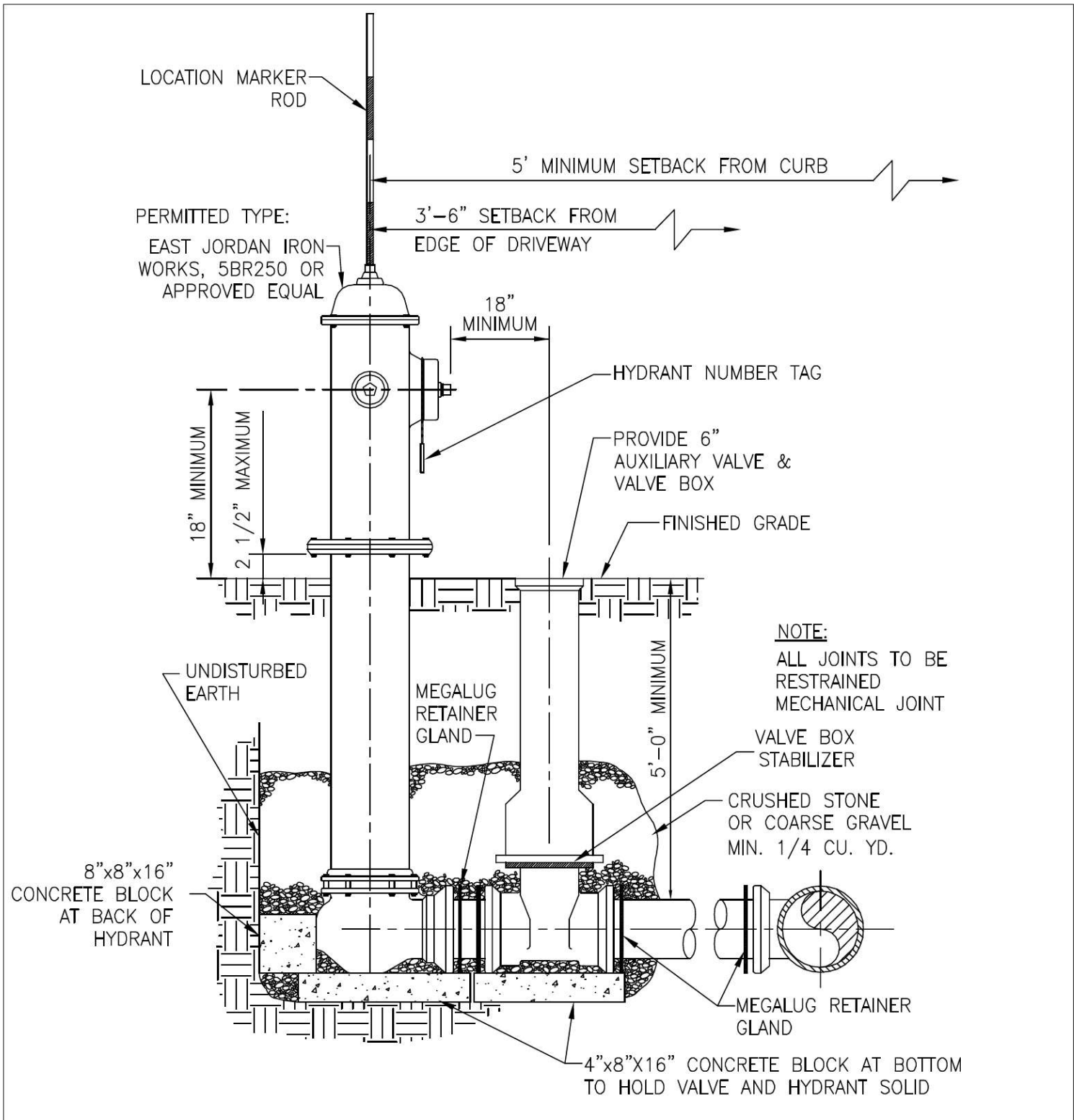
WATER DISTRIBUTION SYSTEM

SERVICE TAP AND CONNECTION

SCALE:
NONE

DATE: JUNE 2009

DWG. NO. W - 1



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



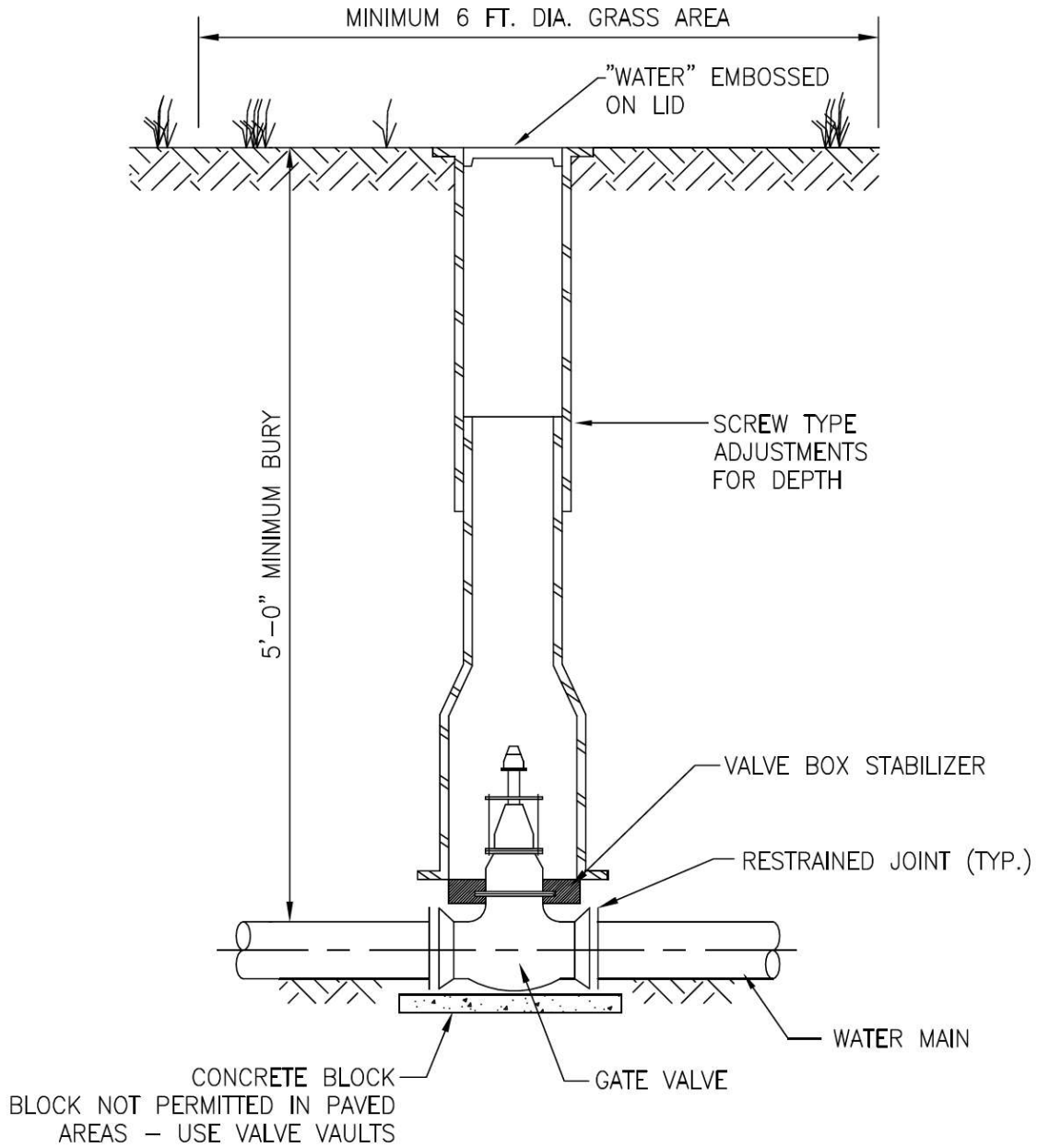
WATER DISTRIBUTION SYSTEM

FIRE HYDRANT DETAIL
TRAFFIC MODEL – BREAKABLE FLANGE AND COUPLING

SCALE:
NONE

DATE: JUNE 2009

DWG. NO. W – 2



NOTES:

1. ALL VALVES IN PAVED AREAS OR VALVES CLOSER THAN 3' TO A PAVED AREA SHALL BE CONSTRUCTED INSIDE VALVE VAULTS.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



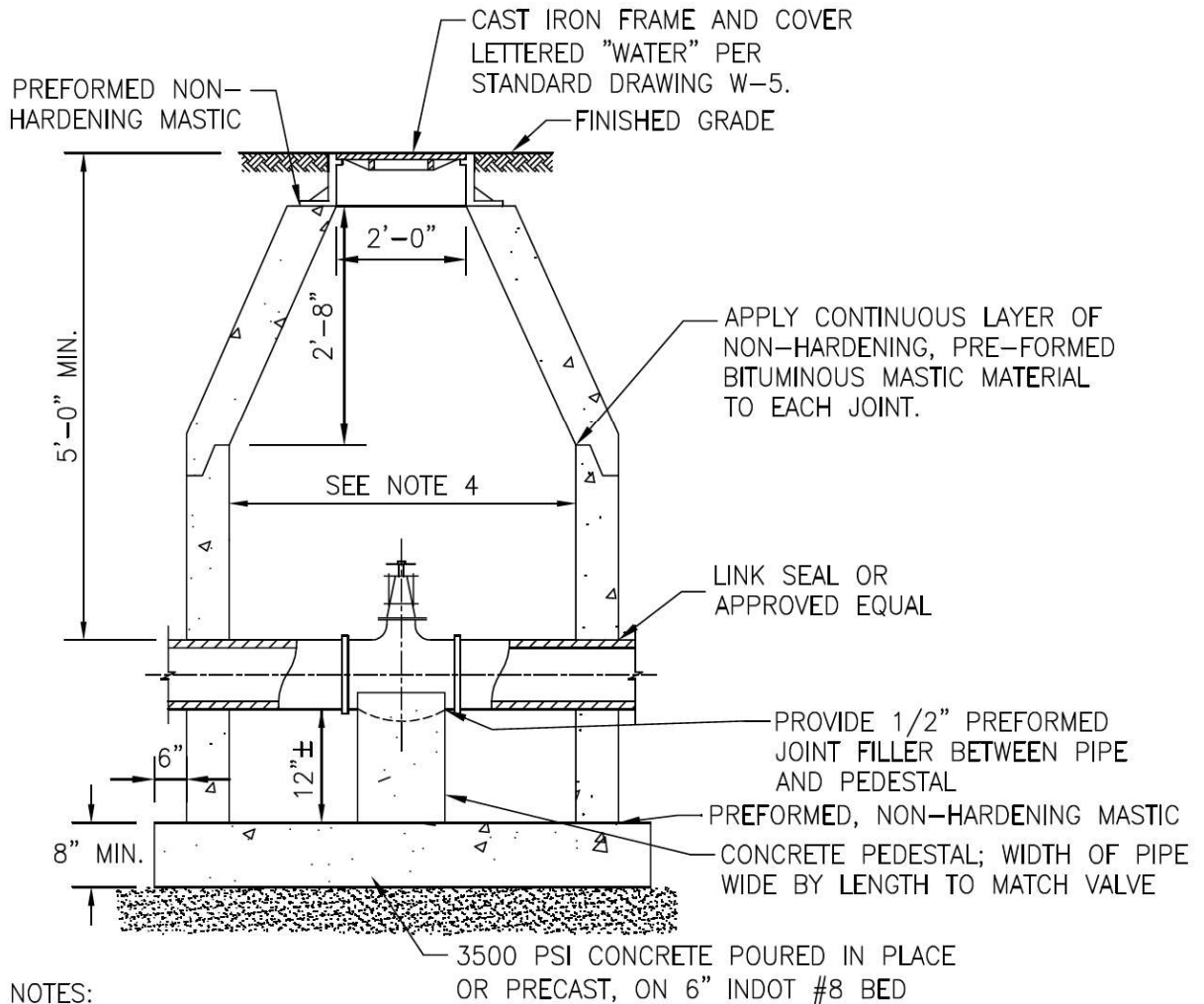
WATER DISTRIBUTION SYSTEM

VALVE BOX INSTALLATION

SCALE:
NONE

DATE: JUNE 2009

DWG. NO. W - 3



NOTES:

1. ALL VALVE VAULTS MADE IN ACCORDANCE WITH ASTM C-478.
2. VALVE VAULT JOINTS SHIP-LAP WITH GASKET IN ACCORDANCE WITH ASTM C-443.
3. VALVE VAULT BASE SHALL BE PLACED ON 6" MINIMUM INDOT #8 BED.
4. VALVE VAULT DIAMETER SHALL BE 48" FOR VALVES 8" AND SMALLER AND 60" FOR VALVES 10" AND LARGER.
5. WHEN GRADE RING ADJUSTMENTS ARE NECESSARY, A MAXIMUM OF TWO (2) PRECAST CONCRETE RINGS SET IN A BED OF PREFORMED NON-HARDENING MASTIC TO A MAXIMUM HEIGHT OF TWELVE (12) INCHES.
6. VALVE OPERATING NUTS MUST HAVE DIRECT VERTICAL ACCESS BELOW FRAME AND COVER OPENING.
7. VALVE VAULTS MUST BE USED WHEREVER VALVES ARE LOCATED BELOW PAVED AREAS.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



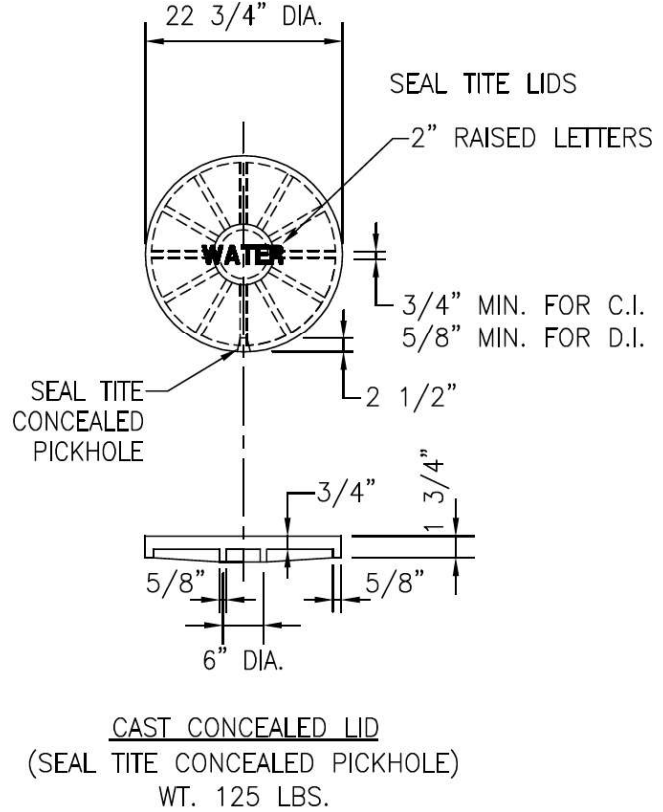
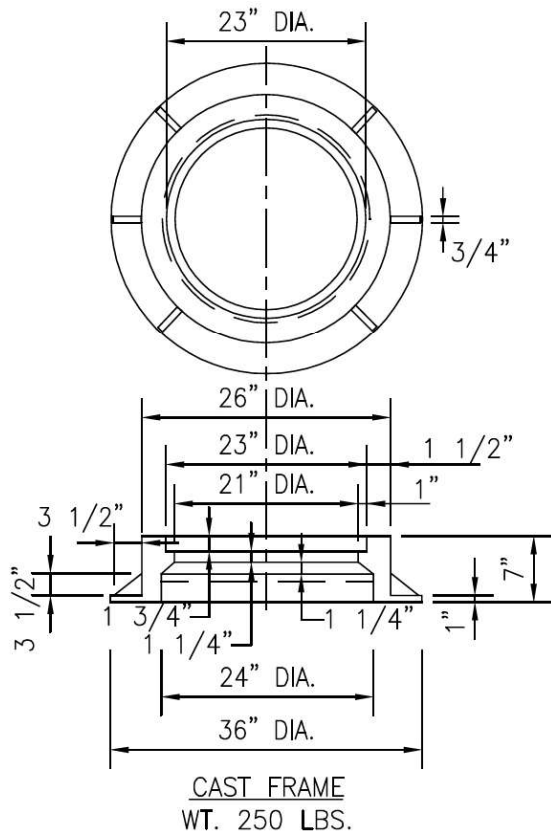
WATER DISTRIBUTION SYSTEM

VALVE VAULT DETAIL

SCALE:
NONE

DATE: JUNE 2009

DWG. NO. W - 4



NOTES:

1. DUCTILE IRON CASTINGS SHALL BE GRADE 60-40-18 AND SHALL BE TESTED IN ACCORDANCE WITH FEDERAL SPECIFICATIONS.
2. ALL FRAMES AND COVERS SHALL HAVE MACHINED HORIZONTAL AND VERTICAL BEARING SURFACES. PICK HOLES SHALL NOT CREATE OPENINGS IN THE COVER.
3. MANHOLE COVERS SHALL HAVE RAISED LETTERS AS SHOWN.
4. AS AN ALTERNATIVE TO DUCTILE IRON LID, GRAY IRON LID MAY BE USED.
5. MINIMUM WEIGHTS FOR CASTINGS AS SHOWN.
6. DIMENSIONS FOR CASTINGS ARE COMPARABLE TO EAST JORDAN NO. 1022 (STANDARD DUTY) OR NEENAH NO. R-1772.
7. ALL CASTINGS MUST BE SHOP PAINTED WITH AN ASPHALT BASE PAINT.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



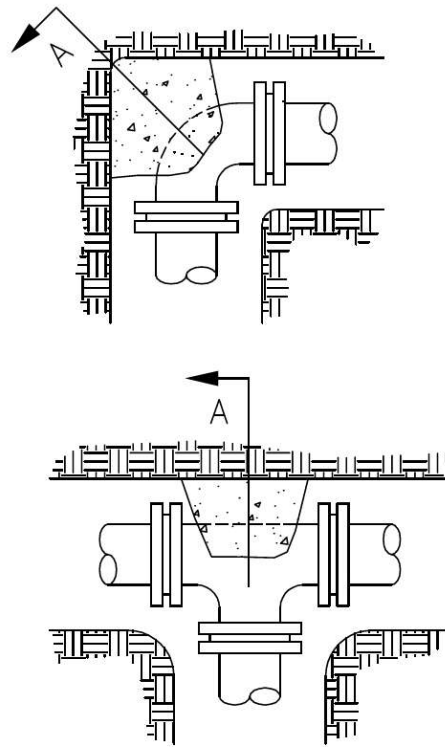
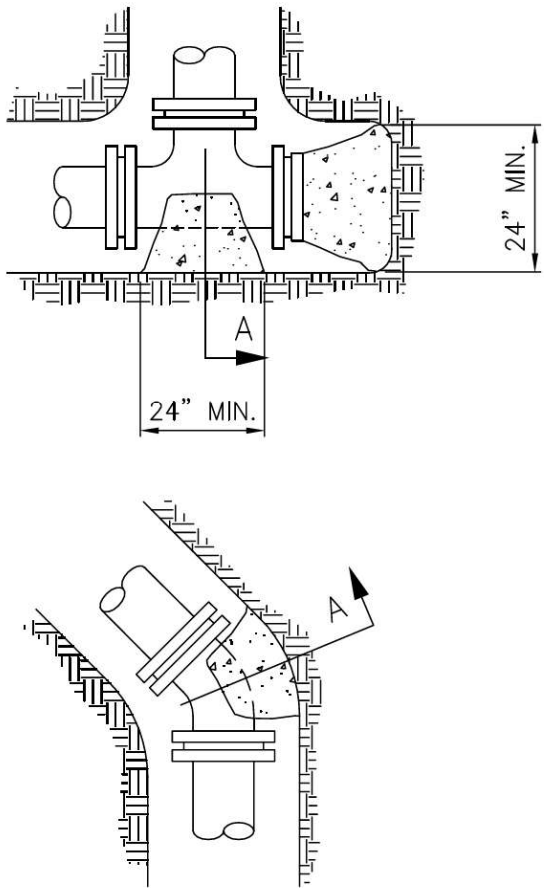
WATER DISTRIBUTION SYSTEM

VALVE VAULT FRAME AND COVER

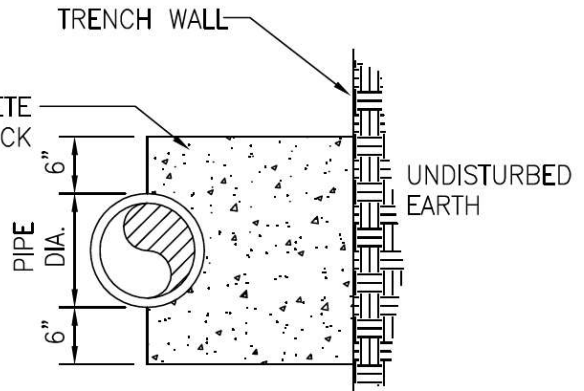
SCALE:
NONE

DATE: JUNE 2009

DWG. NO. W - 5



POURED CONCRETE
THRUST BLOCK



SECTION A

THRUST BLOCKING TO PREVENT MOVEMENT OF LINES UNDER PRESSURE AT BENDS, TEES, CAPS, VALVES, HYDRANTS, AND AT POINT SPECIFIED BY ENGINEER SHALL BE CONCRETE HAVING A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3000 PSI, A MINIMUM 12" THICKNESS, PLACED BETWEEN SOLID GROUND AND FITTING, AND BE ANCHORED IN SUCH A MANNER THAT PIPE AND FITTING WILL BE ACCESSIBLE FOR REPAIRS. THRUST BLOCKS SHALL BE PLACED AT BENDS OF 11 1/4 DEGREES OR GREATER.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



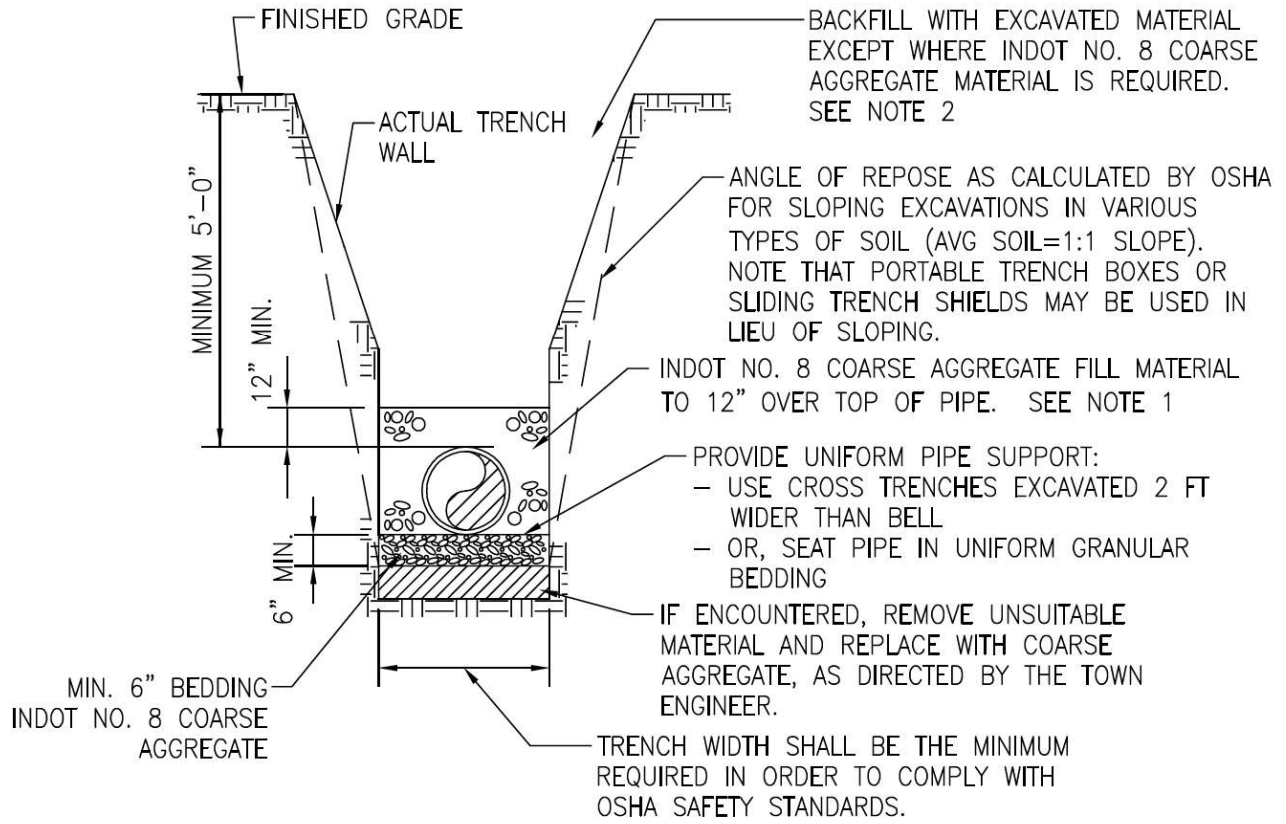
WATER DISTRIBUTION SYSTEM

THRUST BLOCK INSTALLATIONS

SCALE:
NONE

DATE: JUNE 2009

DWG. NO. W - 6



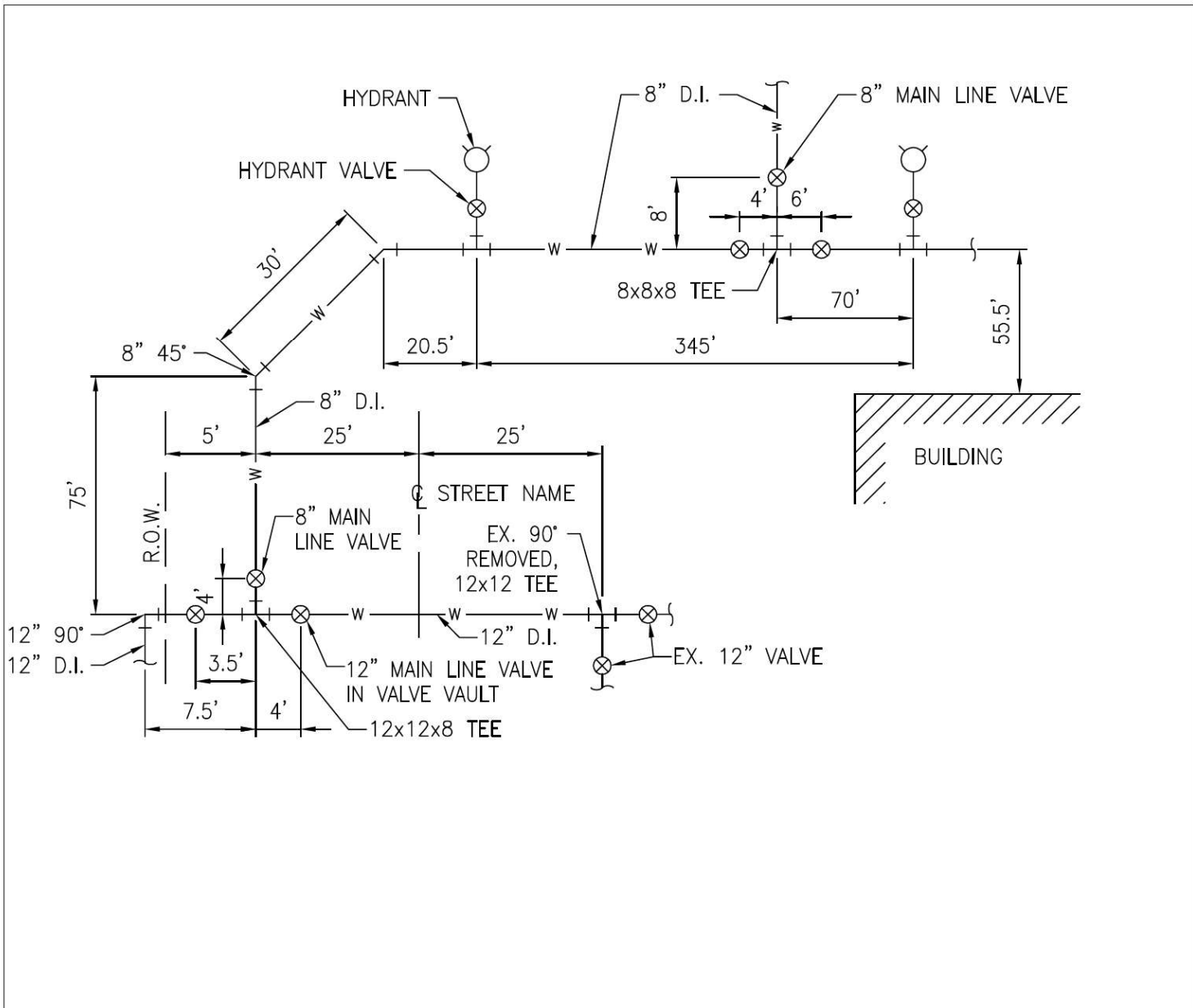
NOTES

1. EXCAVATED MATERIAL (SANDS AND GRAVELS) MAY BE USED FOR BACKFILL AND COMPACTED GRANULAR FILL WITH APPROVAL OF THE DIRECTOR OF OPERATIONS OR THE TOWN ENGINEER.
2. INDOT NO. 53 COARSE AGGREGATE IS REQUIRED FOR ALL PIPE INSTALLED BELOW PAVEMENT AND SIDEWALKS.
3. LIMESTONE ONLY, SLAG IS NOT PERMITTED AS BEDDING OR BACKFILL.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL




WATER DISTRIBUTION SYSTEM		
PIPE TRENCH DETAIL		
SCALE: NONE	DATE: JUNE 2009	DWG. NO. W - 7

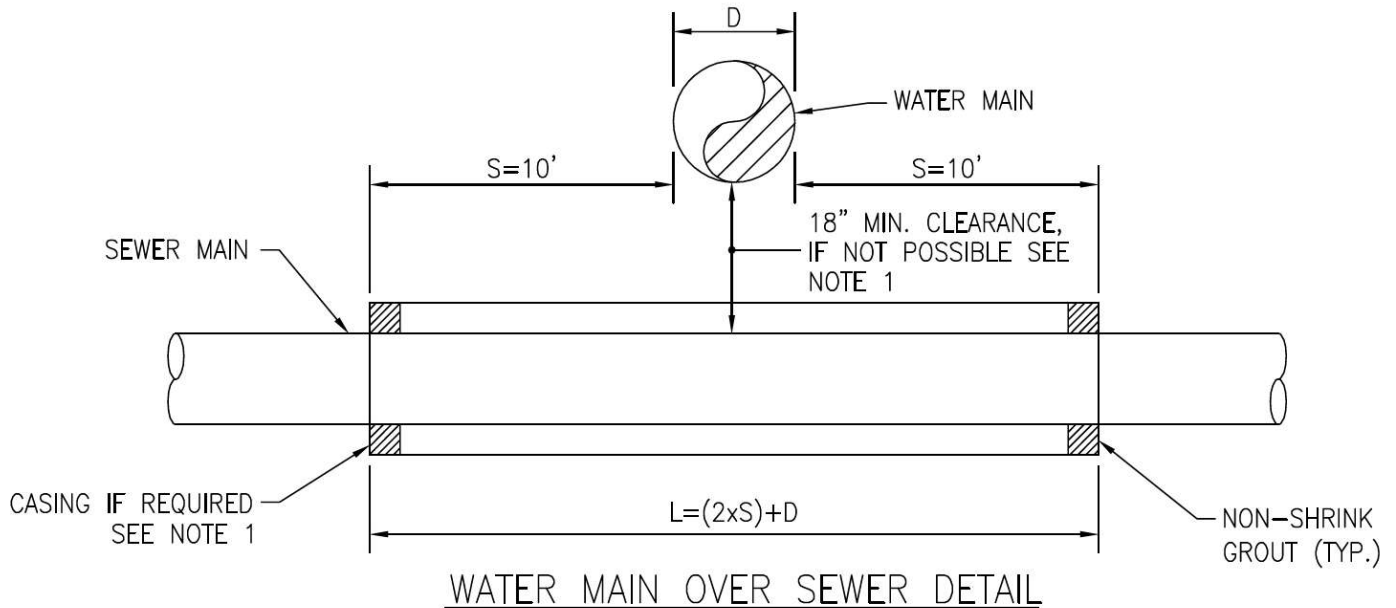
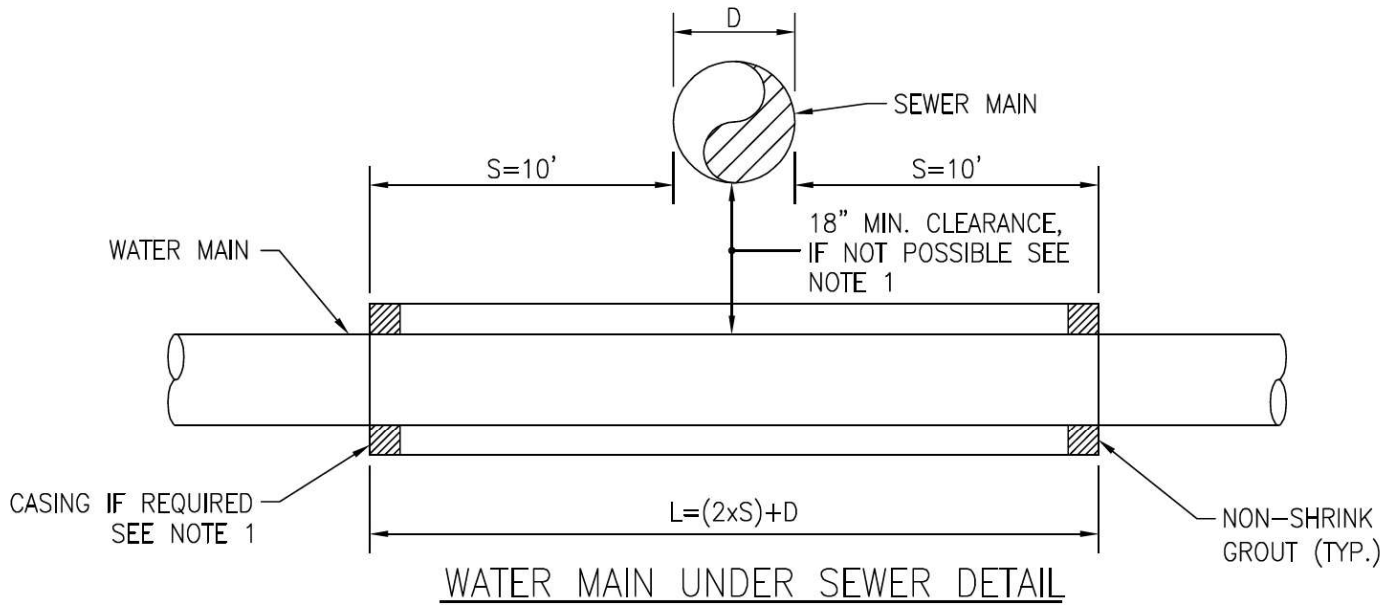


NOTES

1. INTENT IS TO PROVIDE DIMENSIONAL INFORMATION TO NEAREST 0.5 FT FOR FUTURE LOCATION OF WATER MAINS, VALVES, HYDRANTS, REDUCER FITTINGS, BEND FITTINGS, ETC.
2. RECORD DRAWINGS MUST BE SEALED, SIGNED, AND DATED BY A REGISTERED PROFESSIONAL ENGINEER OR ARCHITECT.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL

	WATER DISTRIBUTION SYSTEM	
	RECORD DRAWING EXAMPLE	
	SCALE: NONE	DATE: JUNE 2009



NOTES

1. WATER MAIN CROSSING UNDER OR OVER A SEWER SHALL ADHERE TO RECOMMENDED STANDARDS FOR WATER WORKS, "TEN STATE STANDARDS", MOST CURRENT ADDITION.
2. IF 18" SEPARATION IS NOT MAINTAINED UNDER SEWER INSTALL "L" FEET OF WATER MAIN GRADE PIPE FOR CASING AND SEAL BOTH ENDS WITH NON-SHRINK GROUT.
3. THE CONTRACTOR SHALL INSTALL THE CASING ON THE LOWER ELEVATION LINE. CASING LENGTH AND MATERIAL SHALL BE PER NOTE 1 AND 2.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



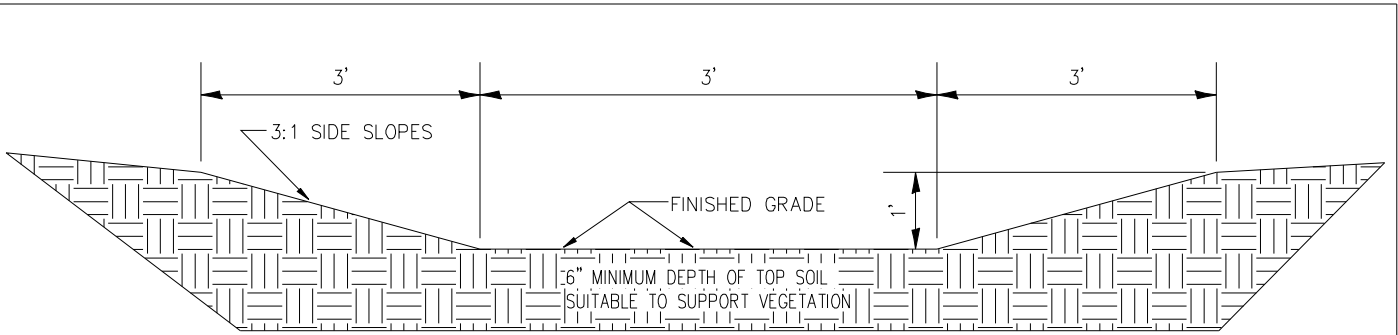
WATER DISTRIBUTION SYSTEM

WATER MAIN CROSSING

SCALE:
NONE

DATE: JUNE 2009

DWG. NO. W - 9



GENERAL NOTES:

1. PLACE PERMANENT SEEDING IMMEDIATELY AFTER FINISHED GRADING IS COMPLETE.
2. APPLY 400 – 600 LBS. / ACRE OF 12-12-12 ANALYSIS OR EQUIVALENT FERTILIZER.
3. WORK FERTILIZER INTO SOIL 2-4 INCHES DEEP WITH A DISC OR RAKE.
4. APPLY FERTILIZER ONLY TO NON-NATIVE SEED MIXES (RESIDENTIAL AREA SEED MIXTURE)
5. APPLY STRAW MULCH TO THE SEEDED AREA. ANCHOR ALL MULCH BY CRIMPING OR WITH A TACKIFIER.
6. USE A SC-150 EROSION CONTROL BLANKET ON SLOPES OF 2:1 OR GREATER.

THE SEED MIXTURE SHALL BE SEED AS FOLLOWS FOR USE IN RESIDENTIAL AREAS ONLY:

SEED DESCRIPTION	PERCENT (BY WEIGHT)
KENTUCKY BLUE GRASS	40 TO 50
CREEKING RED FESCUE	40 TO 45
PERENNIAL RYE	5 TO 10

IT SHALL BE APPLIED AT A RATE OF 218 POUNDS PER ACRE (5 POUNDS PER 1,000 SQUARE FEET.) SEED MIXTURE SHALL NOT CONTAIN MORE THAN 5% INERT MATTER AND CONTAIN NO OBJECTIONAL WEEDS.

THESE SEED MIXTURES SHALL BE SEED AS FOLLOWS FOR USE IN NON-RESIDENTIAL AREAS ONLY:

GRASSED SWALE NATIVE SEED MIX 1

COMMON NAME	SCIENTIFIC NAME	POUNDS/ACRE
BIG BLUESTEM	ANDROPOGON GERARDII	2
VIRGINIA WILD RYE	ELYMUS VIRGINICUS	1
SWITCHGRASS	PANICUM VIRGATUM	2
INDIAN GRASS	SORGASTRUM NUTANS	2

TEMPORARY COVER SHALL BE USED WITH BOTH SEED MIXES

GRASSED SWALE NATIVE SEED MIX 2

COMMON NAME	SCIENTIFIC NAME	OUNCES/ACRE
FRANK'S SEDGE	CAREX FRANKII	2
MEADOW SEDGE	CAREX GRANULARIS	2
PORCUPINE SEDGE	CAREX HYSTERICINA	2
LARGER STRAW SEDGE	CAREX NORMALIS	2
FOX SEDGE	CAREX VULPINOIDEA	8
CANADA WILD RYE	ELYMUS CANADENSIS	40
FOWL MANNA GRASS	GLYCERIA STRIATA	2
RICE CUT GRASS	LEERSIA ORYZOIDES	8
DARK GREEN BULRUSH	SCIRPUS ATROVIRENS	4
DROOPING BULRUSH	SCIRPUS PENDULUS	4
SOFTSTEM BULRUSH	SCIRPUS VALIDUS	6

COMMON NAME	SCIENTIFIC NAME	POUNDS/ACRE
REDTOP	AGROSTIS ALBA	6
BARNYARD GRASS	ECHINOCHLOA CRUSGALLI	2
JASPER RED FESCUE	FESTUCA RUBRA "JASPER"	2
SALT MEADOW GRASS	LEPTOCHLOA FASCICULARIS	2
PERENNIAL RYE	LOLIUM PERENNE	12
FULTS SALT GRASS	PUCCINELLIA DISTANS "FULTS"	2

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



STORM WATER DETAILS

GRASS SWALE

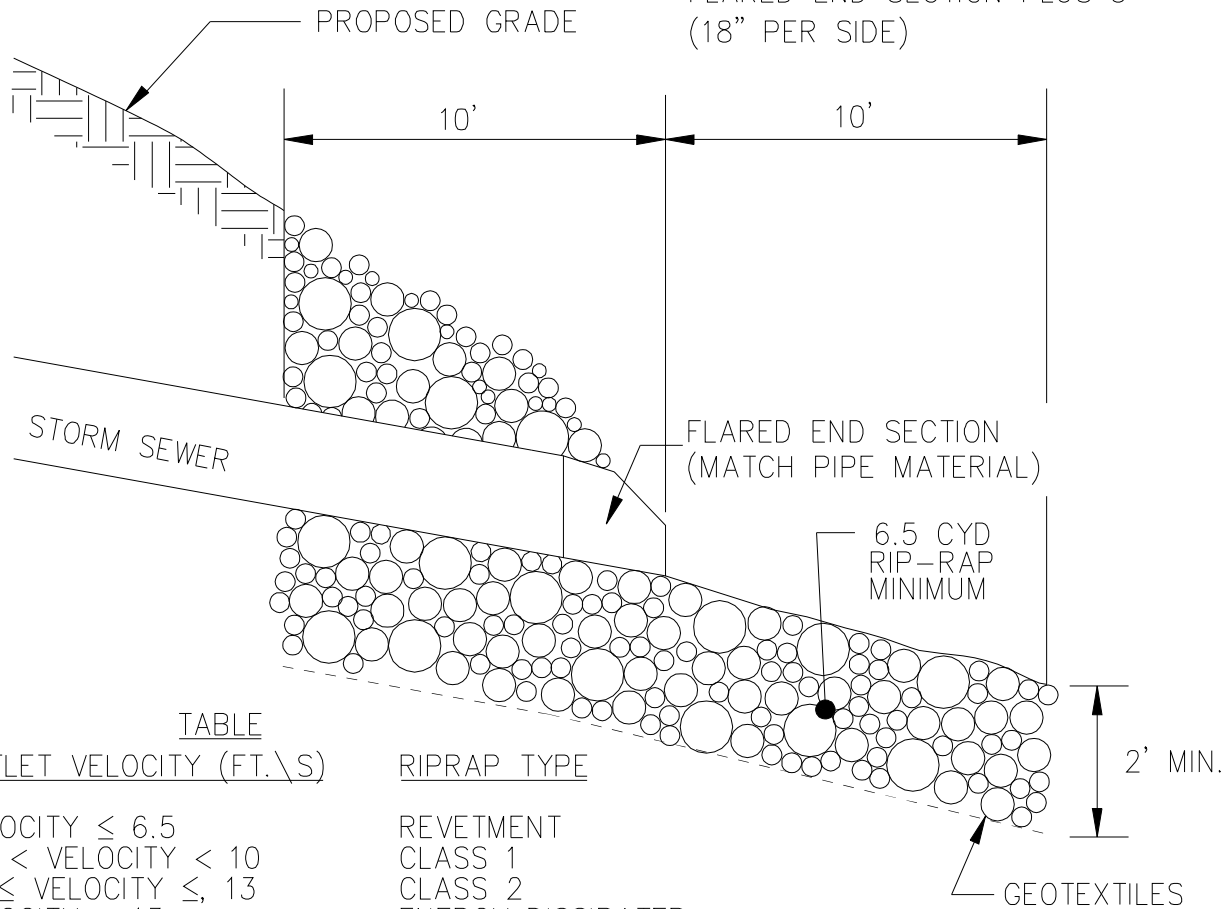
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. SW-1

SEE PLAN FOR WIDTH OF RIP RAP

NOTE:
 MINIMUM WIDTH OF RIP RAP
 SHALL BE EQUAL TO THE
 DOWNSTREAM WIDTH OF THE
 FLARED END SECTION PLUS 3'
 (18" PER SIDE)



TABLE

OUTLET VELOCITY (FT. \ S)	RIPRAP TYPE
VELOCITY \leq 6.5	REVEMENT
6.5 < VELOCITY < 10	CLASS 1
10 \leq VELOCITY \leq , 13	CLASS 2
VELOCITY > 13	ENERGY DISSIPATER

NOTE: THIS DETAIL SHOWS THE MINIMUM REQUIREMENT.
 ADDITIONAL RIPRAP AND/ OR OTHER END TREATMENT
 MAY BE NECESSARY.

CEDAR LAKE
 DEVELOPMENT STANDARDS MANUAL



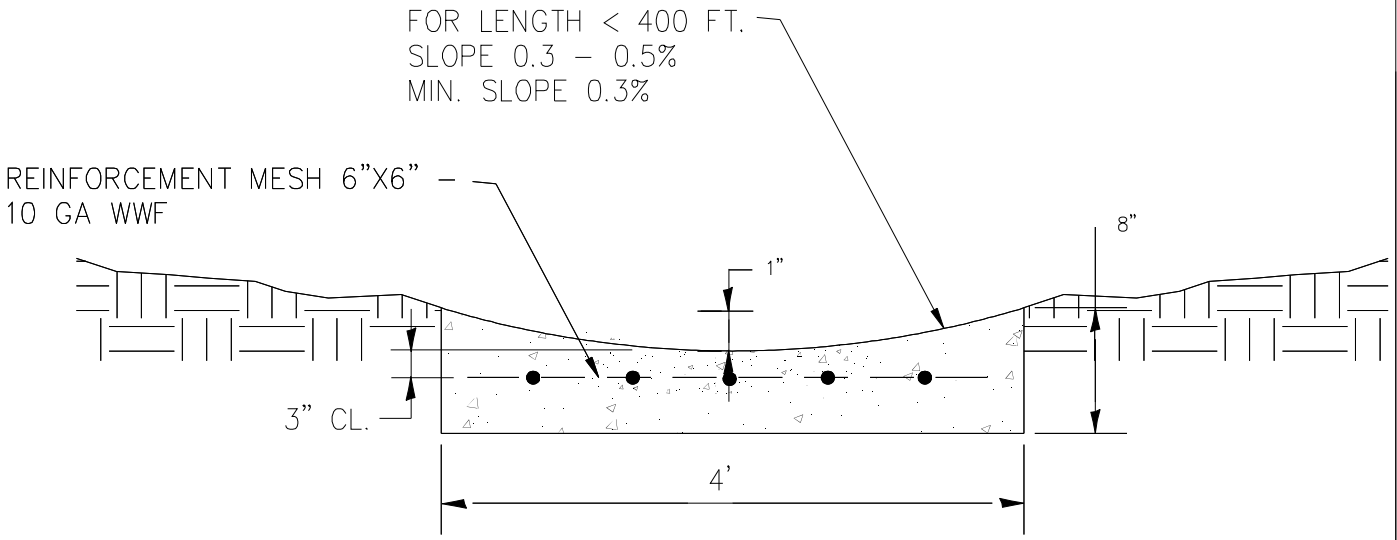
STORM WATER DETAILS

STORM SEWER PIPE END TREATMENT

SCALE:
 NONE

DATE: APRIL 2007

DWG. NO. SW-2



TRANSVERSE CONSTRUCTION JOINT REQUIRED EVERY 20 FEET

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



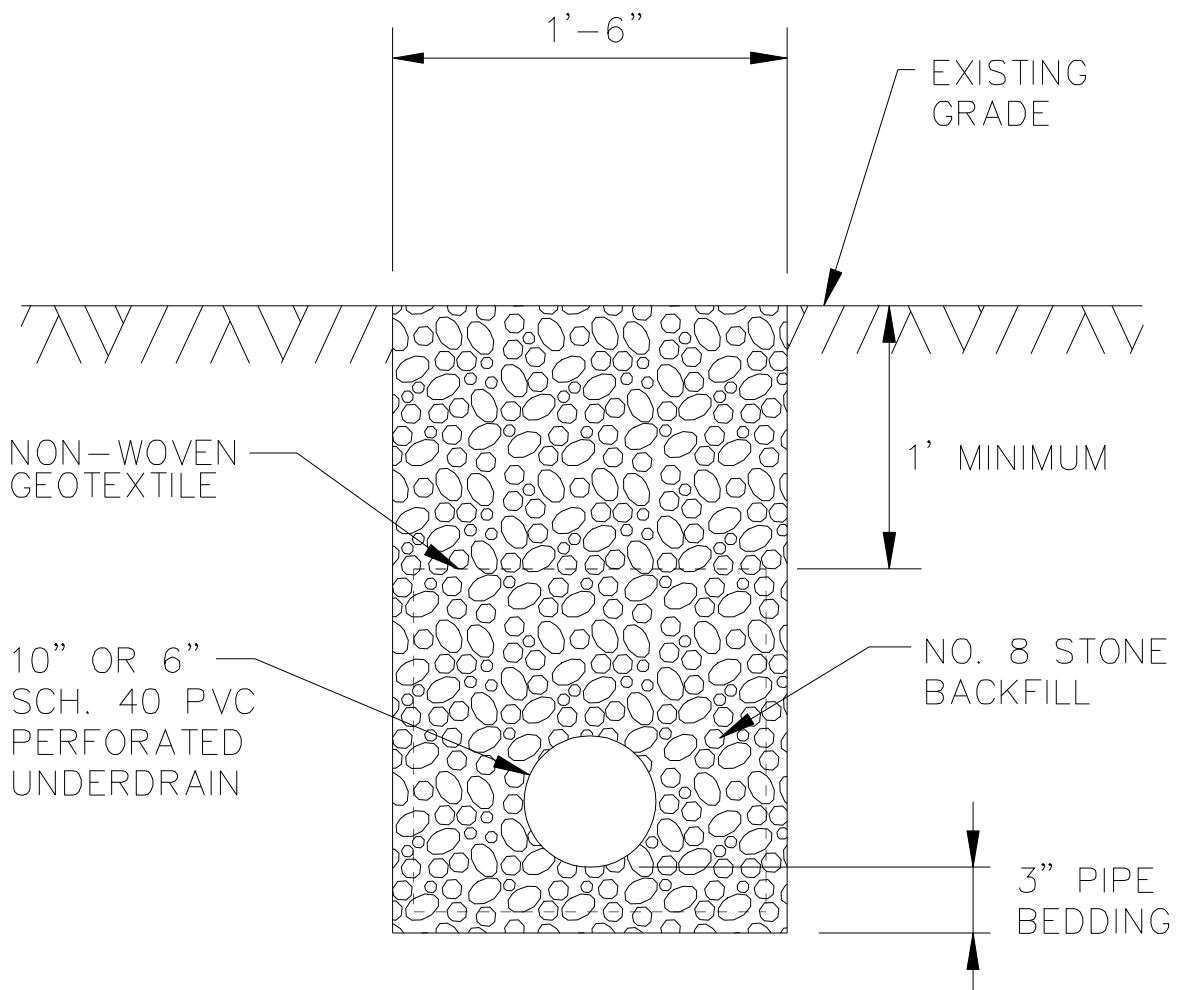
STORM WATER DETAILS

CONCRETE SWALE

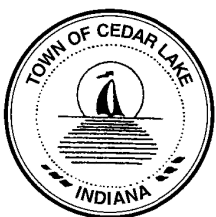
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. SW-3



CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



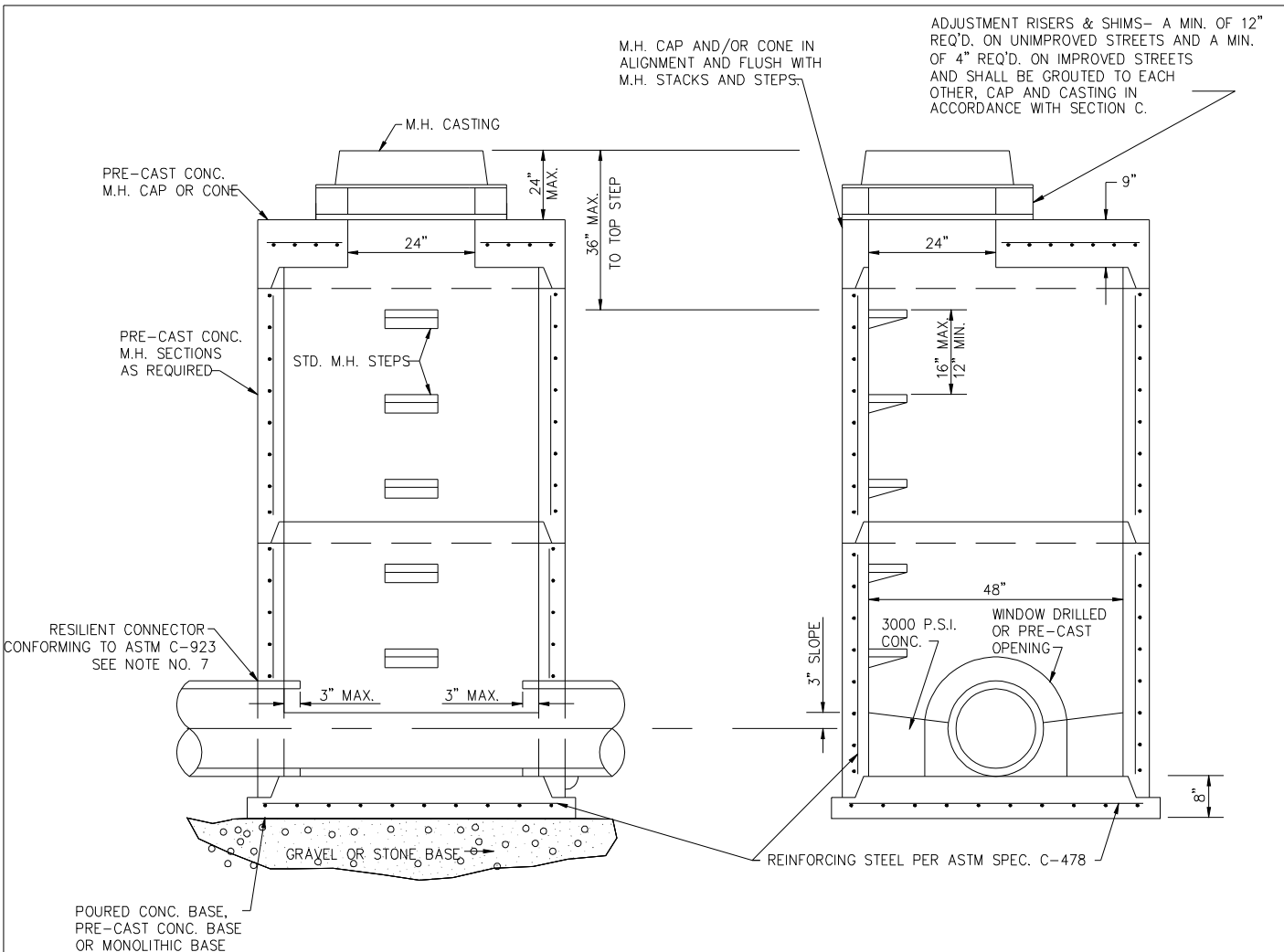
STORM WATER DETAILS

PERFORATED PIPE TRENCH DETAIL

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. SW-4



GENERAL CONSTRUCTION REQUIREMENTS

- 1) MANHOLE MADE IN ACCORDANCE WITH ASTM C-478.
- 2) ALL PIPES SHALL HAVE A SMOOTH FINISH.
- 3) MANHOLE JOINTS SHIP-LAP WITH GASKET IN ACCORDANCE WITH ASTM C-443.
- 4) THE BASE SHALL BE PLACED ON 6" MINIMUM COMPACTED GRAVEL OR STONE.
- 5) BASE DIAMETER 48"
- 6) PIPE DIAMETERS AND ANGLES OF DEFLECTION:
 6" THRU 24": STRAIGHT TO 90 DEGREE DEFLECTION
 25" THRU 30": STRAIGHT TO 45 DEGREE DEFLECTION
 MAXIMUM PIPE SIZE 30"
- 7) CONTRACTOR MAY SELECT A BOOT TYPE (AS MANUFACTURED BY PRESS SEAL GASKET OR APPROVED EQUAL) OR A COMPRESSION TYPE CONNECTOR (AS MANUFACTURED BY A-LOK PRODUCTS INC. OR EQUAL)

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



STRUCTURE DETAILS

TYPE I MANHOLE

SCALE:
NONE

DATE: APRIL 2007

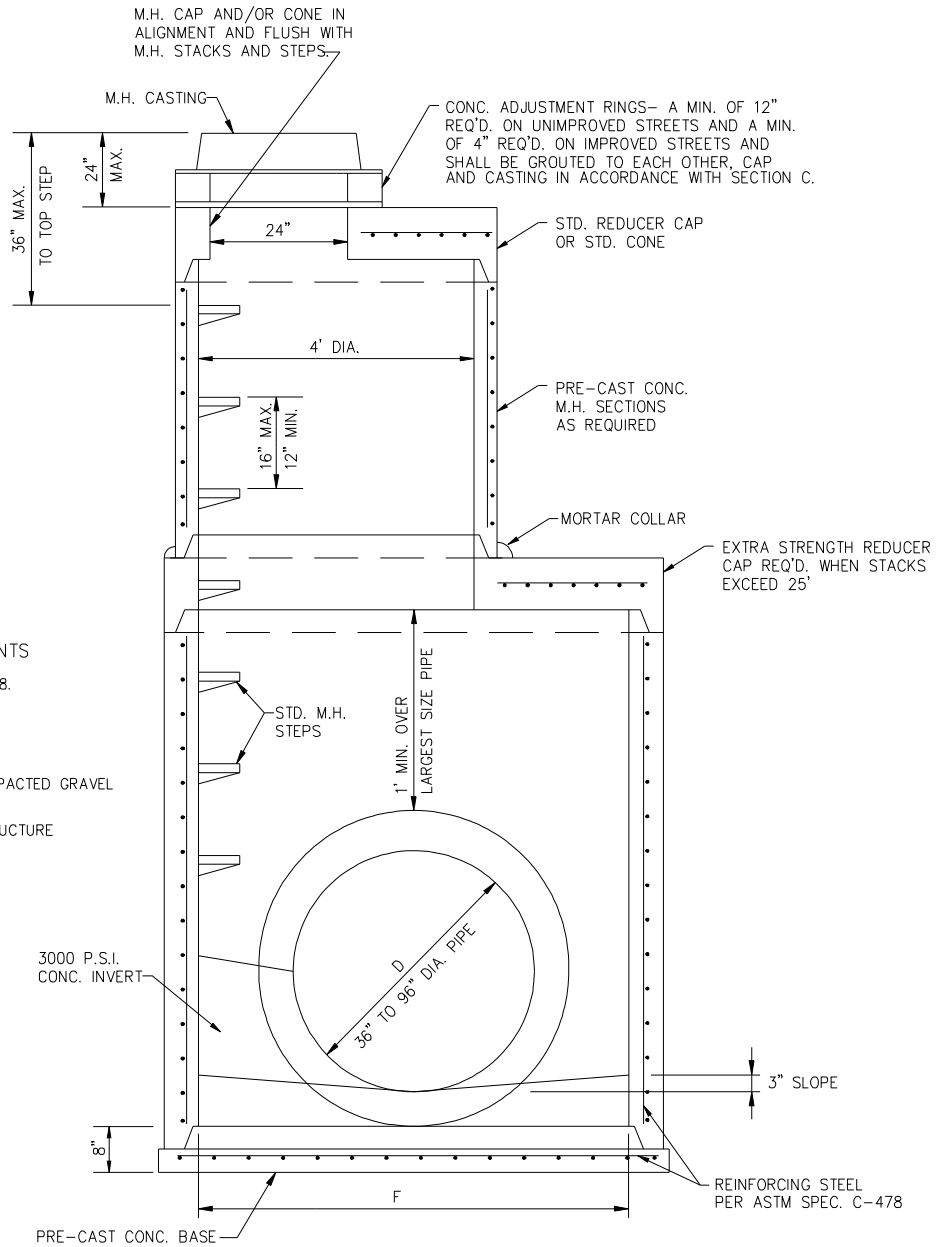
DWG. NO. S - 1

D= INSIDE PIPE DIAMETER
F= INSIDE MANHOLE DIAMETER

MANHOLE PIPE SIZES	
D	F
36"	5'-0"
42"-48"	6'-0"
54"	8'-0"
60"-72"	8'-6"
78"-84"	9'-0"

GENERAL CONSTRUCTION REQUIREMENTS

- 1) MANHOLE MADE IN ACCORDANCE WITH ASTM C-478.
- 2) ALL PIPES SHALL HAVE A SMOOTH FINISH.
- 3) MANHOLE JOINTS SHIP-LAP WITH GASKET IN ACCORDANCE WITH ASTM C-443.
- 4) THE BASE SHALL BE PLACED ON 6" MINIMUM COMPACTED GRAVEL OR STONE.
- 5) OPENINGS FOR PIPES MUST BE PRECAST INTO STRUCTURE



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



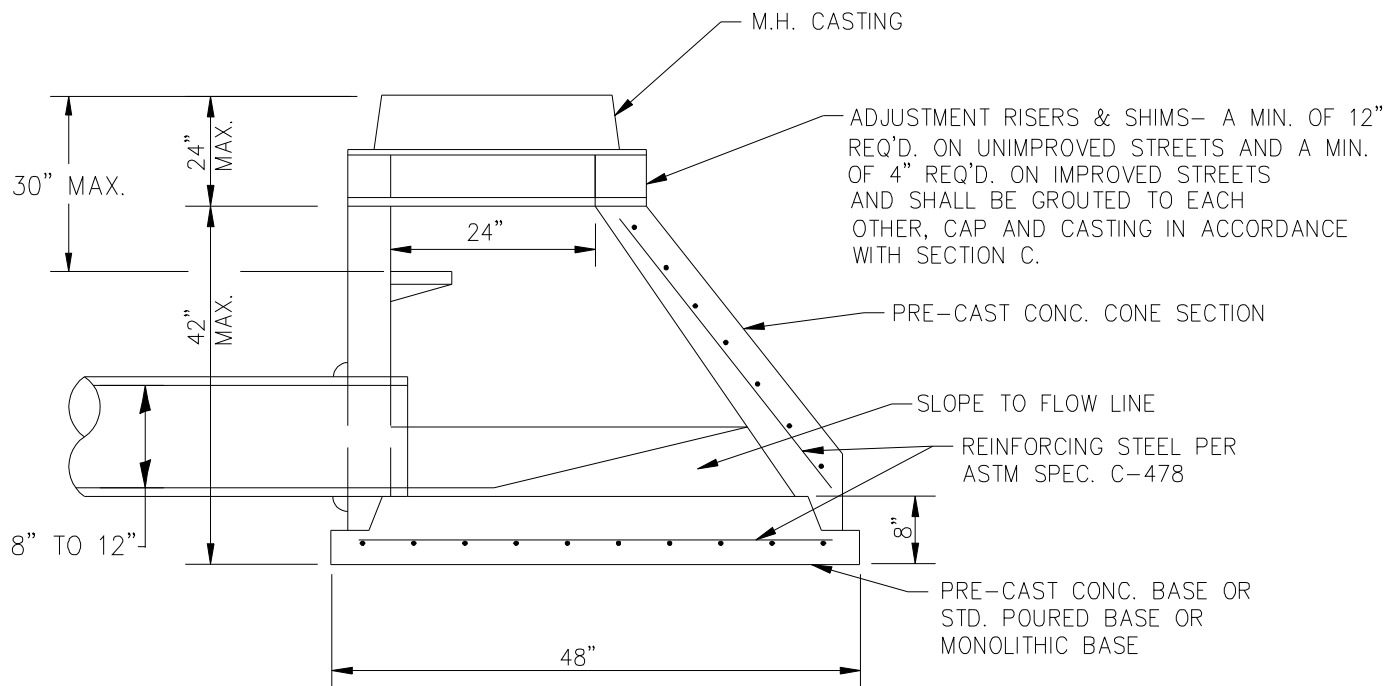
STRUCTURE DETAILS

TYPE II MANHOLE

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. S - 2



GENERAL CONSTRUCTION REQUIREMENTS

- 1) MANHOLE MADE IN ACCORDANCE WITH ASTM C-478.
- 2) ALL PIPES SHALL HAVE A SMOOTH FINISH.
- 3) MANHOLE JOINTS SHIP-LAP WITH GASKET IN ACCORDANCE WITH ASTM C-443.
- 4) CONTRACTOR MAY SELECT A BOOT TYPE (AS MANUFACTURED BY PRESS SEAL GASKET OR APPROVED EQUAL) OR A COMPRESSION TYPE CONNECTOR (AS MANUFACTURED BY A-LOK PRODUCTS INC. OR EQUAL)

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



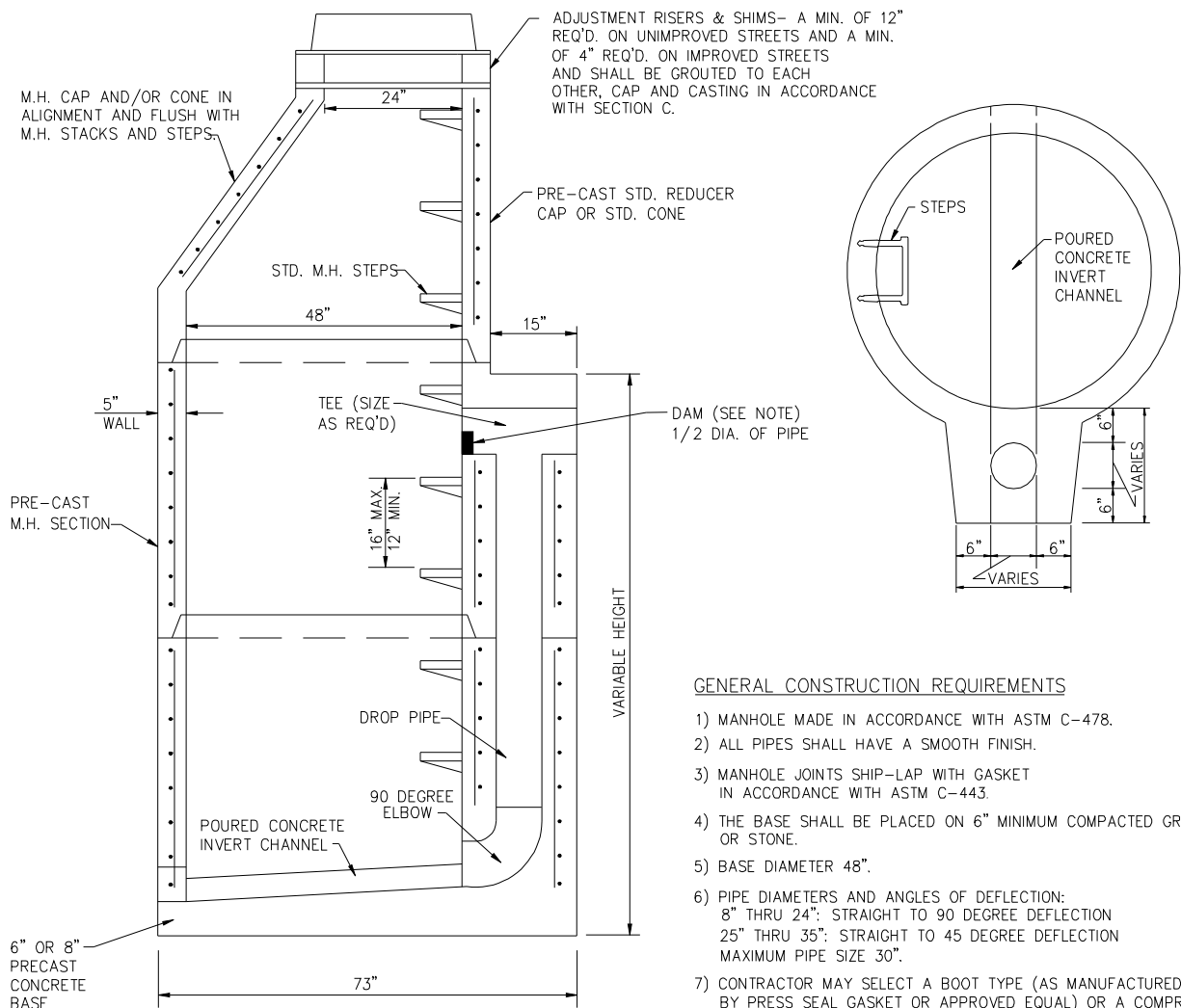
STRUCTURE DETAILS

TYPE IV MANHOLE

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. S - 3



GENERAL CONSTRUCTION REQUIREMENTS

- 1) MANHOLE MADE IN ACCORDANCE WITH ASTM C-478.
- 2) ALL PIPES SHALL HAVE A SMOOTH FINISH.
- 3) MANHOLE JOINTS SHIP-LAP WITH GASKET IN ACCORDANCE WITH ASTM C-443.
- 4) THE BASE SHALL BE PLACED ON 6" MINIMUM COMPACTED GRAVEL OR STONE.
- 5) BASE DIAMETER 48".
- 6) PIPE DIAMETERS AND ANGLES OF DEFLECTION:
 8" THRU 24": STRAIGHT TO 90 DEGREE DEFLECTION
 25" THRU 35": STRAIGHT TO 45 DEGREE DEFLECTION
 MAXIMUM PIPE SIZE 30".
- 7) CONTRACTOR MAY SELECT A BOOT TYPE (AS MANUFACTURED BY PRESS SEAL GASKET OR APPROVED EQUAL) OR A COMPRESSION TYPE CONNECTOR (AS MANUFACTURED BY A-LOK PRODUCTS INC. OR EQUAL).
- 8) EXTERIOR DROP PIPE SHALL BE PROVIDED FOR A SEWER ENTERING A MANHOLE AT AN ELEVATION OF GREATER THAN TWENTY FOUR (24) INCHES OR MORE ABOVE THE MANHOLE DOWNSTREAM INVERT.
- 9) CONSTRUCT DAM OF PVC PLUG/CAP WITH OPENING CUT ABOVE 1/2 DIA. OF PIPE.

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



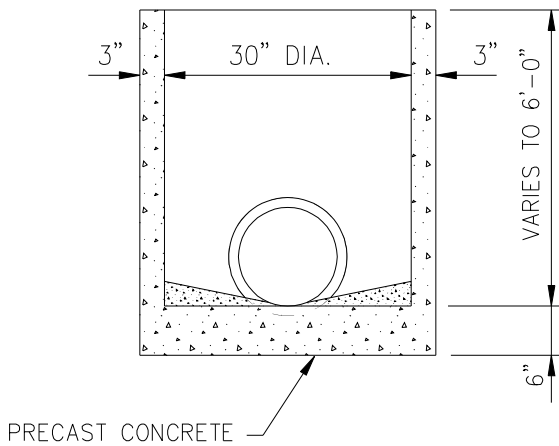
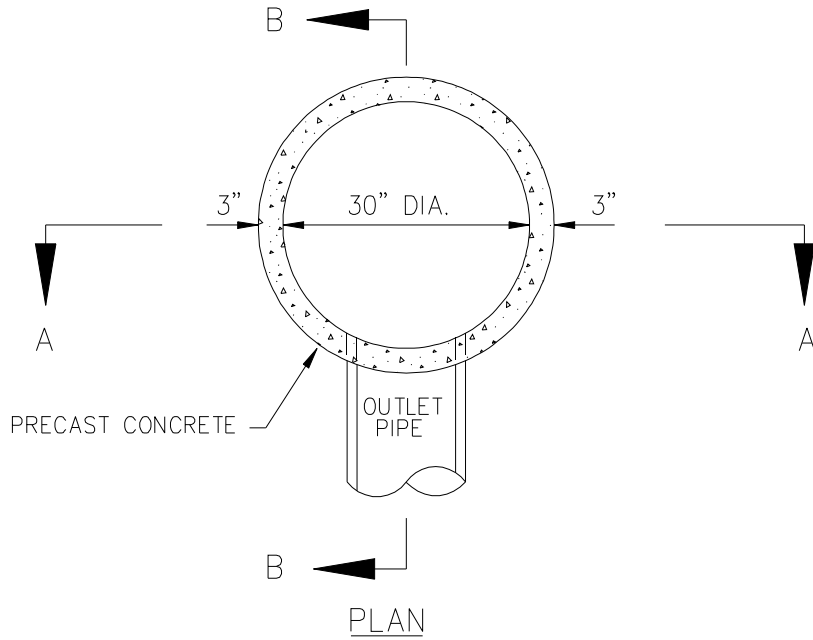
STRUCTURE DETAILS

TYPE VI MANHOLE (DROP MANHOLE)

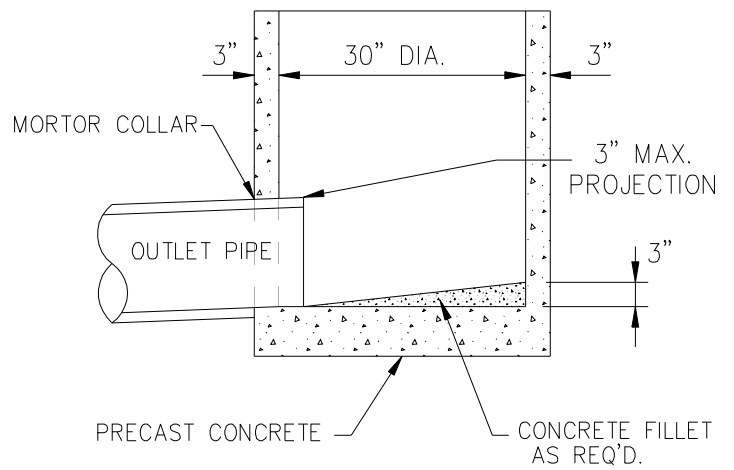
SCALE:
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DATE: APRIL 2007

DWG. NO. S - 4



SECTION A-A



SECTION B-B

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



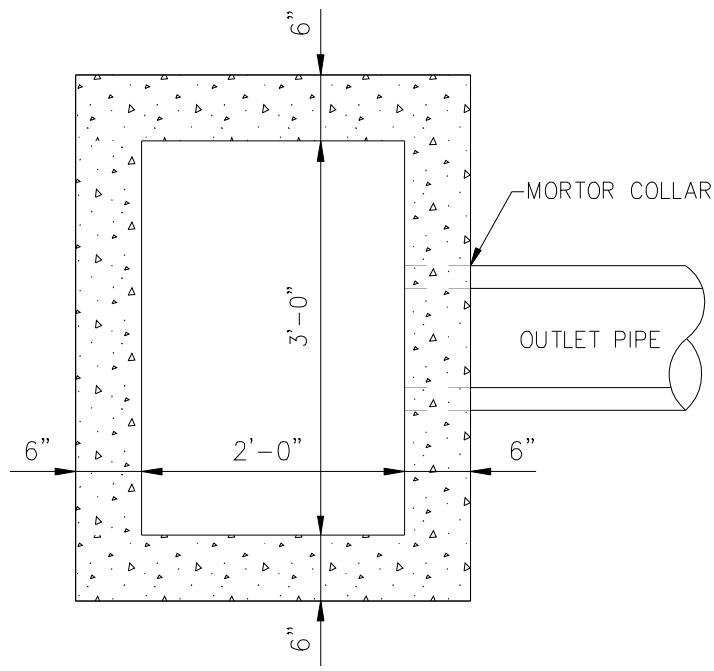
STRUCTURE DETAILS

INLET TYPE I

SCALE:
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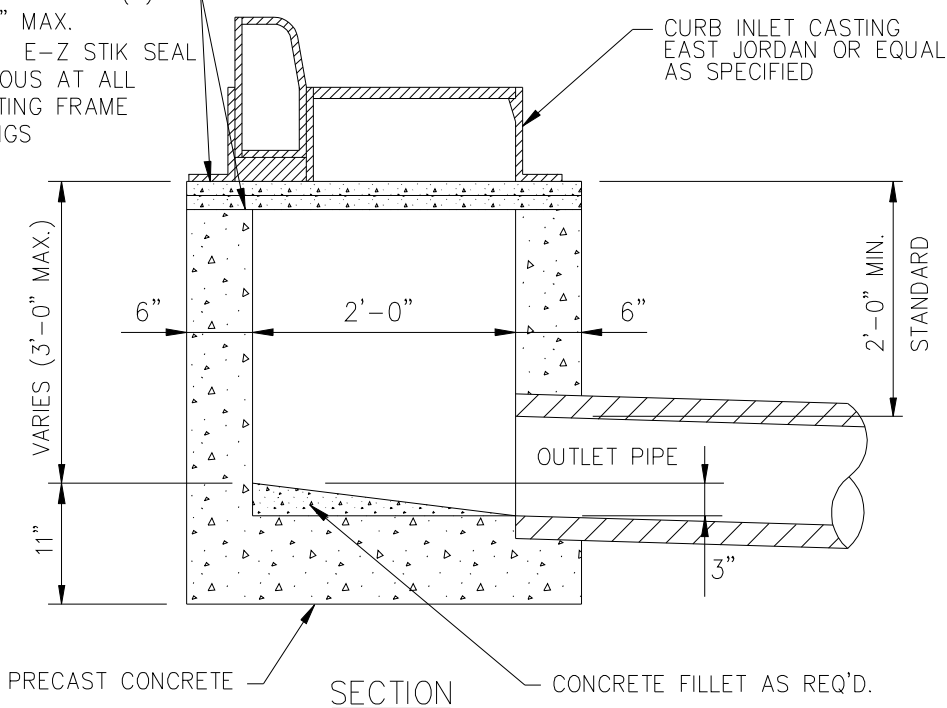
DATE: FEB. 2007

DWG. NO. S - 5



PLAN

REINF. CONC. ADJUSTING RING(S)
AS REQ'D. TOTAL 8" MAX.
1-1/8" SQ. OR RD. E-Z STIK SEAL
OR EQUAL CONTINUOUS AT ALL
JOINTS UNDER CASTING FRAME
AND ADJUSTING RINGS



VARIES (3'-0" MAX.)

STANDARD

11"

3"

PRECAST CONCRETE

SECTION

CONCRETE FILLET AS REQ'D.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



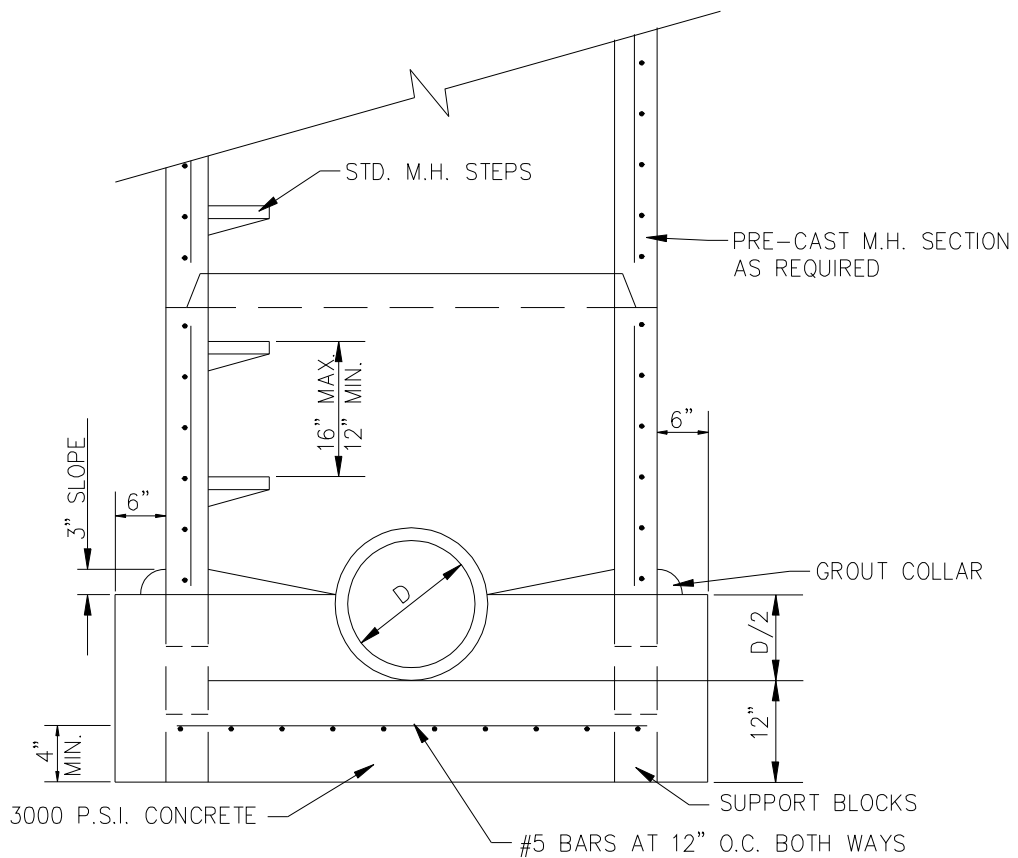
STRUCTURE DETAILS

INLET TYPE III

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. S-6



NOTE:

GENERAL CONSTRUCTION REQUIREMENTS SAME AS TYPE 1 MANHOLE.

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



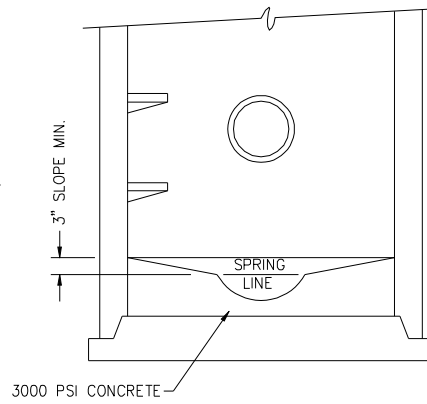
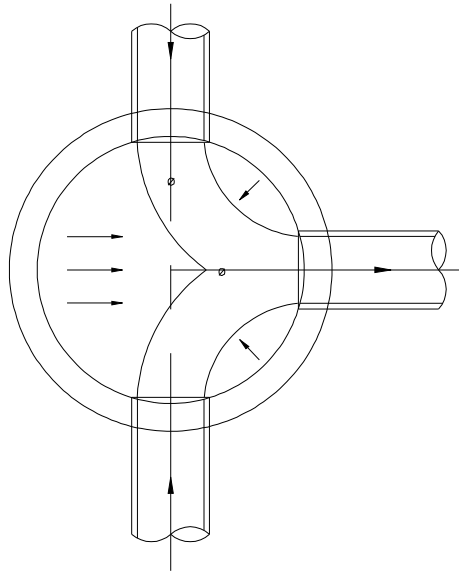
STRUCTURE DETAILS

INVERT FOR CAST IN PLACE PIPE & BASE

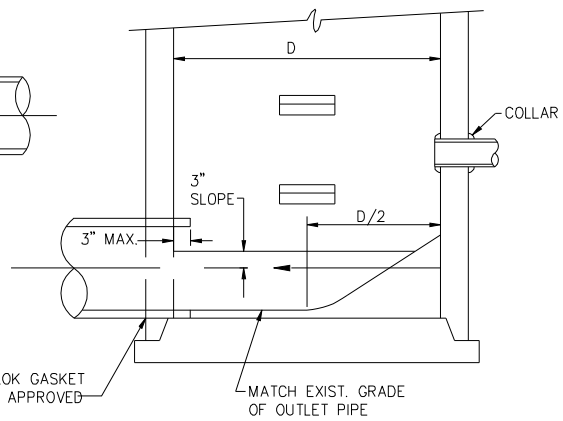
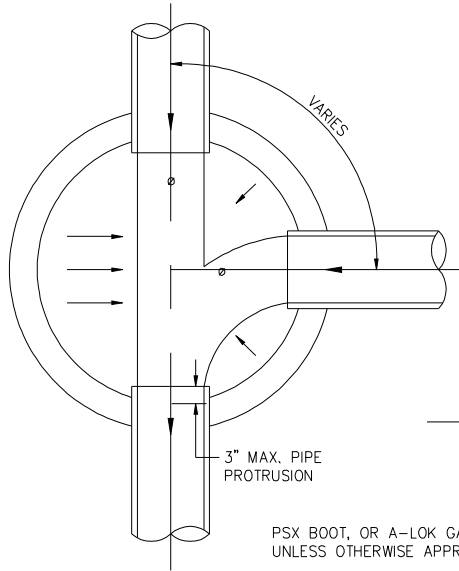
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. S - 7



DROP, END, OR STEP-UP MANHOLE



NOTE:

- 1.) CENTERLINE OF ALL PIPE TO INTERSECT CENTERLINE OF M.H.
- 2.) ALL INCOMING PIPE SHALL HAVE A SMOOTH FINISH.
- 3.) INVERTS TO BE CAST UNDER DRY PIPE CONDITIONS.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



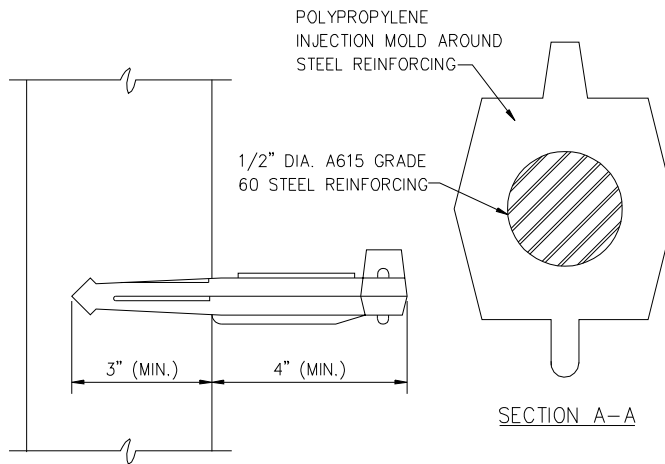
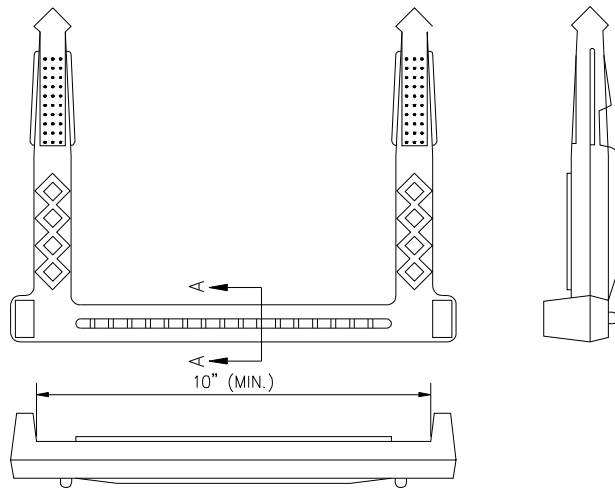
STRUCTURE DETAILS

INVERT SHAPES

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. S - 8



NOTES:

- 1) STEPS SHALL BE PLACED INTO WET CONCRETE WALL DURING MANUFACTURE OR MORTARED INTO HOLES AFTER CONCRETE HAS SET.
- 2) DESIGN OF STEP SHALL MEET REQUIREMENTS OF ASTM C-478, LATEST EDITION.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



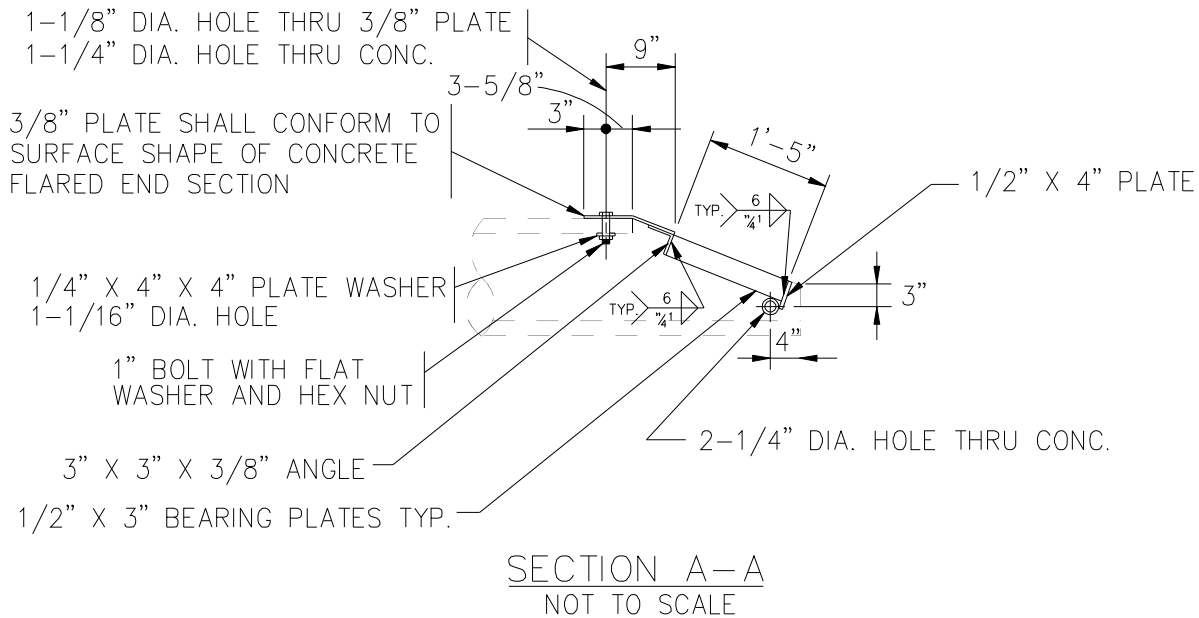
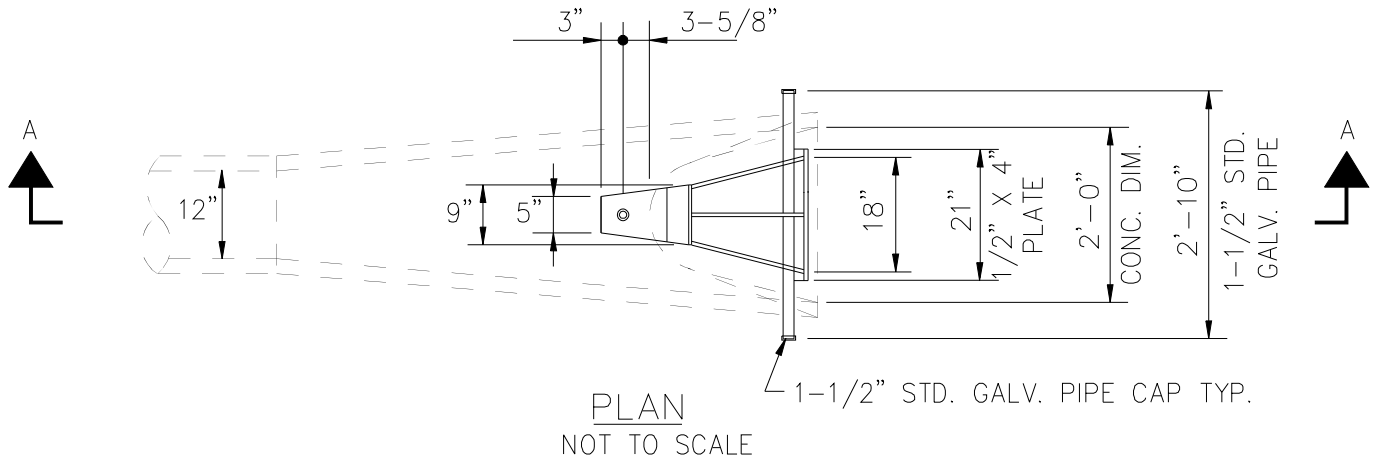
STRUCTURE DETAILS

REINFORCED PLASTIC MANHOLE STEP

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. S - 9



NOTE: 1.) HOLES IN THE PRECAST CONCRETE FLARED END SECTIONS SHALL BE CORED TO THE DIA. NOTED. IF CONE-OUT ON THE OTHER END OF THE HOLE OCCURS, IT SHALL BE FILLED WITH GROUT TO CORRECT THE DIA. OF THE HOLE.

2.) SEE ILLINOIS DEPARTMENT OF TRANSPORTATION STANDARD FOR LARGER SIZES.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



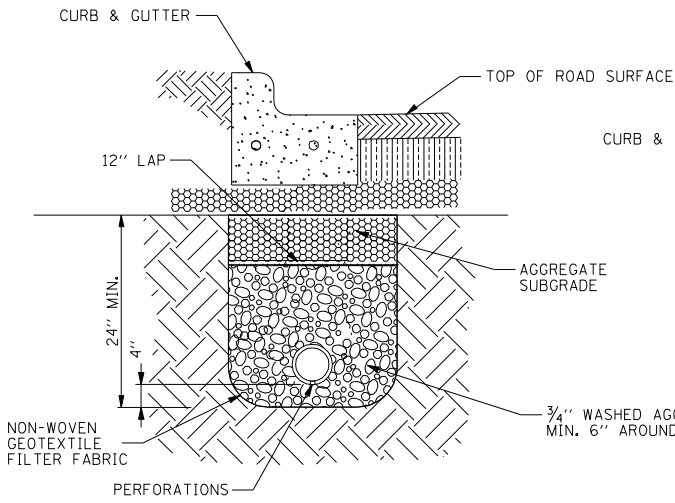
STRUCTURE DETAILS

TRASH RACK
FOR 12" DIA. CONCRETE PIPES

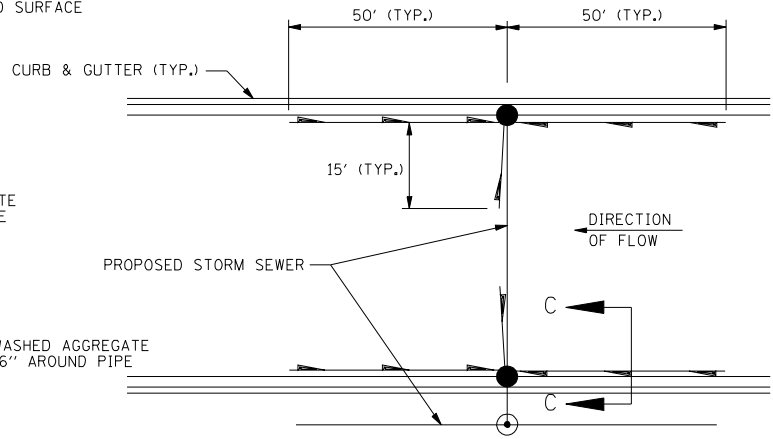
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. S - 10



SECTION C-C



PIPE UNDERDRAIN TO BE INSTALLED AT ALL CURB STRUCTURES IN AREAS

PLAN

PIPE UNDERDRAINS, FABRIC LINED TRENCH

GENERAL NOTES

1. THE TRENCH SHALL BE WRAPPED WITH NON-WOVEN GEOTEXTILE FILTER FABRIC.
2. WASHED AGGREGATE SHALL BE PLACED AROUND THE DRAIN TILE.
3. THE HOLE TO CONNECT UNDERDRAIN TO STRUCTURE SHALL BE CORE DRILLED INTO STRUCTURE.
4. HYDRAULIC CEMENT SHALL BE PLACED AROUND THE PIPE TO SEAL THE OPENING, BOTH INSIDE AND OUTSIDE THE STRUCTURE.
5. MIN. SLOPE = 0.5%
6. TRANSVERSE DRAINS TO BE PLACED AT ALL ROADWAY INLETS AND CATCH BASINS.

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



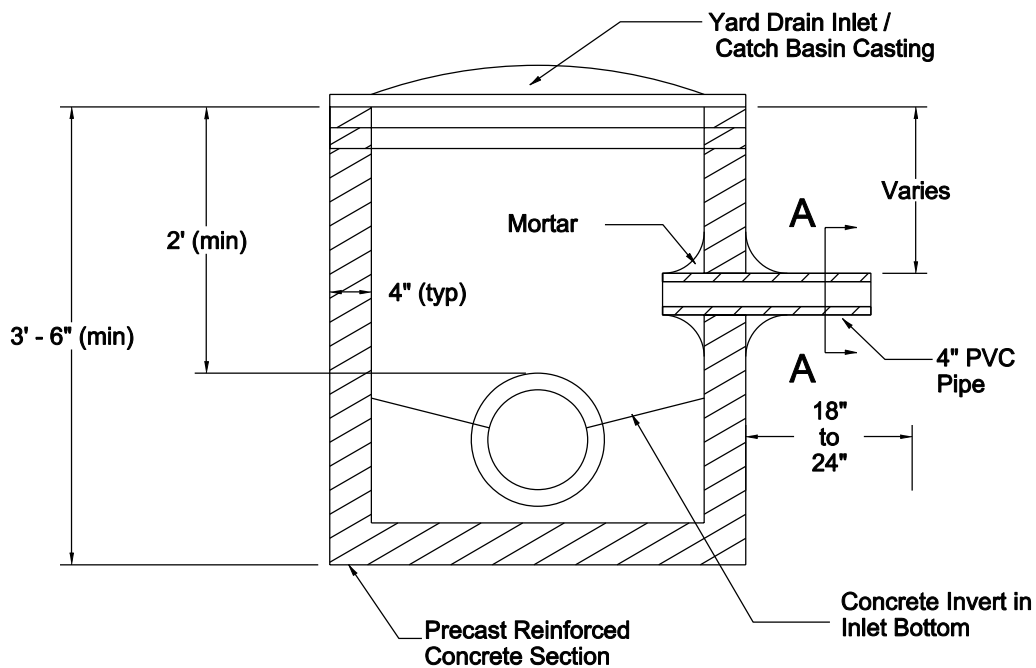
STRUCTURE DETAILS

FINGER DRAIN

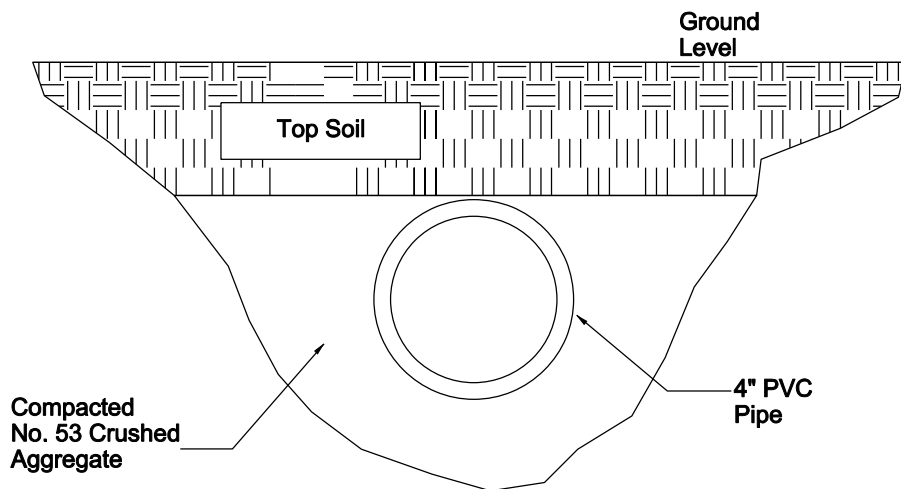
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. S - 11



**Section
A-A**



NOTES:

1) APPLY A CONTINUOUS LAYER OF NON-HARDENING, PREFORMED, BUTYL MASTIC MATERIAL (RUB R NEK, E-Z STICK OR EQUAL) TO EACH JOINT, ADJUSTING RING AND FRAME TO PREVENT INFILTRATION.

2) INTERIOR JOINTS ARE TO BE 'DRESSED UP' WITH HYDRAULIC CEMENT OR PORTLAND CEMENT FOR STRENGTH AND A WATER TIGHT BOND.

**CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL**

STRUCTURE DETAILS

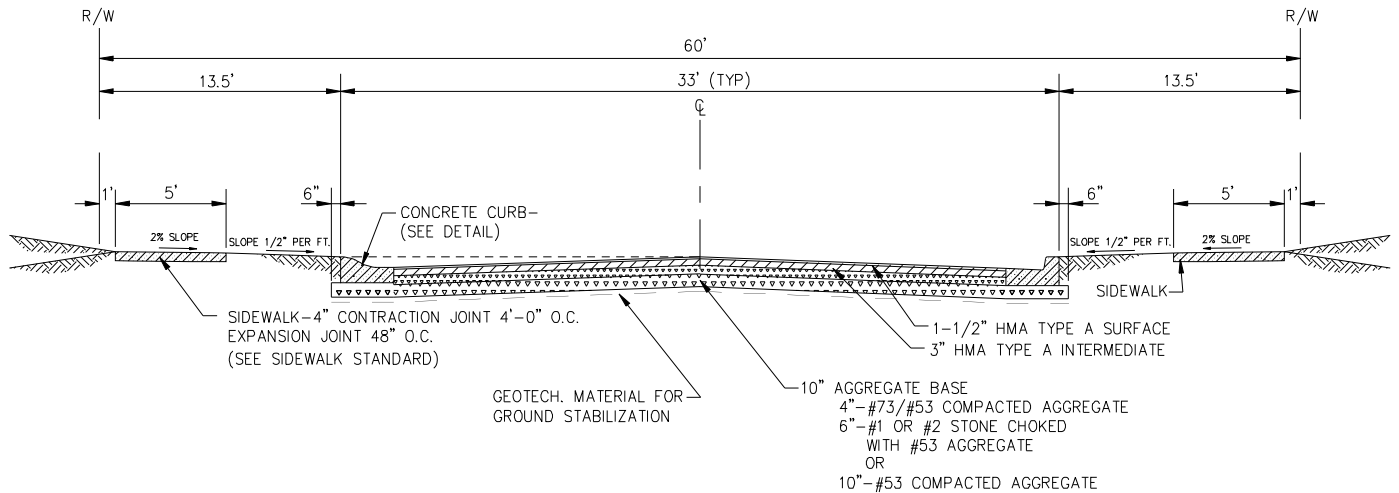
**REAR YARD INLET & SUMP PUMP CONNECTION
-STUB DETAIL**



SCALE:
NONE

DATE: MARCH 2009

DWG. NO. S - 12



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



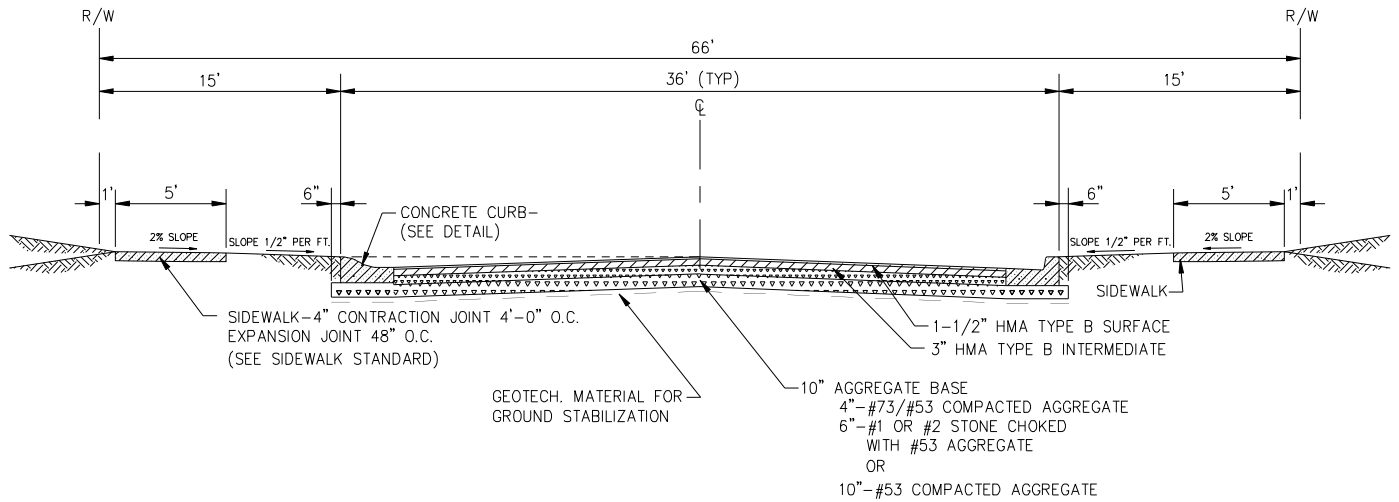
PAVEMENT DETAILS

LOCAL STREET ASPHALT PAVEMENT SECTION W/CURB

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. ST-1



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



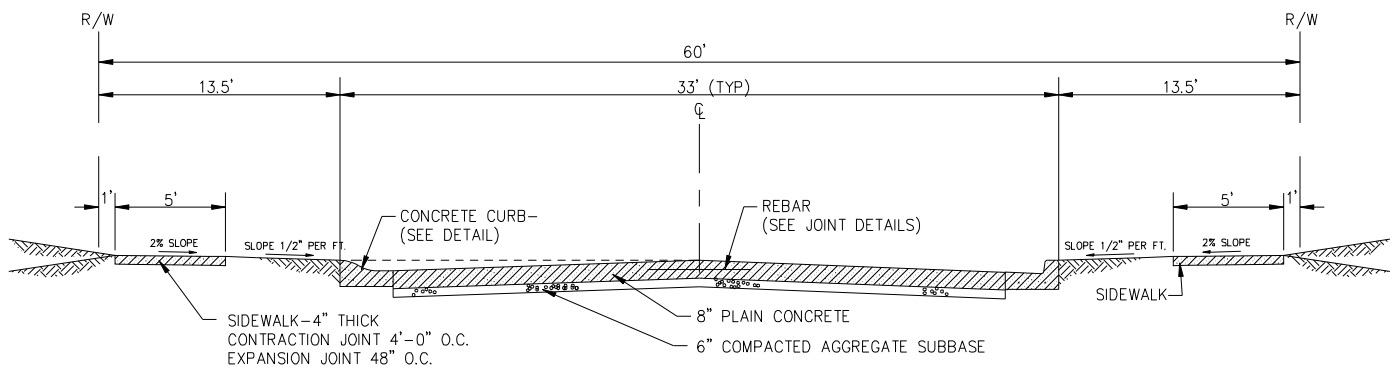
PAVEMENT DETAILS

MINOR ARTERIAL/COLLECTOR STREET
ASPHALT PAVEMENT SECTION W/CURB

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. ST-2



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



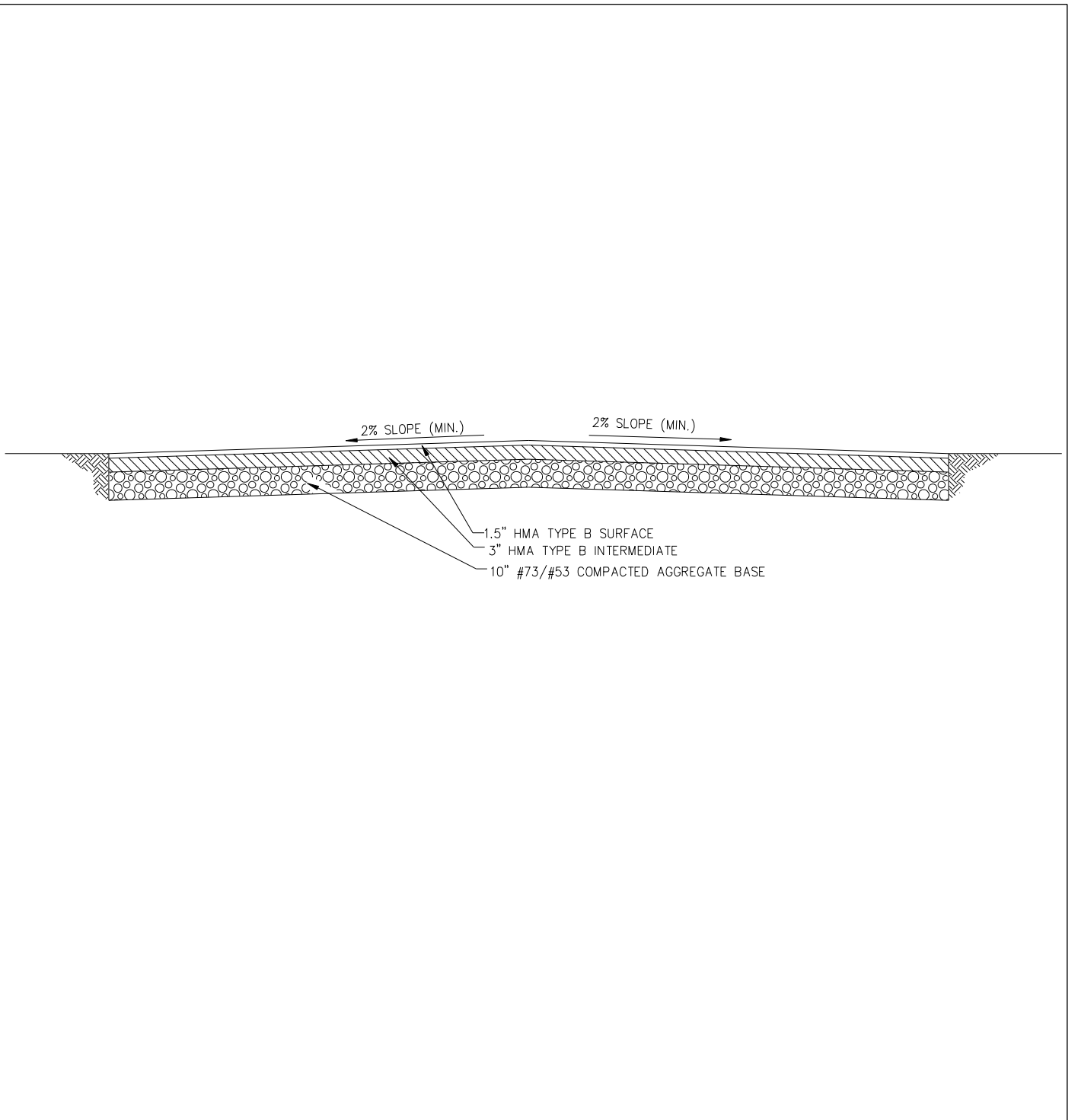
PAVEMENT DETAILS

LOCAL STREET CONCRETE PAVEMENT SECTION W/ CURB

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. ST-3



CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



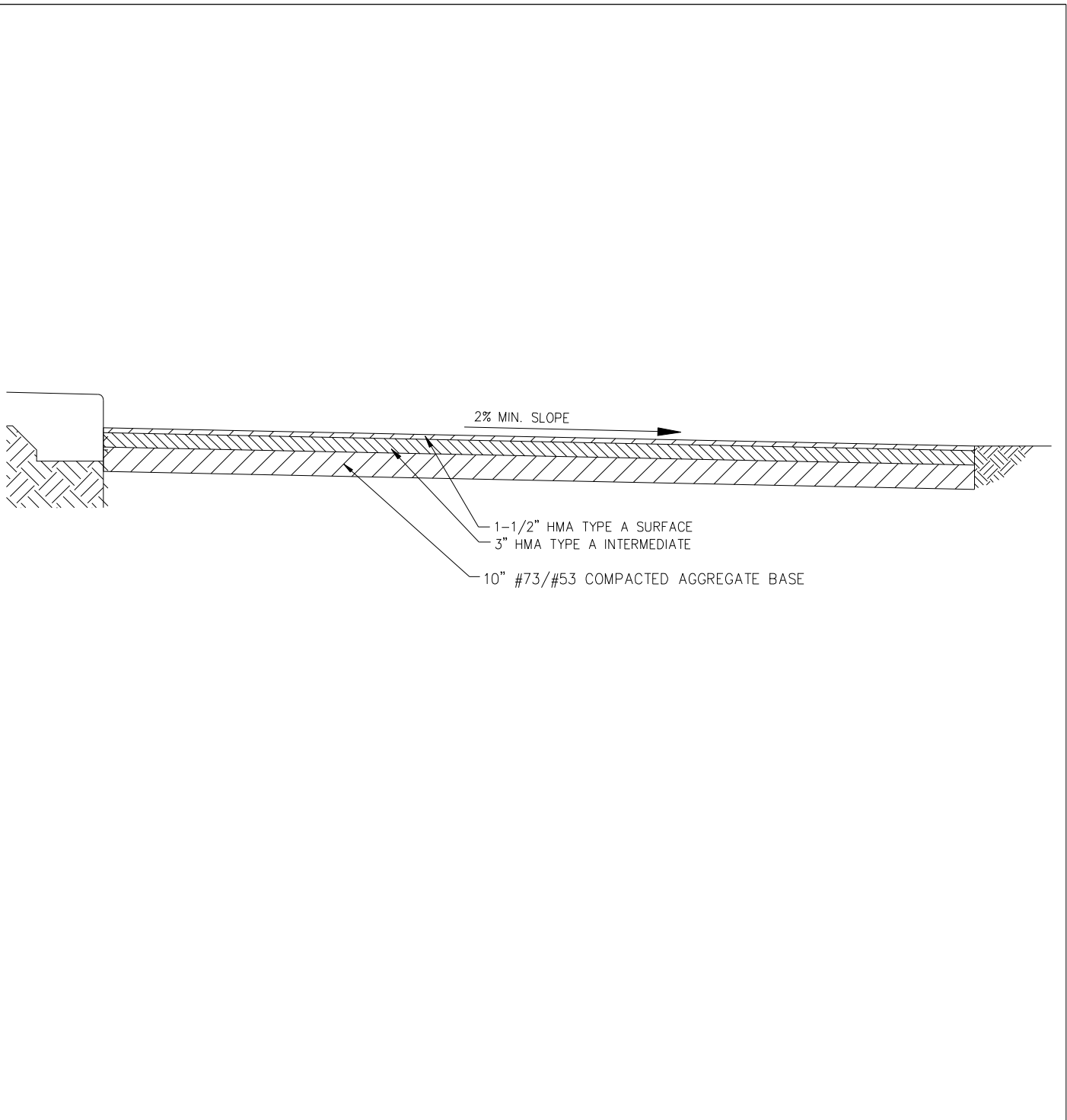
PAVEMENT DETAILS

ROAD PAVEMENT SECTION

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. ST-4



CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



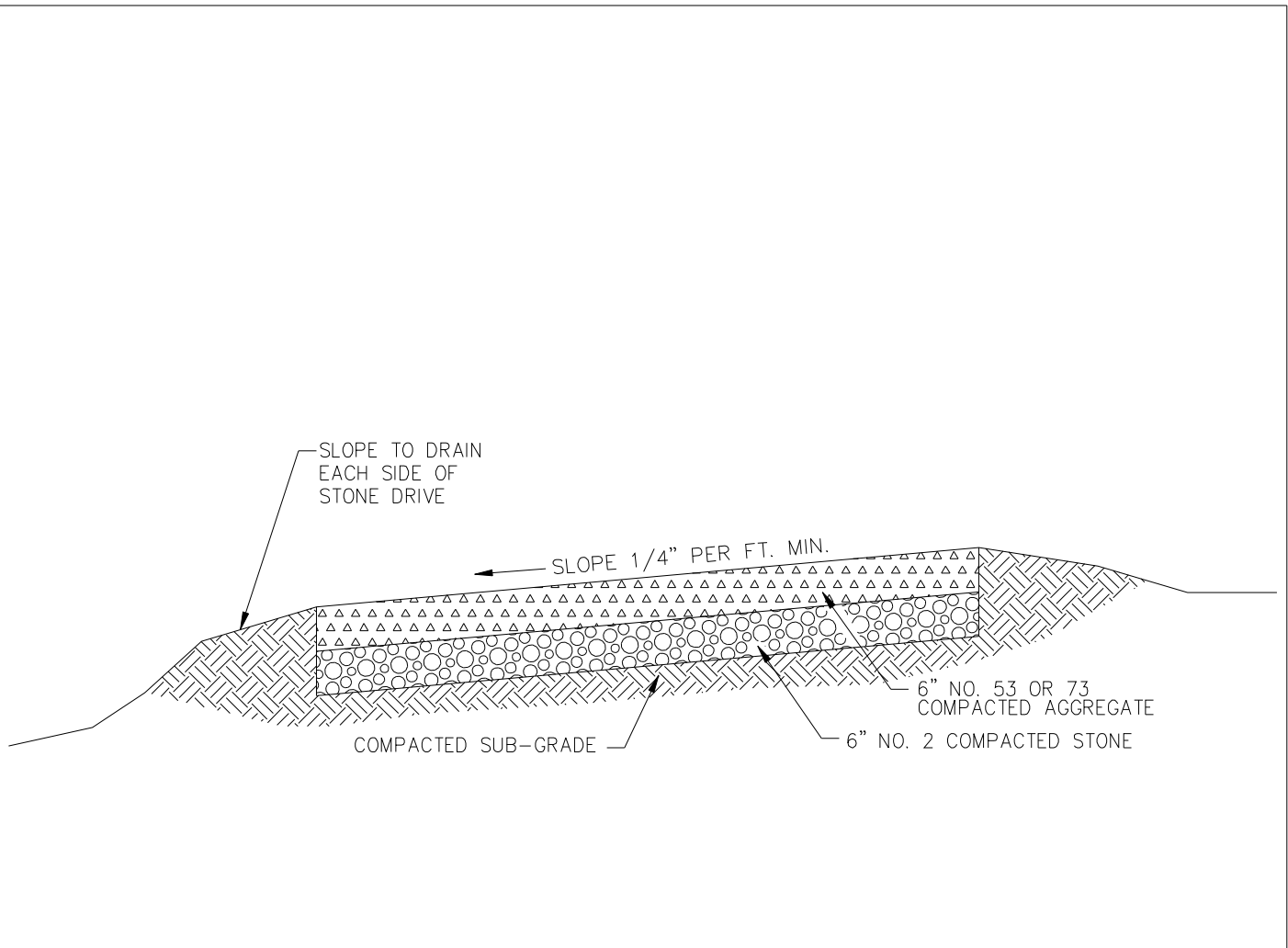
PAVEMENT DETAILS

PARKING LOT PAVEMENT SECTION

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. ST-5



NOTE: TO BE USED FOR REPAIR OF EXISTING STONE DRIVEWAYS ONLY.
 NOT FOR USE IN NEW CONSTRUCTION OR DRIVEWAY REPLACEMENT.

CEDAR LAKE
 DEVELOPMENT STANDARDS MANUAL



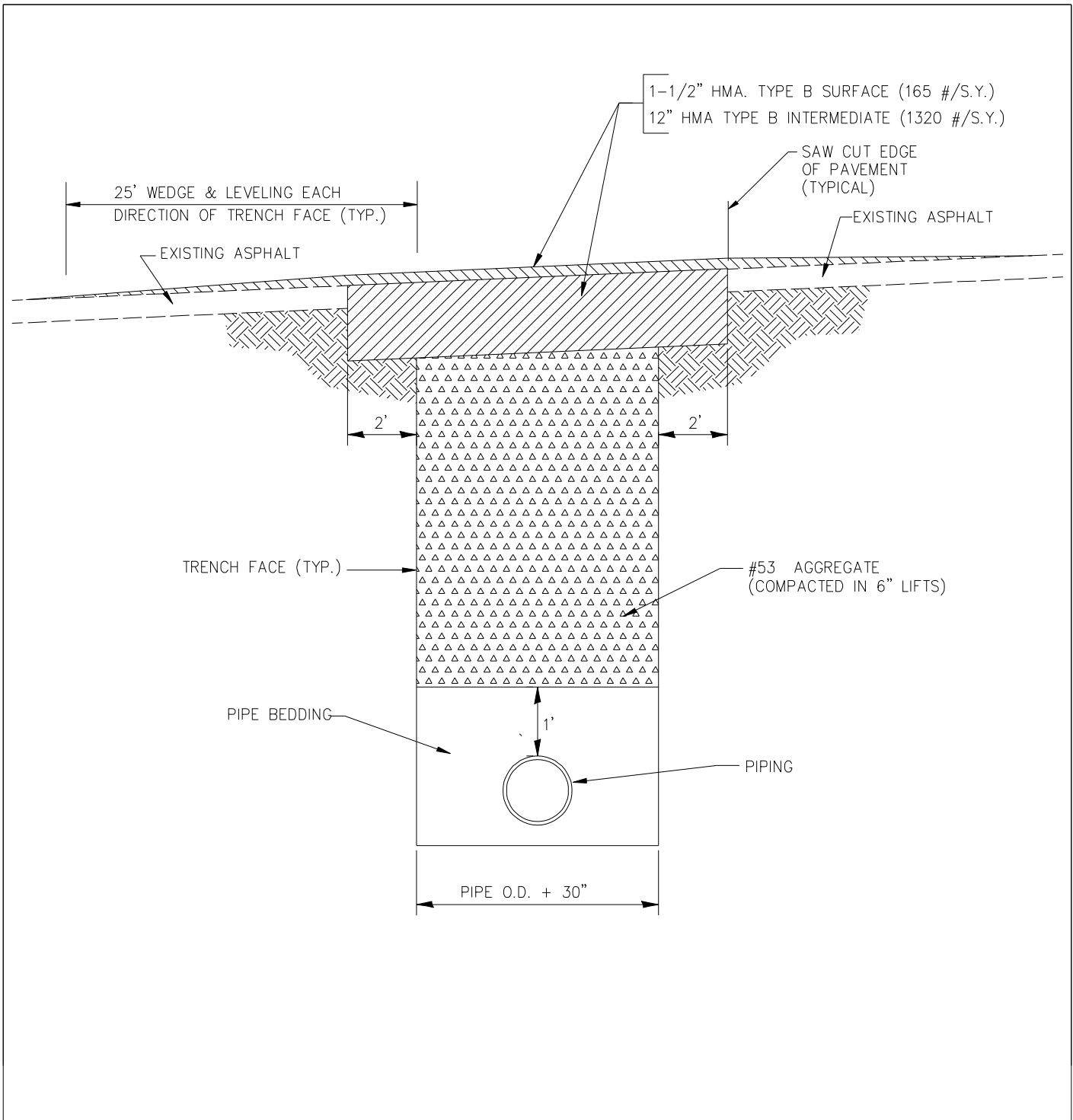
PAVEMENT DETAILS

STONE DRIVEWAY DETAIL

SCALE:
 NONE

DATE: APRIL 2007

DWG. NO. ST-6



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



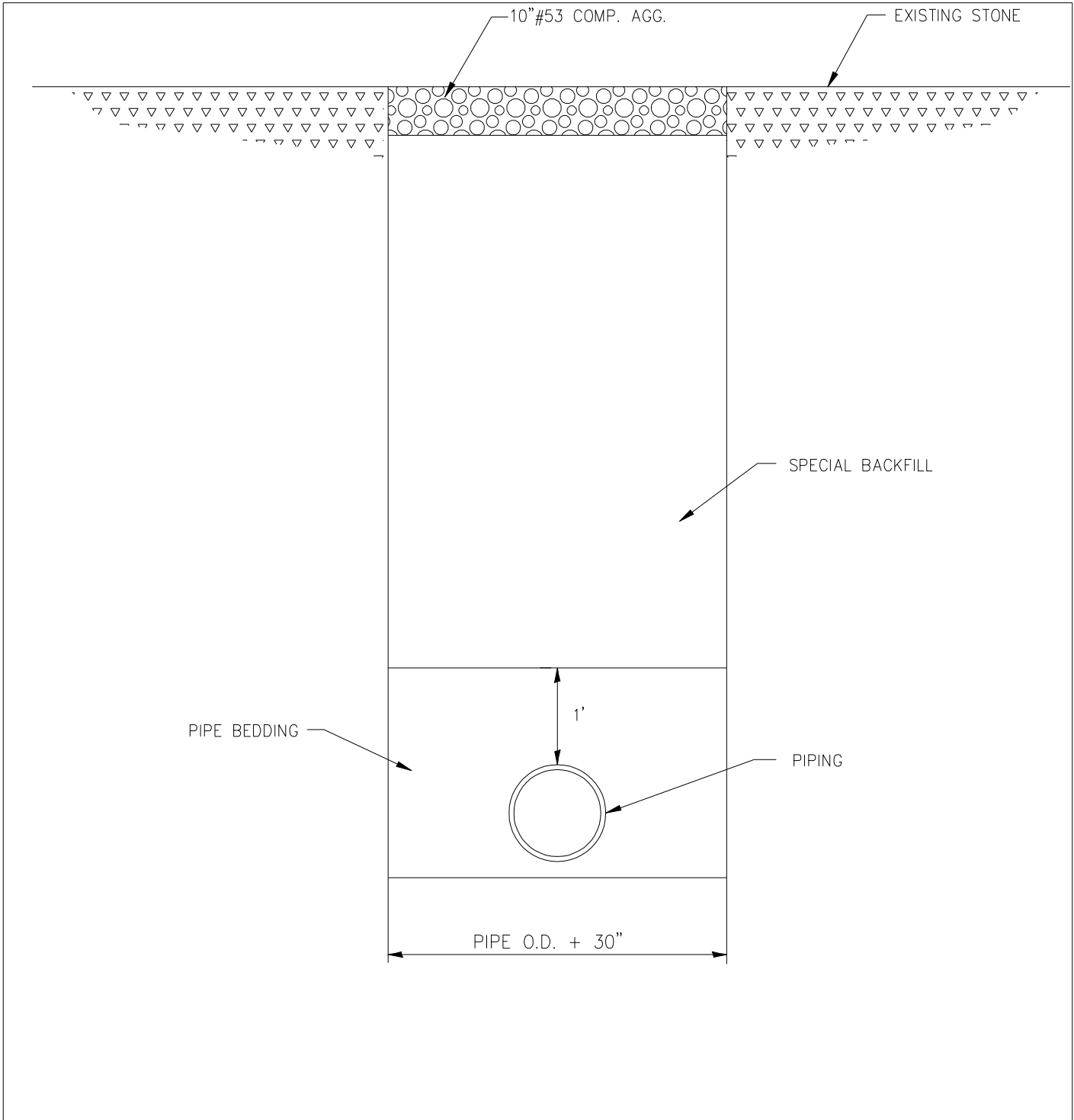
PAVEMENT DETAILS

ASPHALT PAVEMENT REPAIR

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. ST-7



CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



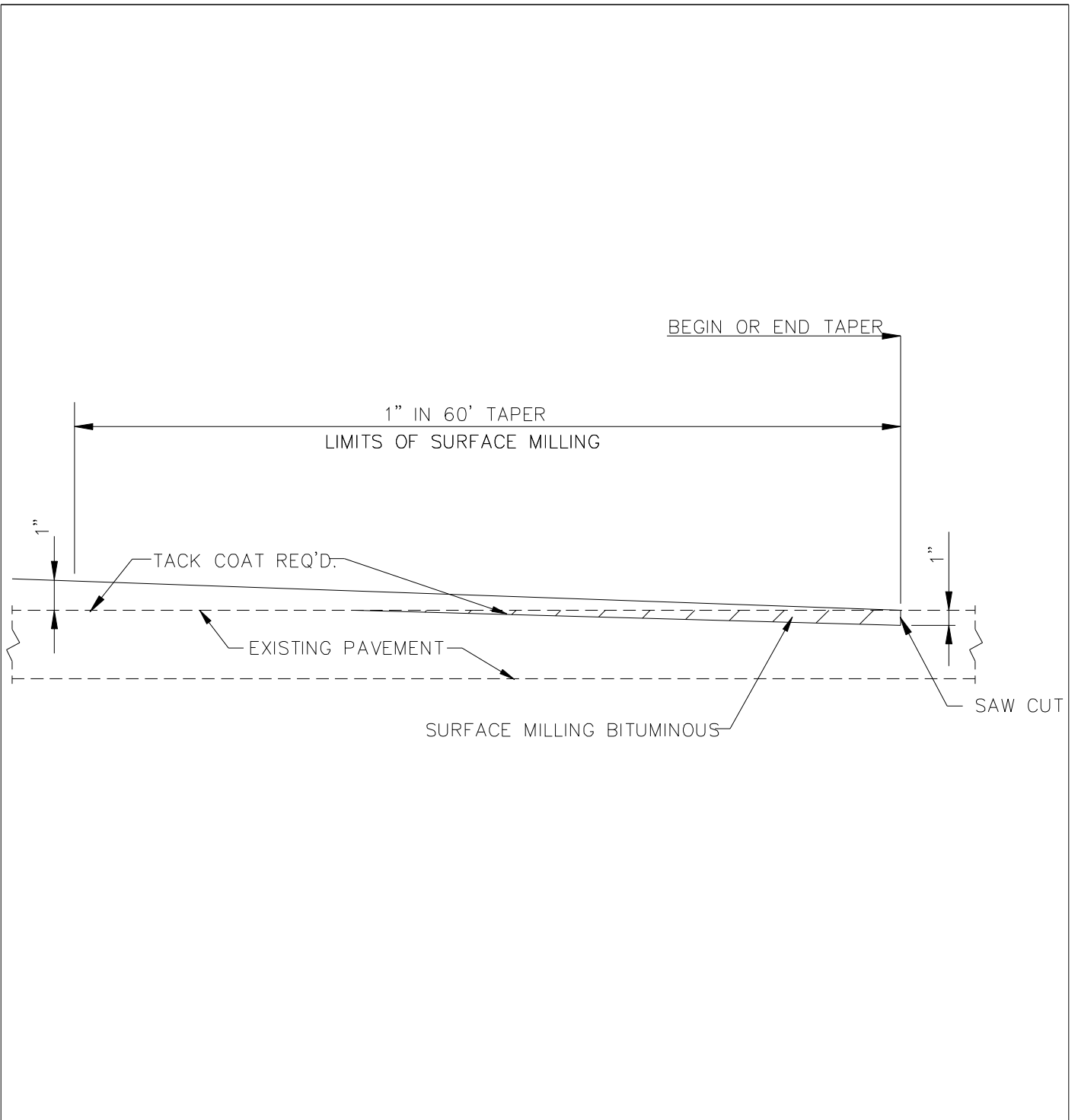
PAVEMENT DETAILS

STONE SHOULDER/STONE DRIVEWAY REPAIR

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. ST-8



CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



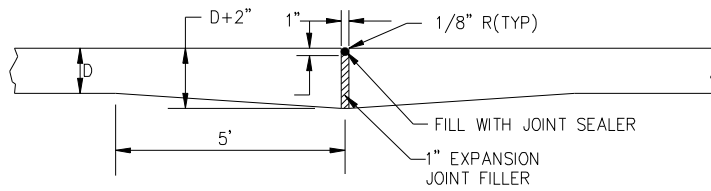
PAVEMENT DETAILS

PAVEMENT OVERLAY, ASPHALT BUTT JOINT DETAIL

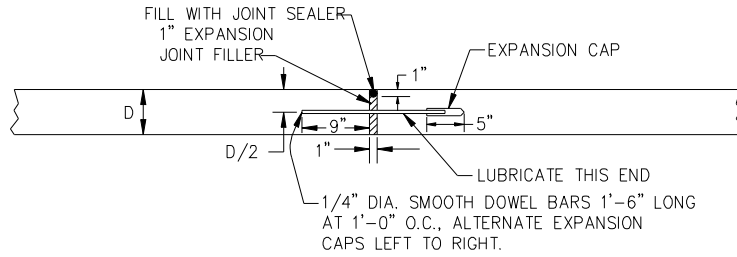
SCALE:
NONE

DATE: APRIL 2007

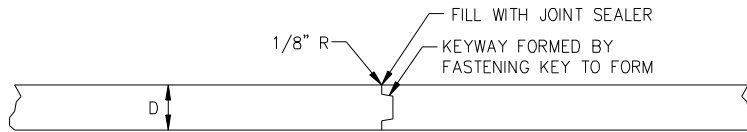
DWG. NO. ST-9



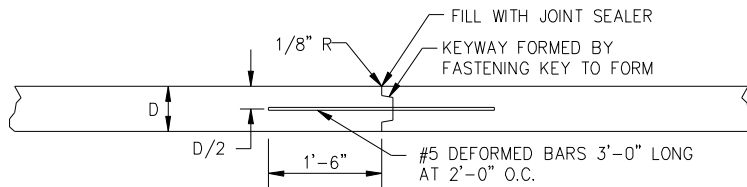
1" EXPANSION JOINT



1" EXPANSION JOINT WITH LOAD TRANSFER



KEYWAY JOINT



TIED TRANSVERSE CONSTRUCTION JOINT

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



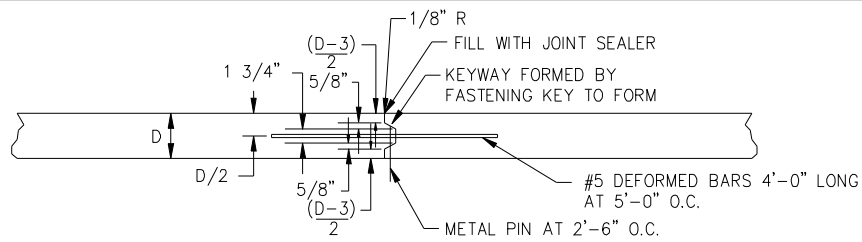
PAVEMENT DETAILS

CONCRETE PAVEMENT JOINT DETAILS

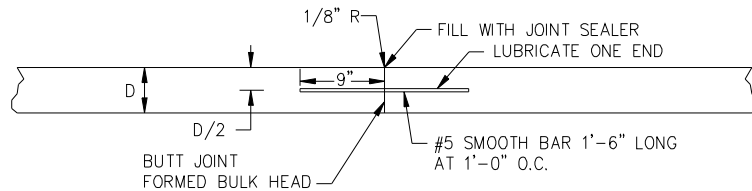
SCALE:
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DATE: APRIL 2007

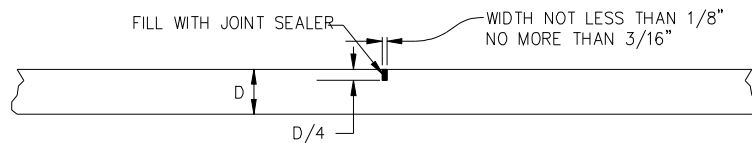
DWG. NO. ST-10



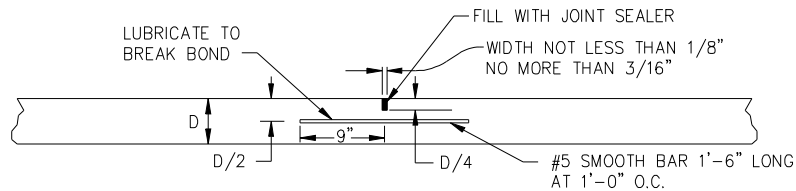
LONGITUDINAL CONSTRUCTION JOINT



TRANSVERSE CONSTRUCTION JOINT



CONTRACTION JOINT



TYPE D-1 CONTRACTION JOINT

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



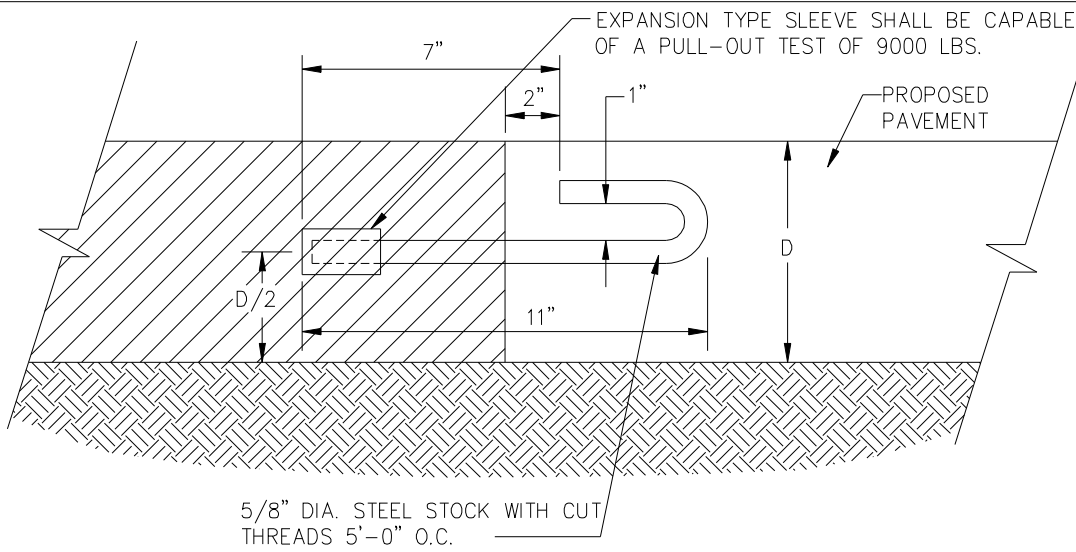
PAVEMENT DETAILS

CONCRETE PAVEMENT JOINT DETAILS

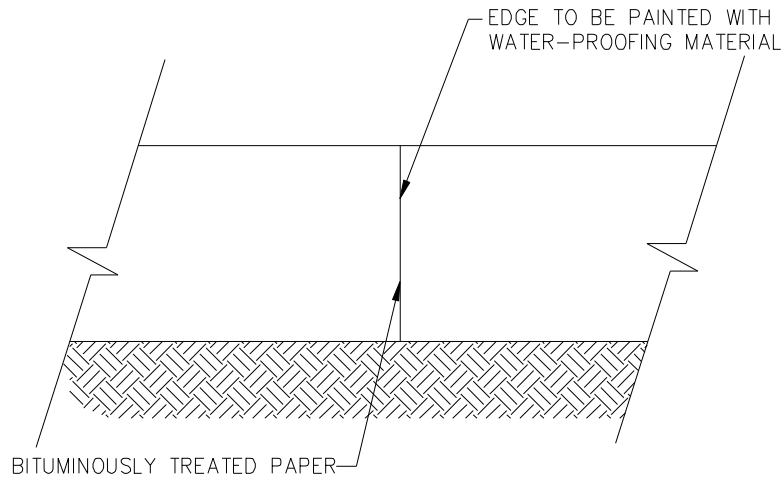
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. ST-11



ANCHOR BOLT JOINT



BUTT JOINT

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



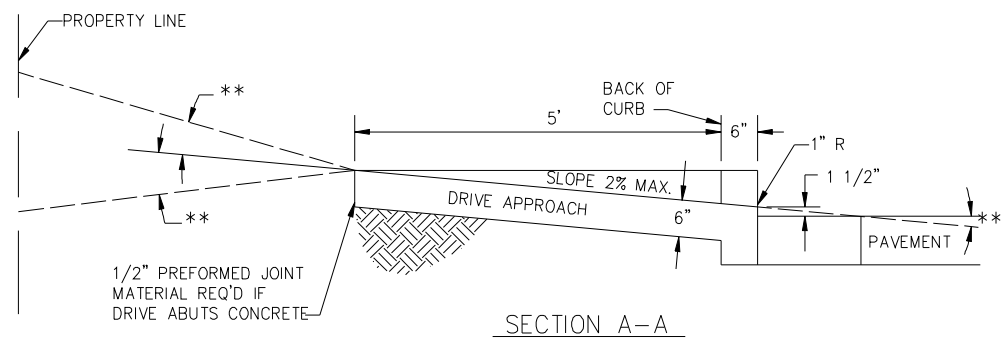
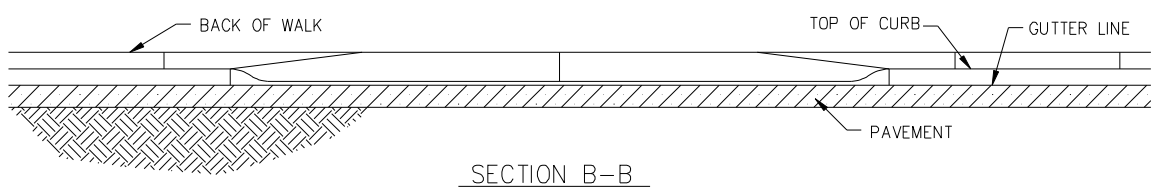
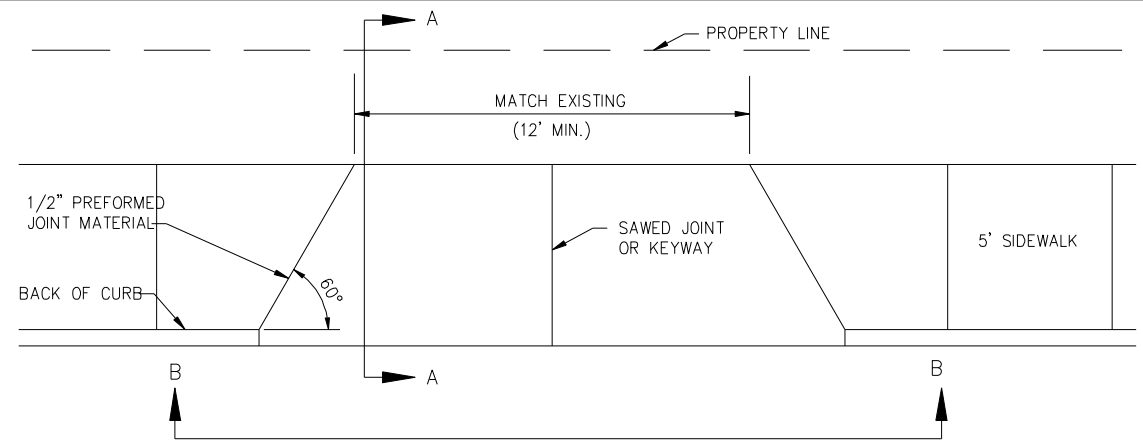
PAVEMENT DETAILS

JOINT DETAILS

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. ST-12



NOTE:
 ** THE MAXIMUM ALGEBRAIC DIFFERENCE IN GRADES FOR ANY 10 FOOT INTERVAL SHALL NOT EXCEED 8% FOR CREST VERTICAL CURVES NOR 12% FOR SAG VERTICAL CURVES.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



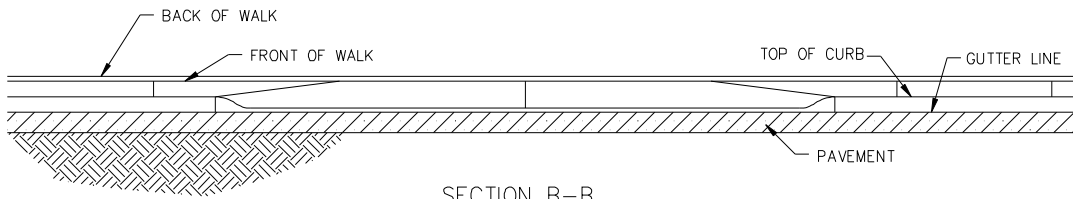
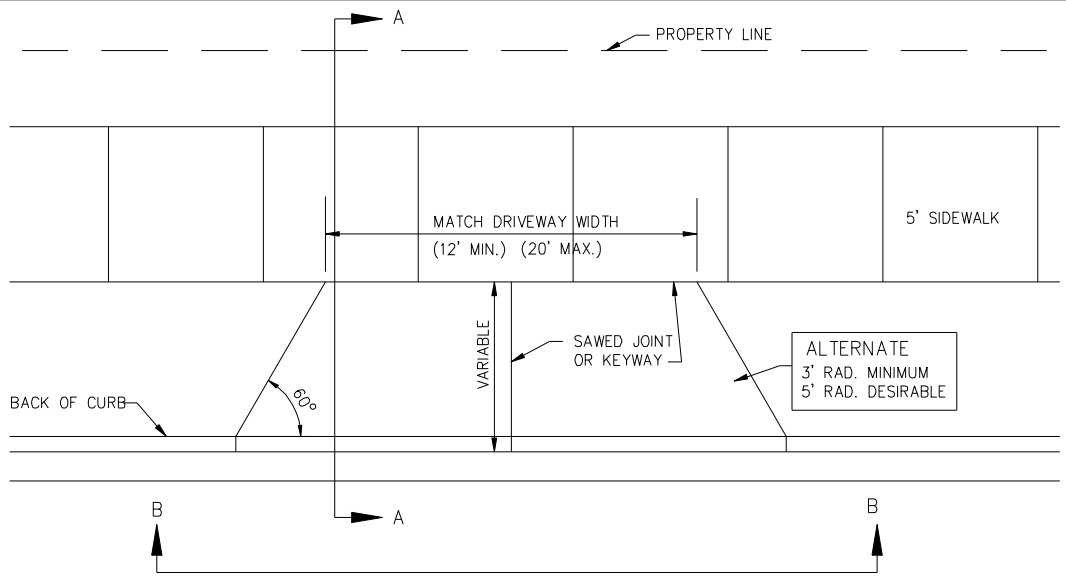
PAVEMENT DETAILS

RESIDENTIAL DRIVE APPROACH (NO UTILITY STRIP)

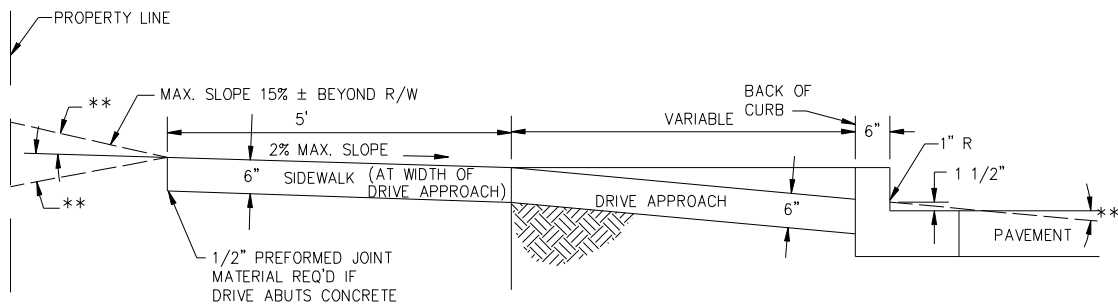
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. ST-13



SECTION B-B



SECTION A-A

* - AS SHOWN ON CONSTRUCTION PLANS

NOTE:
** THE MAXIMUM ALGEBRAIC DIFFERENCE IN GRADES FOR ANY 10 FOOT INTERVAL SHALL NOT EXCEED 8% FOR CREST VERTICAL CURVES NOR 12% FOR SAG VERTICAL CURVES.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



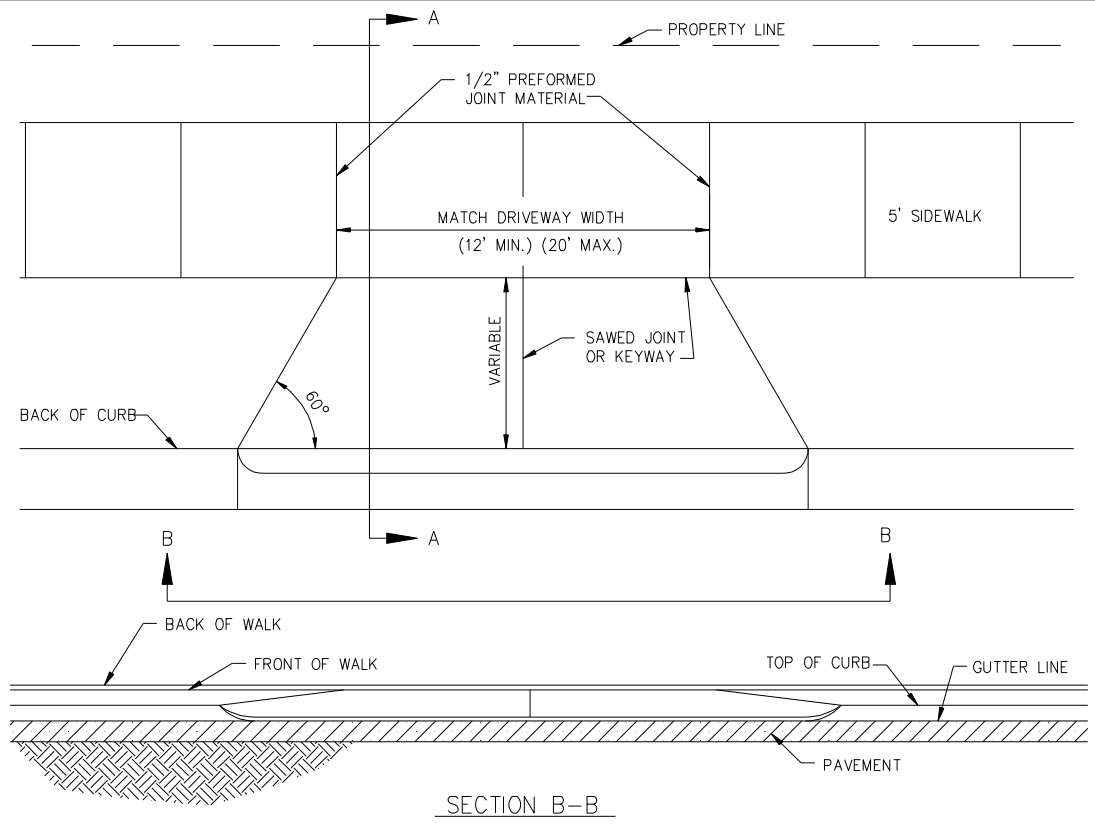
PAVEMENT DETAILS

RESIDENTIAL DRIVE APPROACH (6" X 6" CURB)

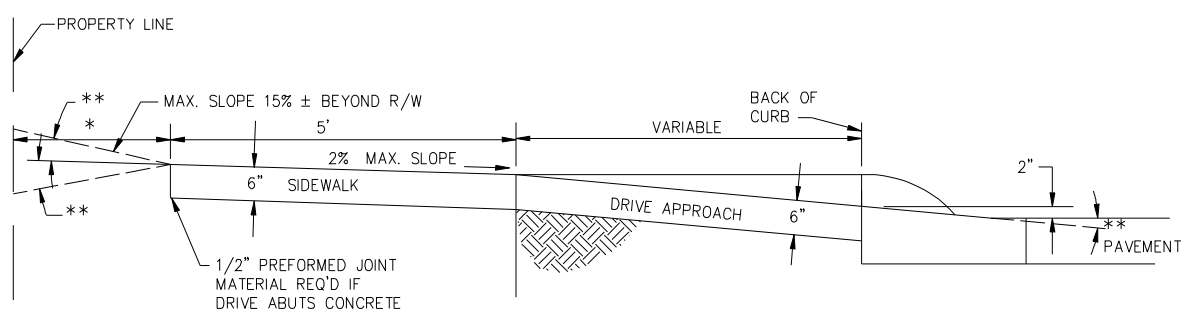
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. ST-14



SECTION B-B



SECTION A-A

* - AS SHOWN ON CONSTRUCTION PLANS

NOTE:
 ** THE MAXIMUM ALGEBRAIC DIFFERENCE IN GRADES FOR ANY 10 FOOT INTERVAL SHALL NOT EXCEED 8% FOR CREST VERTICAL CURVES NOR 12% FOR SAG VERTICAL CURVES.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



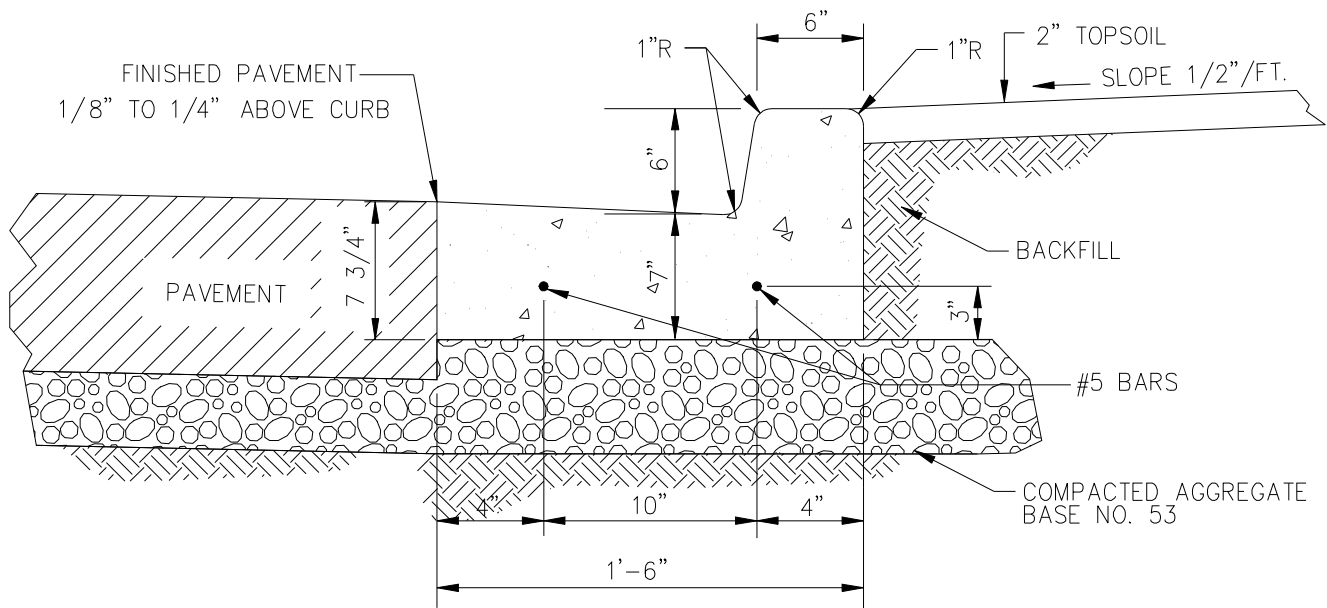
PAVEMENT DETAILS

RESIDENTIAL DRIVE APPROACH (ROLLED CURB)

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. ST-15



NO. 5 REBARS, 10' LONG CENTERED OVER UTILITY TRENCHES AND 2 NO. 5 DOWEL BARS AT EXPANSION JOINTS EVERY 60'. SAW CONSTRUCTION JOINTS EVERY 15', 3" DEPTH.

EXTEND COMPACTED AGGREGATE BASE COURSE TO PROVIDE A MINIMUM 6.5" LAYER OF STONE UNDER THE CURB. EXTEND COMPACTED AGGREGATE A MINIMUM OF 6" BEYOND BACK OF CURB.

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



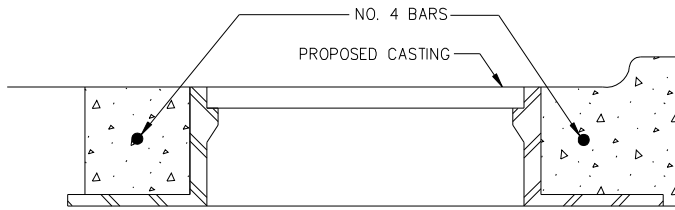
CURB, SIDEWALK & RAMP DETAILS

6" X 6" CONCRETE CURB & GUTTER

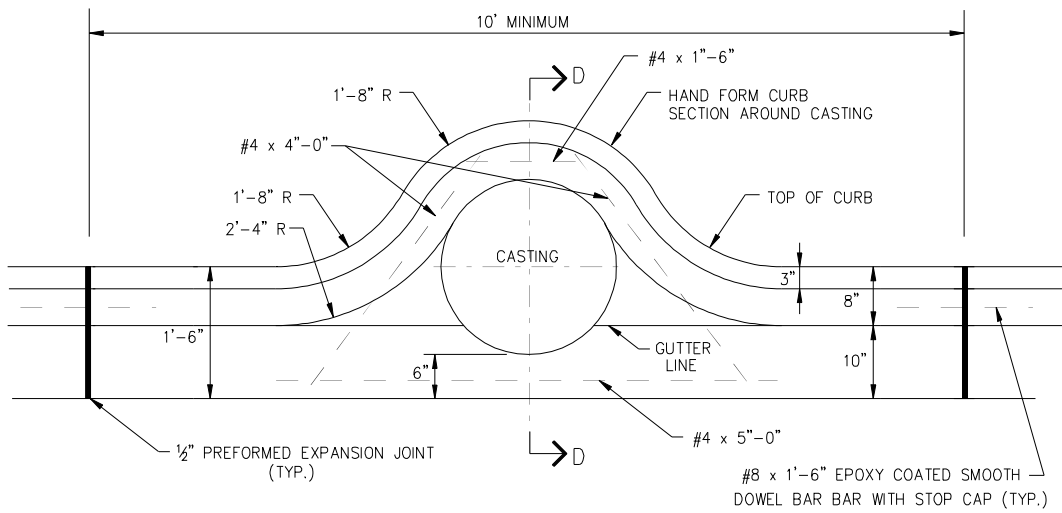
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. CS-2



SECTION D-D



DETAIL OF CURB AND GUTTER AT STRUCTURE

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



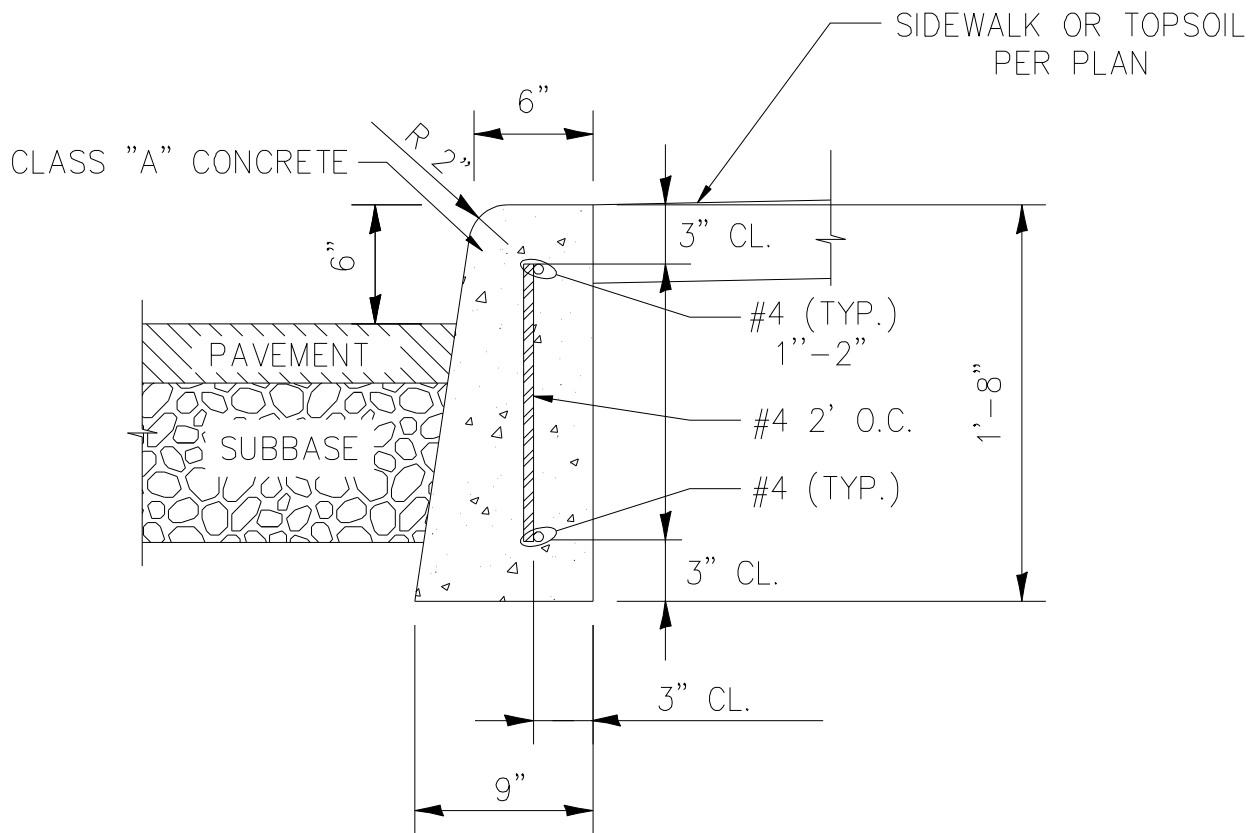
CURB, SIDEWALK AND RAMP DETAILS

CURB AND GUTTER AT STRUCTURE

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. CS-3



CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



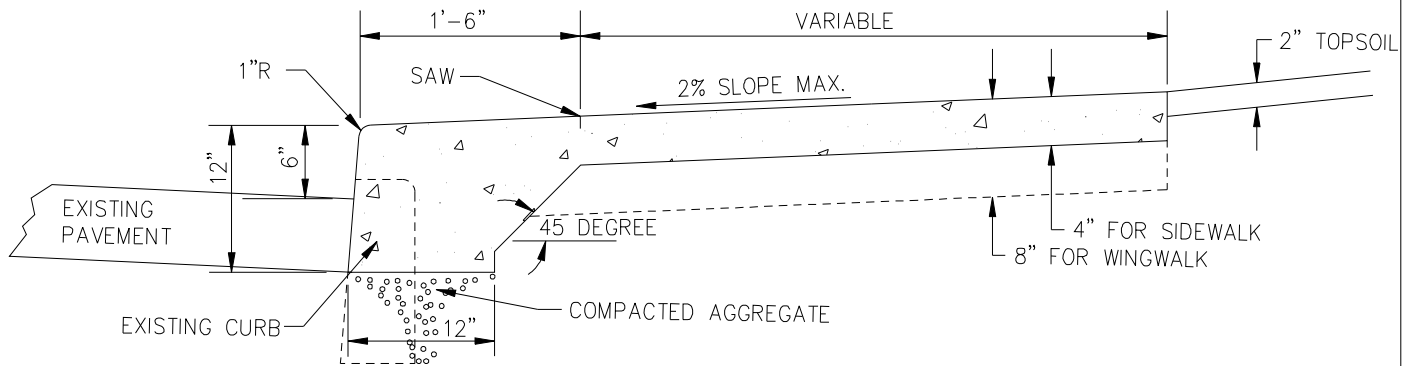
CURB, SIDEWALK & RAMP DETAILS

6" BARRIER CURB

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. CS-4



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



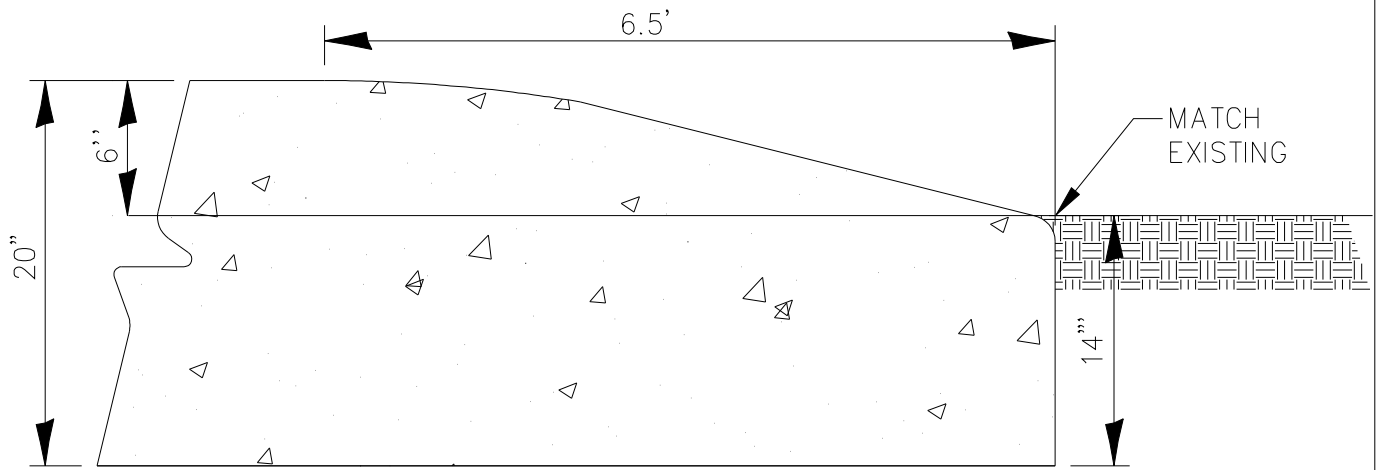
CURB, SIDEWALK & RAMP DETAILS

CURBFACE WALK & WINGWALK

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. CS-5



1. CURB SHALL MEET STANDARDS CS-4.
2. CURB SHALL REDUCE FROM 6" OF EXPOSED CURB TO 0" OF EXPOSED CURB OVER 6.5 LINEAL FEET OF CURB.

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



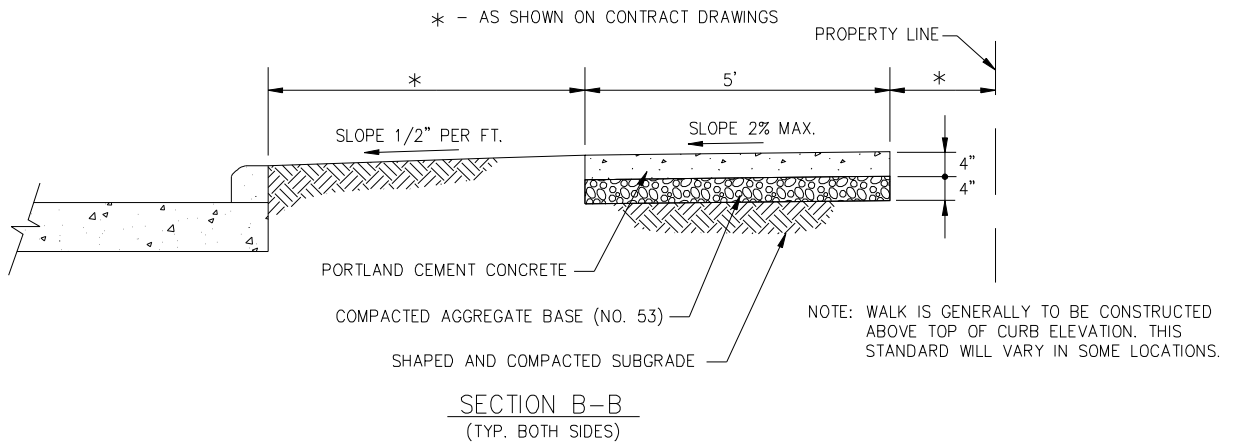
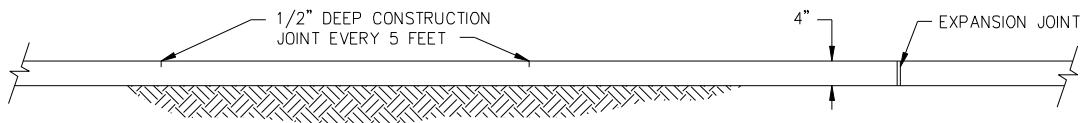
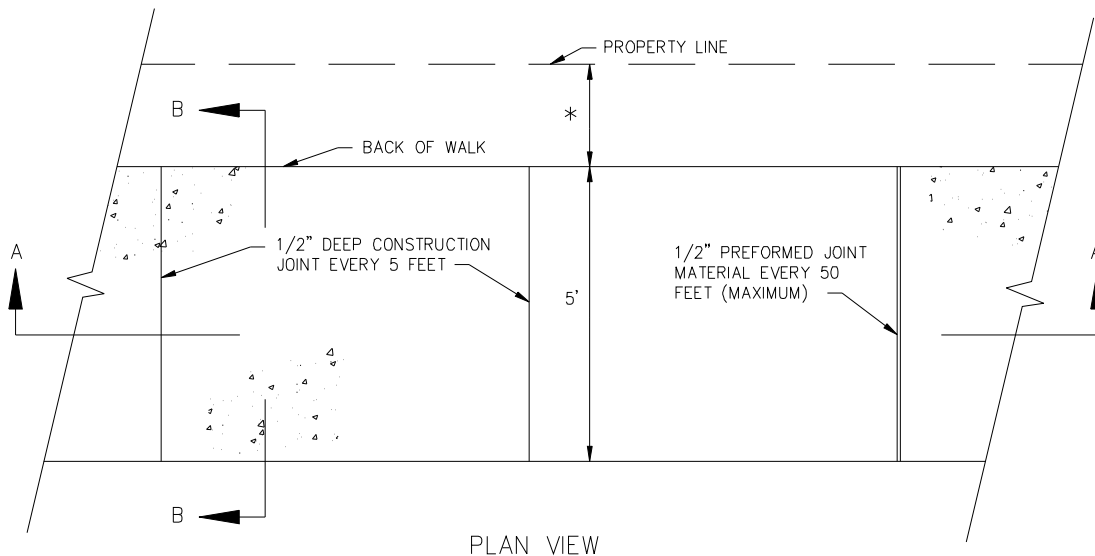
CURB, SIDEWALK & RAMP DETAILS

20" CONCRETE CURB TERMINUS TAPER

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. CS-6



CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



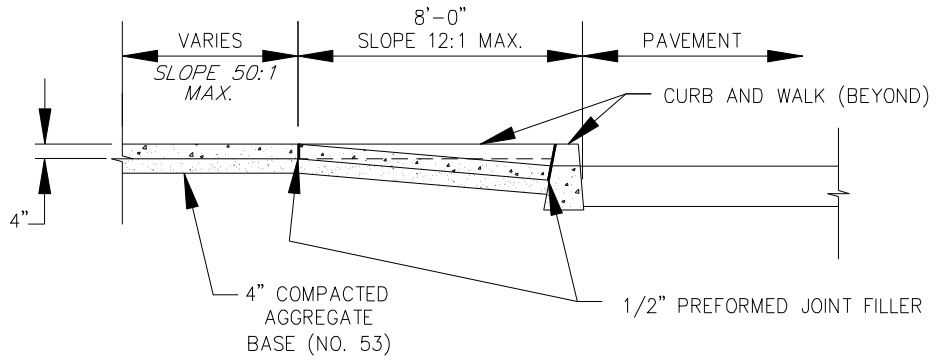
CURB, SIDEWALK & RAMP DETAILS

CONCRETE SIDEWALK

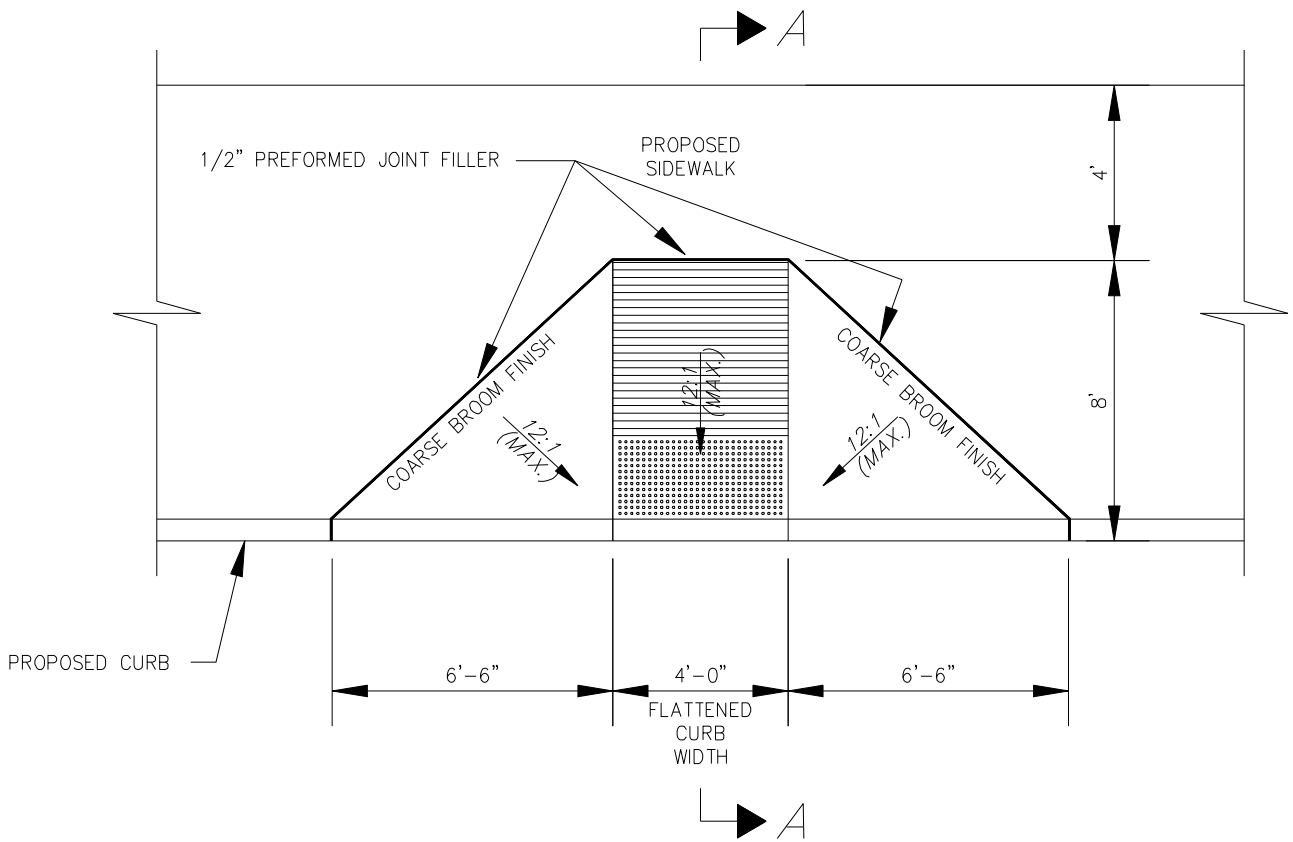
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. CS-7



SECTION A-A
NOT TO SCALE



FOR SECTION A-A, ALSO SEE DWG. NO. CS-14

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



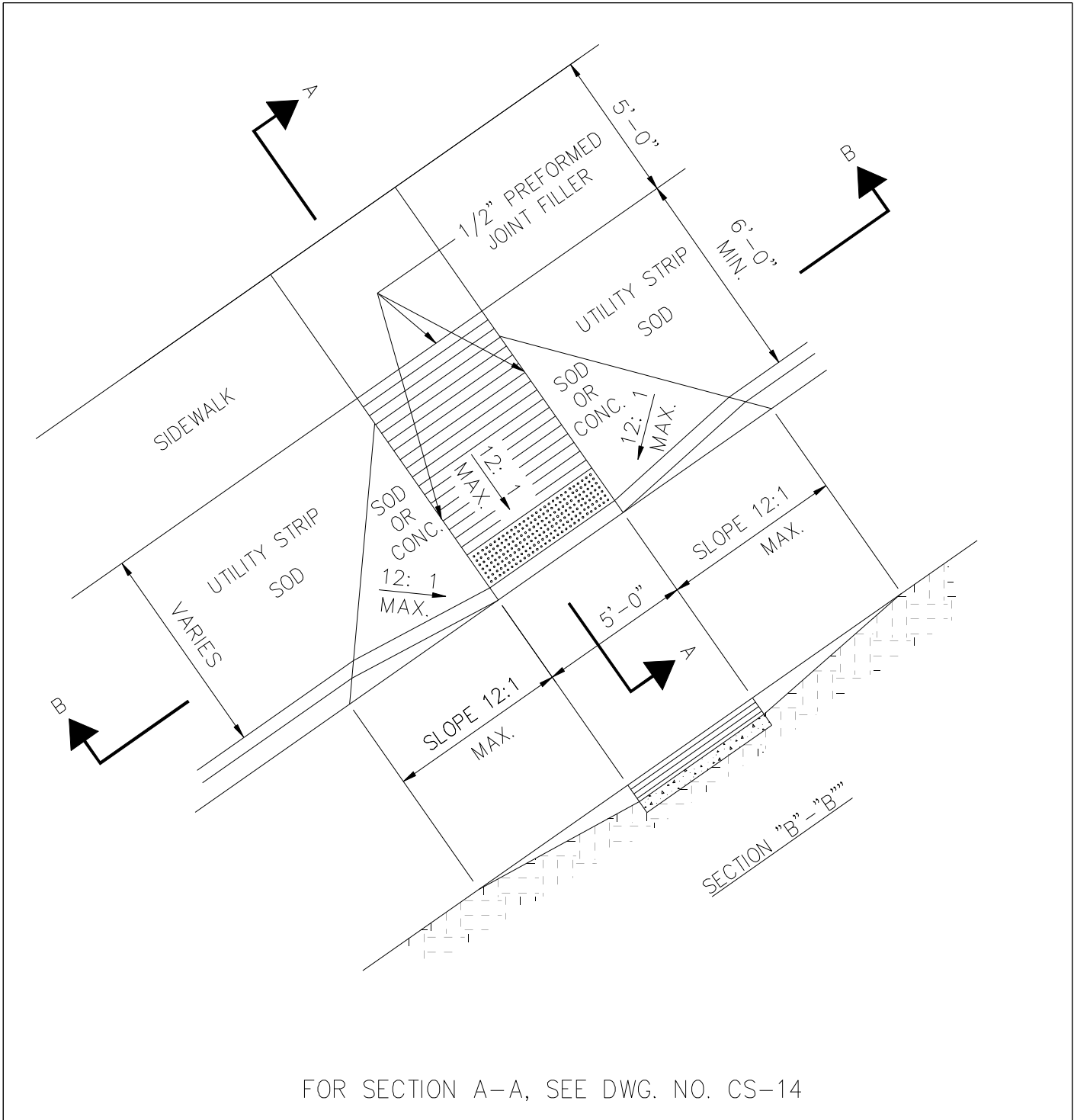
CURB, SIDEWALK & RAMP DETAILS

CURB RAMP, TYPE "A"

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. CS-8



FOR SECTION A-A, SEE DWG. NO. CS-14

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



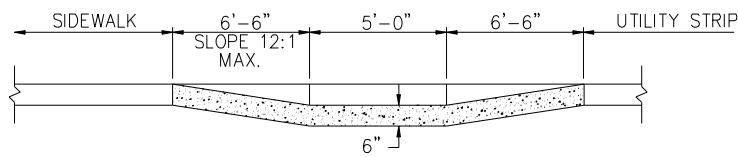
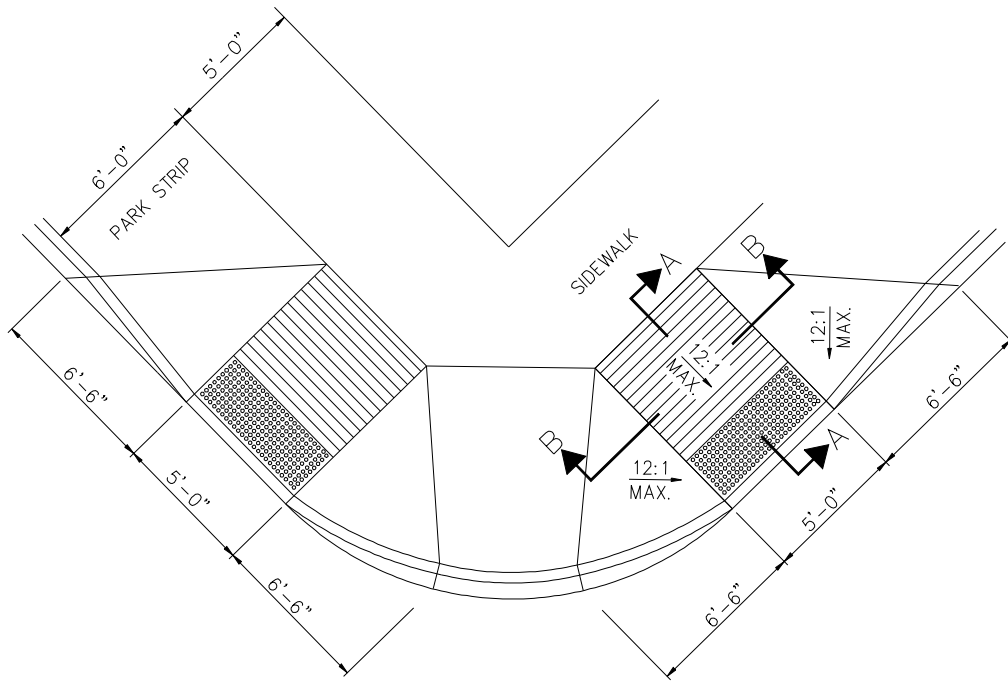
CURB, SIDEWALK & RAMP DETAILS

CURB RAMP (TYPE "C")

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. CS-9



NOTE: FOR SECTION A-A, SEE DWG. NO. CS-14

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



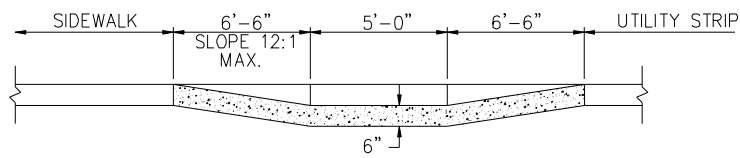
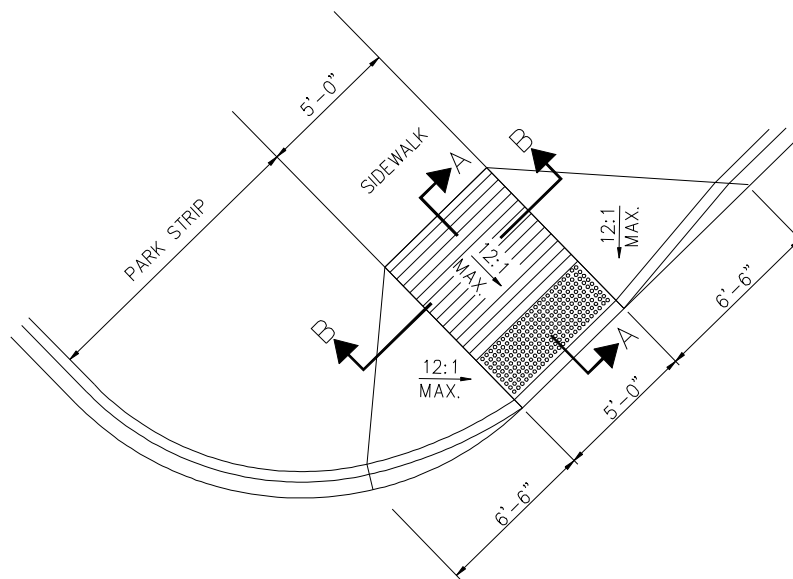
CURB, SIDEWALK & RAMP DETAILS

CURB RAMP (TYPE D)

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. CS-10



NOTE: FOR SECTION A-A, SEE DWG. NO. CS-14

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



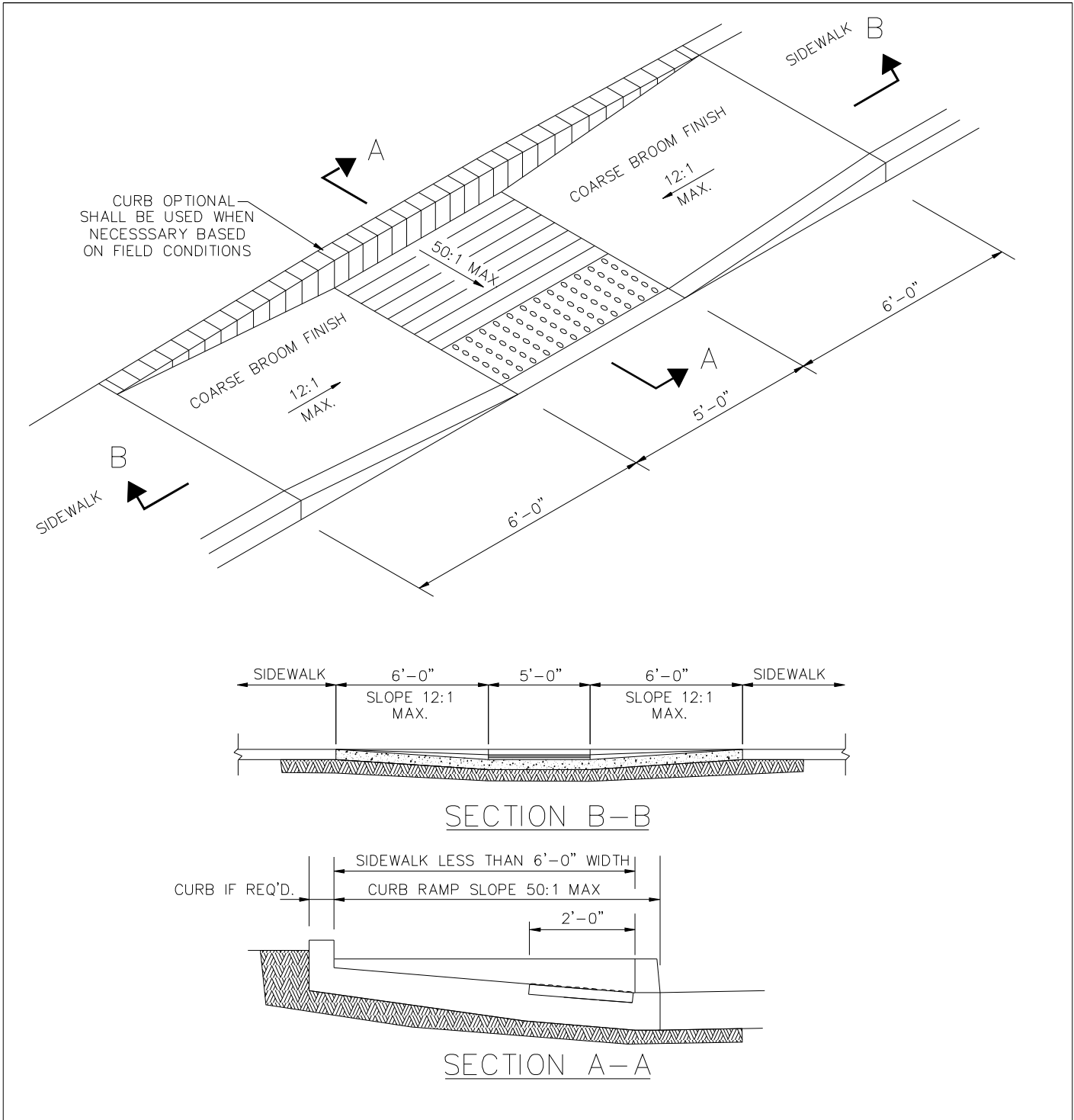
CURB, SIDEWALK & RAMP DETAILS

CURB RAMP (TYPE E)

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. CS-11



CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



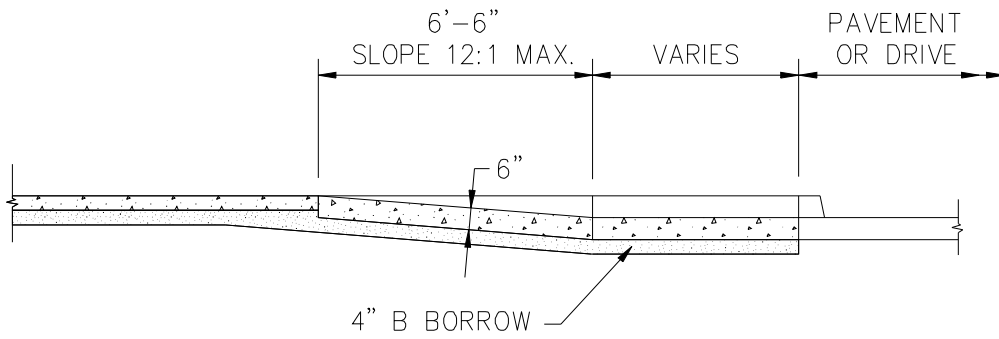
CURB, SIDEWALK & RAMP DETAILS

CURB RAMP (TYPE "F")

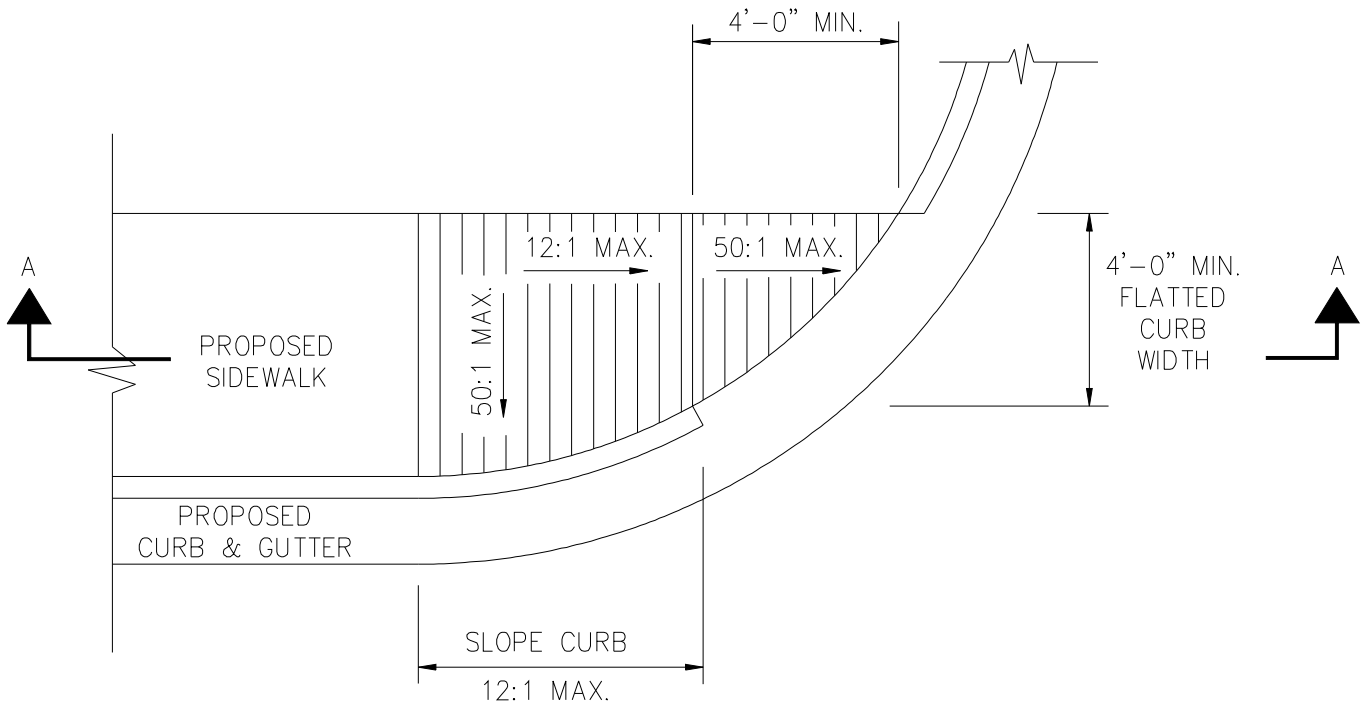
SCALE:
NONE

DATE: APRIL 2007

DWG. NO. CS-12



SECTION "B"- "B"
NOT TO SCALE



CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



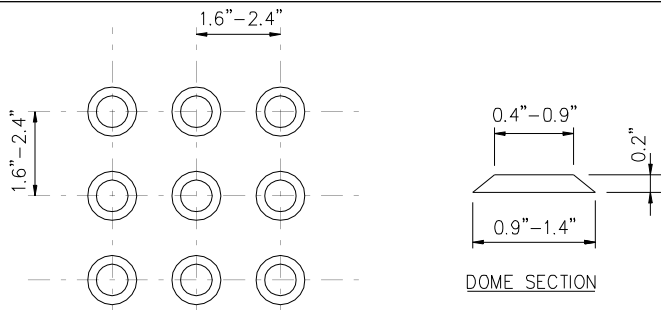
CURB, SIDEWALK & RAMP DETAILS

CURB RAMP (TYPE "G")

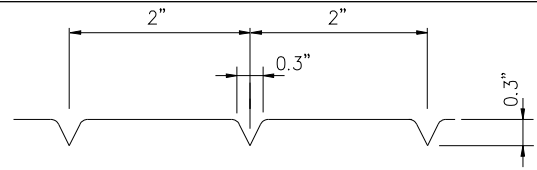
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DATE: APRIL 2007

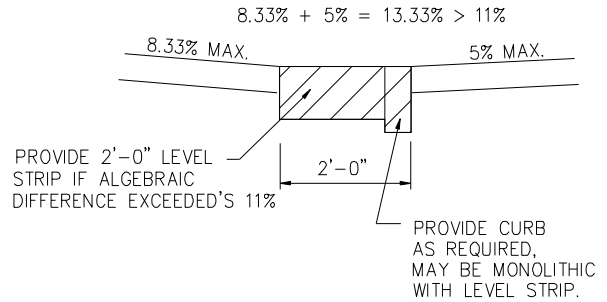
DWG. NO. CS-13



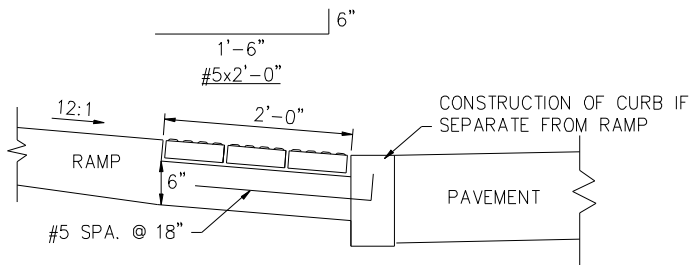
TRUNCATED DOMES USED IN DETECTABLE WARNINGS



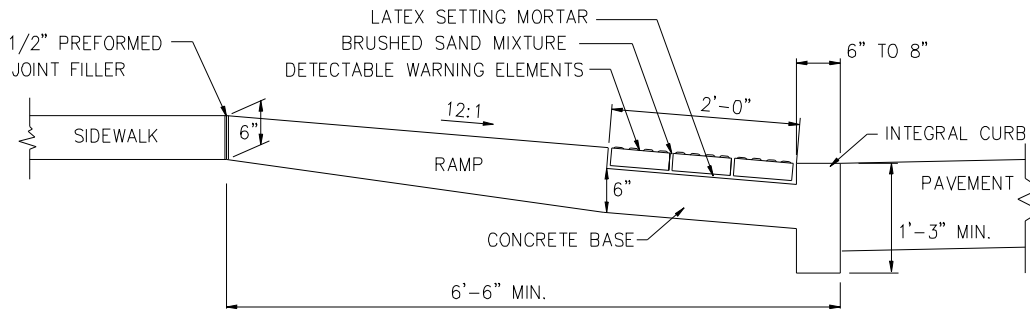
RAMP GROOVE DETAIL



CHANGE OF GRADE



ALTERNATE CURB CONSTRUCTION



SECTION A-A

GENERAL NOTES

- ① THE BOTTOM EDGE OF THE CURB RAMP SHALL BE FLUSH WITH THE EDGE OF THE ADJACENT PAVEMENT AND GUTTER LINE.
- ② LANDING AREAS AT THE TOP OF CURB RAMPS SHALL HAVE MAXIMUM CROSS SLOPE OF 50:1 IN ANY DIRECTION. WHEN SITE INFEASIBILITY PRECLUDES A LANDING SLOPE OF 50:1 IN ANY DIRECTION, THE SLOPE PERPENDICULAR TO THE CURB FACE SHALL NOT EXCEED 50:1.
- ③ ALGEBRAIC DEFERENCE IN GRADE BETWEEN THE BASE OF CURB AND THE GUTTER SHALL BE LIMITED TO LESS THAN 11%. IF THIS IS NOT PRACTICAL, A 2'-0" WIDE LEVEL STRIP SHALL BE PROVIDED. SEE DETAIL SKETCH.
- ④ MINIMUM RECOMMENDED WIDTH OF CURB RAMP IS 5'-0".

CEDAR LAKE DEVELOPMENT STANDARDS MANUAL



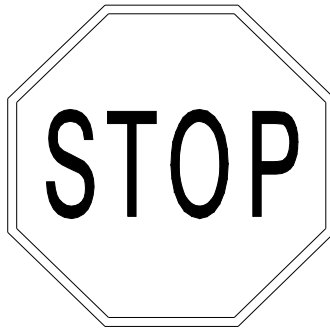
CURB, SIDEWALK & RAMP DETAILS

CURB RAMP DETAILS

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. CS-14



R1-1 (30" x 30")

THE STOP SIGN SHALL BE A WHITE LEGEND AND BORDER ON A RED BACKGROUND.

GENERAL NOTES:

1. ALL REGULATORY AND STREET NAME SIGNS SHALL BE RETROREFLECTIVE.
2. ALL SIGN SIZE, GENERAL DESIGN AND PLACEMENT GUIDELINES ARE TO BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), CURRENT EDITION.
3. OTHER TRAFFIC REGULATORY AND INFORMATIONAL SIGNS MAY BE REQUIRED.
4. SUBMITTED STREET DRAWINGS WILL BE REVIEWED AND MARKED BY THE TOWN TRAFFIC ENGINEER
5. ALL SIGNS MUST BE PLACED IN THE PROPER LOCATIONS AT THE TIME OF PLACEMENT OF THE INTERMEDIATE COURSE OF ASPHALT AND PRIOR TO ANY VEHICULAR USE. STREETS WITHOUT PROPER SIGNAGE WILL NOT BE ACCEPTED IN FINAL INSPECTION.
6. STREET SIGN SHOP DRAWINGS SHALL BE SUBMITTED AND REVIEWED BY THE TOWN.

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



TRAFFIC SIGN DETAILS

STOP SIGN

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. TS-1



TO BE AFFIXED DIRECTLY BELOW SPEED LIMIT SIGN ON SAME POST.



R2-1(20*) 24"X30"
* = SPEED IN M.P.H.

ALL STREETS THIS NEIGHBORHOOD
PLAQUE 10"X24"

SPEED LIMIT SIGN AND ALL STREETS PLAQUE TO BE PLACED WITHIN 200 FEET OF EVERY SUBDIVION ENTRANCE.

THE SPEED LIMIT SIGN AND ALL STREETS PLAQUE SHALL BE A BLACK LEGEND AND BORDER ON A WHITE BACKGROUND.

GENERAL NOTES:

1. ALL REGULATORY AND STREET NAME SIGNS SHALL BE RETROREFLECTIVE.
2. ALL SIGN SIZE, GENERAL DESIGN AND PLACEMENT GUIDELINES ARE TO BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), CURRENT EDITION.
3. OTHER TRAFFIC REGULATORY AND INFORMATIONAL SIGNS MAY BE REQUIRED.
4. SUBMITTED STREET DRAWINGS WILL BE REVIEWED AND MARKED BY THE TOWN TRAFFIC ENGINEER
5. ALL SIGNS MUST BE PLACED IN THE PROPER LOCATIONS AT THE TIME OF PLACEMENT OF THE INTERMEDIATE COURSE OF ASPHALT AND PRIOR TO ANY VEHICULAR USE. STREETS WITHOUT PROPER SIGNAGE WILL NOT BE ACCEPTED IN FINAL INSPECTION.
6. STREET SIGN SHOP DRAWINGS SHALL BE SUBMITTED AND REVIEWED BY THE TOWN.

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



TRAFFIC SIGN DETAILS

SPEED LIMIT SIGN

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. TS-2



D3-1

TO BE POSTED AT ALL INTERSECTIONS WITH THE STREET NAME AND INTERSECTING STREET NAME MOUNTED WITH WITH THEIR FACES PARALLEL TO THE STREETS THEY NAME.

LETTERING HEIGHT TO BE A MINIMUM OF 4 INCHES HIGH. SUPPLEMENTARY LETTERING TO INDICATE THE SECTION (SUCH AS E) AND THE TYPE OF STREET (SUCH AS STREET OR AVENUE) TO BE A MINIMUM OF 3 INCHES HIGH. CONVENTIONAL ABBREVIATIONS AS FOUND IN THE MUTCD MAY BE USED EXCEPT FOR THE STREET NAME ITSELF.

THE STREET NAME SIGN SHALL BE A WHITE LEGEND ON A GREEN BACKGROUND WITH A WHITE BORDER.

GENERAL NOTES:

- 1. ALL REGULATORY AND STREET NAME SIGNS SHALL BE RETROREFLECTIVE.
- 2. ALL SIGN SIZE, GENERAL DESIGN AND PLACEMENT GUIDELINES ARE TO BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), CURRENT EDITION.
- 3. OTHER TRAFFIC REGULATORY AND INFORMATIONAL SIGNS MAY BE REQUIRED.
- 4. SUBMITTED STREET DRAWINGS WILL BE REVIEWED AND MARKED BY THE TOWN TRAFFIC ENGINEER
- 5. ALL SIGNS MUST BE PLACED IN THE PROPER LOCATIONS AT THE TIME OF PLACEMENT OF THE INTERMEDIATE COURSE OF ASPHALT AND PRIOR TO ANY VEHICULAR USE. STREETS WITHOUT PROPER SIGNAGE WILL NOT BE ACCEPTED IN FINAL INSPECTION.
- 6. STREET SIGN SHOP DRAWINGS SHALL BE SUBMITTED AND REVIEWED BY THE TOWN.

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



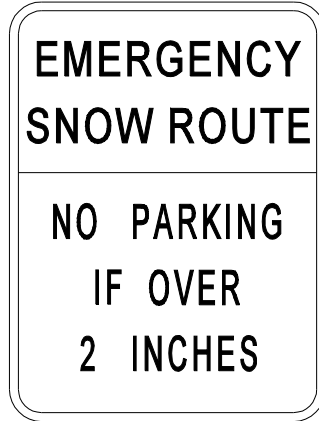
TRAFFIC SIGN DETAILS

STREET NAME SIGNS

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. TS-3



R7-203 (24" X 30")

TO BE POSTED AT ALL SUBDIVISION ENTRANCES.

THE NO PARKING SIGN SHALL BE A RED LEGEND AND BORDER ON A WHITE BACKGROUND WITH THE EMERGENCY SNOW ROUTE PORTION REVERSED TO BE A WHITE LEGEND ON A RED BACKGROUND.

GENERAL NOTES:

1. ALL REGULATORY AND STREET NAME SIGNS SHALL BE RETROREFLECTIVE.
2. ALL SIGN SIZE, GENERAL DESIGN AND PLACEMENT GUIDELINES ARE TO BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), CURRENT EDITION.
3. OTHER TRAFFIC REGULATORY AND INFORMATIONAL SIGNS MAY BE REQUIRED.
4. SUBMITTED STREET DRAWINGS WILL BE REVIEWED AND MARKED BY THE TOWN TRAFFIC ENGINEER
5. ALL SIGNS MUST BE PLACED IN THE PROPER LOCATIONS AT THE TIME OF PLACEMENT OF THE INTERMEDIATE COURSE OF ASPHALT AND PRIOR TO ANY VEHICULAR USE. STREETS WITHOUT PROPER SIGNAGE WILL NOT BE ACCEPTED IN FINAL INSPECTION.
6. STREET SIGN SHOP DRAWINGS SHALL BE SUBMITTED AND REVIEWED BY THE TOWN.

CEDAR LAKE
DEVELOPMENT STANDARDS MANUAL



TRAFFIC SIGN DETAILS

EMERGENCY SNOW ROUTE SIGN

SCALE:
NONE

DATE: APRIL 2007

DWG. NO. TS-4