RIVER FALLS MUNICIPAL UTILITIES

ENGINEERING STANDARDS

For Utility Construction in Conjunction with Development of Subdivisions, Commercial, and Industrial Property

REVISED
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I. General

A. Introduction

River Falls Municipal Utilities, a community-owned utility, provides electric, water, and wastewater utility services to the City of River Falls. We have provided electric service since 1900, water service since 1894, and wastewater service since 1930. Today, River Falls Municipal Utilities offers its residents some of the lowest electric rates in northwestern Wisconsin and provides its customers with clean, high-quality water. We also provide sanitary sewer service and wastewater treatment for City of River Falls residents.

The appointed members of the Utility Commission oversee the operation of electric, sewer and water service provided by River Falls Municipal Utilities The full time Utility General Manager serves as advisor to the commission.

B. Purpose

The purpose of this document is to standardize work performed by developers of subdivisions, commercial and industrial properties. These standards include requirements, materials, and standards that shall be incorporated into the preparation of plans and specifications for water and sanitary sewer utilities within the River Falls Municipal Utilities service area.

Compliance with these standards will help provide quality products and assure uniform performance of utilities.

River Falls Municipal Utilities reserves the right to modify these standards on a case by case basis.

C. Engineering Requirements

All plans and specifications for construction of water and sanitary sewer utilities shall be prepared by or under the direction of a Professional Engineer licensed under the laws of the State of Wisconsin. Where applicable, the Wisconsin Department of Natural Resources or other state and/or federal regulatory agency shall review and approve plans and specifications. The Engineer shall be responsible for securing all applicable regulatory approvals and permits prior to construction and providing proof of such approvals and permits to River Falls Municipal Utilities.

The Engineer shall be responsible for the accuracy and completeness of the plans and specifications and the thoroughness and quality of field inspections. The Engineer shall also be familiar with these standards and the reference documents listed herein.

The engineering standards presented herein cover water and sanitary sewer utilities, services provided by River Falls Municipal Utilities. The city of River Falls Engineering Department is responsible for other public works facilities, including

streets and storm water conveyance. Additional requirements for subdivisions of land are found in the City of River Falls Municipal Code.

D. Contractor Requirements

The Contractor shall guarantee all materials and equipment furnished and all work performed for a period of eighteen months from the date of final acceptance. The Contractor must warrant and guarantee for a period of eighteen months from the date of final acceptance that the completed system is free from all defects due to faulty materials or workmanship and the Contractor shall promptly make such corrections as necessary by reason of such defects including the repair of any damage to the parts of the system resulting from such defects.

River Falls Municipal Utilities will give notice of observed defects with reasonable promptness. In the event the Contractor should fail to make such repairs, adjustments or other work that may be made necessary by such defects, River Falls Municipal Utilities may do so and charge the Contractor the cost thereby incurred. The performance bond shall remain in full force and effect through the guarantee period.

E. Definitions

Terms used in these standards have the following definitions.

1. Utility: River Falls Municipal Utility (RFMU)

2. Contractor: A company or individual performing construction activities for public infrastructure facilities.

3. Developer: A company, individual, or other entity that develops property with the River Falls Municipal Utilities service area that is served by public works utilities.

4. Engineer: A Professional Engineer licensed in the State of Wisconsin.

5. Public utilities: Facilities for conveyance of sanitary sewage and potable water that are constructed within the right-of-way or within public easements for the use of the general public. Within these standards, public utilities are commonly water main and sanitary sewer main and their appurtenant facilities.

F. Reference Documents

A number of documents have been incorporated by reference into these engineering standards. The following reference documentation shall be the latest edition, including amendments and published updates.

1. Wisconsin Administrative Code
    a. Comm 82 – Design, Construction, Installation, Supervision, Maintenance and Inspection of Plumbing
    b. NR 108 – Requirements for Plans and Specifications Submittal for Reviewable Projects and Operations of Community Water Systems, Sewerage Systems and Industrial Wastewater Facilities
    c. NR 110 – Sewerage Systems
    d. NR 140 – Groundwater Quality
    e. NR 809 – Safe Drinking Water
    f. NR 810 – Requirements for the Operation and Maintenance of Public Water Systems
    g. NR 811 – Design Requirements for Community Water Systems
    h. NR 812 – Well Construction and Pump Installation

2. City of River Falls, WI Municipal Code
    a. Title 13 – Public Services
    b. Title 16 – Subdivision

Specific standards are also referenced in each of the specifications. The following organizations' reference standards are incorporated:

1. ANSI – American National Standards Institute
2. ASTM – American Society for the Testing of Materials
3. AWWA – American Water Works Association

II. Common Work Results for Utilities

A. General Requirements

PART 1 GENERAL

1.01 SUMMARY

A. The Department of Commerce (Comm 82.30 and 82.40) requires a means to locate buried, non-metallic service laterals and protect the exterior access location of the tracer wire with a tracer box.

B. This section includes tracer wire and box requirements for non-metallic service laterals.

1.02 REFERENCES

A. Comm 82.

1.03 SUBMITTALS

A. Submit product data and diagram of system prior to construction.

PART 2 PRODUCTS

2.01 TRACER WIRE

A. Wire shall be a minimum of 18 gauge, insulated, single-conductor copper wire (Comm 82.30.11(h)1(b).

B. Tracer wire insulation color for non-metallic sewer pipe shall be green (Comm 82.30.11(h)1(h).

C. Tracer wire insulation color for non-metallic, potable water pipe shall be blue (Comm 82.40.8(k)2.

2.02 TRACER BOX

A. The tracer box shall have a metal cover to aid in locating.

B. The box cover does not require a label.
   1. If labeled, the box cover shall say "Tracer Wire."
   2. The tracer box shall not be labeled "Electric."

C. Tracer boxes shall be by:
   1. Bingham & Taylor – 2 ½-inch boxes.
   2. Valvco Tracer Wire Access Box.
   3. Copperhead Tracer Wire Box.
   4. Approved equal.

2.03 GROUNDING CLAMP

A. The grounding clamp for the copper stub shall be bronze or stainless steel to prevent corrosion.

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Water:
   1. The water tracer wire shall start in a tracer box located at grade, then be brought down to a grounding clamp which must be attached to the copper service stub.
   2. From the grounding clamp, the tracer wire shall run above and parallel to the plastic water pipe to the house foundation and grounded.

B. Sewer:
   1. The sewer tracer wire shall start in a tracer box located at grade (a common box may be used for water and sewer), then be brought down to the sewer lateral.
   2. From there, the tracer wire shall run above and parallel to the plastic sewer pipe to the house foundation and grounded.
   3. The sewer tracer wire is not attached to the copper service stub.

C. Grounding:
   1. The tracer wire must be attached to an approved grounding conductor (such as copper or copper coated steel) at the point where the pipe enters the footing/foundation.
   2. Each tracer wire requires a separate ground.
   3. The tracer wire is to be attached to the gounding rod with a brass or stainless steel clamp.
   4. The grounding rod shall be a minimum of 2 feet in length.
   5. Rebar will not be accepted as the grounding conductor.
   6. Tracer wire shall not be bonded to the grounding system inside the structure or grounded to the structure's foundation.
   7. Grounding rods shall have a minimum of 2 feet horizontal separation distance to prevent interference during locating operations.

D. Location:
   1. The tracer box shall be installed a minimum of two feet from the curb stop, toward the building.
   2. Tracer wire shall be a minimum of two feet below grade to protect from irrigation installation and landscaping.
   3. Tracer wire length in the tracer box shall be adequate to allow for shift due to frost and for removal of the tracer box cover. A minimum of 1 foot of extra wire shall be provided in the tracer box.
   4. The tracer box shall not be paved over.

E. Miscellaneous:
   1. Tracer wire shall not be looped. When a locating signal is sent down looped lines which are close together, the tracer signal down the wire will be cancelled out by the return signal.
   2. Maintenance, repairs, or adjustments to final grade is not the responsibility of the Utility.

3.02 FIELD QUALITY CONTROL

A. Contractor shall notify Utility staff and/or building inspector to inspect the complete installation including lateral, tracer wire, and appurtenances prior to backfilling.

B. The contractor shall demonstrate that the system is functional prior to acceptance by the Utility.

END OF SECTION

B. Excavation, Backfilling and Compacting (31 23 30)

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Trenching for sanitary sewers, water main, and appurtenances, including excavation, backfill, and compaction.
2. Dewatering, protection of excavation and site, existing utilities and other obstructions, and excesses and shortages of backfill.
3. Excavating, filling, stockpiling, borrow, rough and finish grading, and placement of topsoil.
4. Control of surface drainage.

1.02 REFERENCES

A. ASTM:
1. C136 - Standard Method for Sieve Analysis of Fine and Course Aggregate
2. C331 - Standard Specification for Lightweight Aggregate for Concrete Masonry Units
3. D420 - Standard Guide for Investigating and Sampling Soil and Rock
4. D698 - Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 5.5 pound Hammer and 12 inch Drop
5. D1682 - Standard Test Methods for Breaking Load and Elongation of Textile Fabrics
6. D2487 - Standard Test Methods for Classification of Soils for Engineering Purposes
7. D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
8. D3017 - Standard Test Methods for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

B. Wisconsin Department of Transportation Standards for Road and Bridge Construction (WisDOT):
1. 209 - Granular Backfill

C. Standard Specifications for Sewer and Water Construction in Wisconsin

1.03 SUBMITTALS

A. Submit 10-pound sample of each type of fill to testing laboratory, in accordance with ASTM D420.

1.04 DEFINITIONS

A. Suitable Materials: ASTM D2487 classified as GW, GP, SP and SW.

B. Unsuitable Materials: Roots or other organic matter, trash, debris, frozen materials and stones larger than 3 inches, and other materials classified in ASTM D2487 not defined as Suitable Materials. Person-made fills, refuse, or backfill from previous construction.

C. Rock: Boulders measuring 1/2 cubic yard or more and materials that cannot be removed without systematic drilling and blasting, and below ground concrete or masonry structures, exceeding 1/2 cubic yard in volume. Pavements shall not be considered rock.

D. Unstable Materials: Too wet to support utility pipe, conduit, or appurtenant structure.

E. Topsoil: Fertile, friable, natural loam, surface soil. Free of subsoil, clay lumps, brush, weeds, litter, roots, stumps, stones larger than 1 inch in any dimension, and other extraneous or toxic matter harmful to plant growth.

PART 2 PRODUCTS

2.01 MATERIAL

A. Bedding Material: WisDOT 209. Remove all partials retained on a 1-inch screen.

B. Granular Material: WisDOT 209.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to construction, inspect existing utility structures and surface features with RFMU and document condition.

B. Verify with RFMU that permits necessary to do work are obtained.

3.02 PREPARATION

A. Have utility owners field mark utility locations and verify location of existing utilities prior to excavation.

B. Protect surface features that are not designated to be removed.

C. Notify utility companies of progress schedule so they can accomplish any necessary or previously agreed to relocations, removals, or supporting of lines.

D. Implement traffic control. Place traffic warning signs.

E. Strip off existing topsoil from within excavation limits and stockpile. Separate vegetation from salvageable topsoil and dispose of as appropriate.

F. Notify RFMU and regulatory agencies of location of dewatering discharges and dewatering sedimentation basins.

3.03 UTILITY TRENCH EXCAVATION

A. Excavate trenches to line and grade shown on Drawings.

B. Pipe Envelope: Trench width and initial backfill depth, as indicated on Drawings. Width at top of excavation will vary depending on soil and depth.

C. Over-excavation below grade shall be corrected by replacing and compacting with granular material to 100 percent of Standard Proctor density.

D. Slopes: Excavated to at least the angle of repose and as required by the Accident Prevention Division of the State Industrial Commission or OSHA, whichever is more restrictive. Brace, shore, or sheet and drain excavation to protect property and provide worker safety.

E. Pile excavated material in a manner that will not endanger work or obstruct sidewalks, driveways, or gutters.

F. Segregate soils in excavated material that are unsuitable for trench backfill and dispose of as specified in this Section.

G. Dewater ground as necessary to excavate trench and install pipe. Hold ground water level to a minimum 2 feet below pipe invert.

H. Direct surface and groundwater discharges to natural drainage channels, drains, or storm sewers. Provide energy dissipation at discharge point of dewatering wells or points. Provide dewatering sedimentation basins at discharge point of trench sump pump.

I. Over-excavate when bottom of trench contains unstable or unsuitable material. Bring excavation up to pipe grade with compacted select granular or suitable material taken from excavation. Notify RFMU of soil conditions which may be poor bearing capacity and when organic soils are

encountered. Install additional rock stabilization or geotextile fabric at direction of RFMU.

J. Provide temporary support, remove, relocate, or reconstruct existing utilities located within trench excavation. Utility owner shall designate method employed. Use care and provide compacted fill or other stable support for utility crossings to prevent displacement, rupture, or failure.

K. Excavate to expose existing utilities that cross in close proximity to new pipe line to determine utilities' location ahead of pipe installation to avoid grade conflict. Measure to determine utilities' location relative to new pipe line location. RFMU may order deviation from alignment, grade, and location to avoid conflict. Plan work with RFMU at preconstruction conference and coordinate activities during course of work.

L. Install and maintain barricades, guards, and warning lights to protect persons from injury and avoid property damage.

M. Maintain activities within limits shown on Drawings.

3.04 STRUCTURE EXCAVATION

A. Excavate to elevations and dimensions indicated, plus space required for construction operations, forming and inspection.

B. Footings and foundation to rest on undisturbed soil, unless shown otherwise on Drawings, or required by the RFMU.

C. Verify soil bearing capacity at base of footings exceeds 2,000 psf.

3.05 INITIAL BACKFILL

A. Bedding for sewers and structures: Shown on the Drawings.

B. Remove ledge rock, boulders, and large stones to provide at least 6-inch clearance from pipe.

C. Dig bell holes in pipe bedding at each joint such that pipe barrel rests continuously on bedding.

D. Place backfill in uniform layers not to exceed 6 inches before compaction. Tamp each layer to eliminate possibility of lateral displacement and provide uniform support. Compact to a minimum of 95 percent of Standard Proctor density.

E. Install trench dams at locations indicated.

3.06 FINAL BACKFILL

A. Backfill with suitable materials selected from excavated materials.

B. Place backfill in uniform depth layers not to exceed 12 inches before compaction. Compact each layer before placing material for succeeding layer.

C. Compact each layer by mechanical means. Trenches shall be compacted to a minimum of 95 percent of Standard Proctor density, except to 100 percent of Standard Proctor density in upper 3 feet of boulevard areas, shoulders, and paved surfaces. If moisture content of backfill material is greater than 3 percent above optimum moisture, compact material to minimum density of 3 pounds/cubic foot less than Standard Proctor curve at that moisture content, except that minimum compaction shall be 85 percent of Standard Proctor density.

D. Plastic Marking Tape: Installed 12 inches above underground electrical, telephone, gas conduits and 18 inches below finish grade, continuous along route of conduit.

E. Excavated material not suitable or required for backfill shall be disposed of.

F. Spread salvaged topsoil uniformly over disturbed area.

G. Use select granular backfill within any building areas. Fill other areas with material from the site.

H. Fill in unsurfaced areas of more than 2 feet in depth shall be placed in maximum 2-foot lifts, and mechanically compacted.

I. Scarify slopes receiving fill to permit new fill to bond. Allow clay, heavy loams or sandy loam soils to dry before using as fill.

3.07 FINISH GRADING

A. Finish site grading true to grade within 0.1 foot of the grade shown on Drawings.

B. Plow, disk and drag any areas compacted by trucks, other vehicles or storage of materials to match texture of adjacent areas.

C. Insure a minimum of 6 inches of topsoil covers all unsurfaced areas. Fertilizing, seeding and landscaping will be by others.

3.08 DEWATERING

A. Install dewatering equipment necessary to hold groundwater level to a minimum 2 feet below bottom of excavation.

B. Direct surface and groundwater discharges to natural drainage channels, drains, or storm sewers. Provide energy dissipation at discharge point.

C. Conduct dewatering operations in accordance with applicable regulations and permits.

D. Assure proper erosion control methods.

3.09 COMPACTION

A. Compact all fill within building areas to minimum 98 percent modified proctor density (ASTM D1557).

B. Notify RFMU minimum 48 hours prior to starting compaction that requires testing.

C. Prior to filling in areas requiring compaction, remove all topsoil, vegetation, roots, and other organic materials. Place and compact material in 6-inch maximum lifts.

3.10 TOLERANCES

A. Trench settlements which occur in paved surfaces or yard areas during the guarantee period that are greater than 1 inch as measured by a 10-foot straight edge shall be repaired. Trench settlements of greater than 4 inches in remaining areas as measured by a 10-foot straight edge shall be repaired.

3.11 FIELD QUALITY CONTROL

A. Independent Testing Laboratory: Sample backfill materials, determine Moisture/ Density relationship (Standard Proctor), and perform Field Moisture/Density tests at locations determined by RFMU. Testing laboratory shall also perform gradation testing of Pipe Foundation Improvement and Bedding materials.

B. Standard Proctor Tests: Performed exclusively for this Section and in accordance with ASTM D698.

C. Field Moisture/Density Tests: Performed exclusively for this Section, 1 for every foot of lift in 200 lineal feet of excavation, and in accordance with ASTM D2922 (Method B) and ASTM D3017.

D. Gradation Tests: Performed exclusively for this Section for material specified in Part 2 of this Section and in accordance with ASTM C136.

END OF SECTION

C. Horizontal Directional Drilling (HDD) Pipe Installation (33 05 20)

PART 1 GENERAL

1.01 SUMMARY

A. Section includes installation of underground pipe using Horizontal Directional Drilling (Guided Boring) method.

B. Related Sections:
1. Section 31 23 30 – Excavation, Backfilling and Compacting
2. Section 33 05 50 - Surface Facility Restoration
3. Section 33 11 00 - Water Distribution Systems
4. Section 33 31 00 – Sanitary Sewer Systems

1.02 REFERENCES

A. ASTM:
1. D2667 - Standard Practice for Heat Joining Polyolefin Pipe and Fitting
2. D3261 - Standard Specification for Butt Fusion Polyethylene (PE) Plastic Fittings for PE Plastic Pipe and Tubing
3. F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR - PR) Based on Outside Diameter
4. F905 - Standard Practice for Qualification of Saddle Fusion Joints

B. AWWA C906 - AWWA Standard for HDPE Pipe

1.03 DEFINITIONS

A. Horizontal Directional Drilling (HDD) Pipe Installation (also known as Guided Boring): Method of trenchless construction producing continuous bores using a surface launched, remotely steerable, electronically monitored drilling tool controlled from a mobile drilling frame, and including a field power unit, mud mixing, storage and recycling system, and mobile spoils extraction system.

B. IPS: Iron Pipe Size.

1.04 SYSTEM DESCRIPTION

A. HDD Process:
1. Excavate drilling and receiving pits.
2. Install drilling frame in drilling pit.
3. Drill pilot hole to receiving pit in conformance with proposed alignment and grade of proposed pipe.
4. Control toolhead by means of real time guidance system that measures inclination, roll, and azimuth.
5. Remove toolhead and install drill string and pipe in receiving pit.
6. Pull drill string and pipe back to drilling pit along pilot hole alignment.
7. Pilot hole is enlarged as required to accommodate pipe during pullback.
8. Remove excess spoils generated during pipe installation by vacuum extraction.

1.05 SUBMITTALS

A. Product Data:
1. Drilling fluid:
   a. Manufacturer.
   b. Components.
   c. Special precautions.
   d. Manufacturer's recommended method of mixing and application.
   e. Manufacturer's recommendation for storage and handling.
   f. Material Safety Data Sheet (MSDS).
2. Equipment:
   a. Detailed description of equipment and tools.
   b. Size and capacity.
   c. Piping materials.
   d. Setup requirements.
   e. Type and size of cutting toolhead and backreaming tool.
   f. Type of pipe joining equipment.
3. Written procedures for:
   a. Proposed pipe staging and installation.
   b. Dewatering.

c. Monitoring and control of line and grade.
d. Time requirement for joint fusion.
e. Line and grade correction.

4. Construction schedule for installations.

B. Shop Drawings:
1. Location and dimensions for:
a. Drilling and receiving pits.
b. Product joining and staging areas.

C. Quality Assurance:
1. Qualifications and experience of field supervisors and boring machine operators.
2. Previous HDD boring project references.

D. Certificates: Provide Certificates of Compliance from the manufacturer certifying that the HDPE pipe and fittings meet the requirements listed in Article 1.02.

1.06 QUALITY ASSURANCE

A. Minimum qualifications for field supervisors and boring machine operators.
1. Three previous installation projects.
2. Minimum of 100,000 feet of boring successfully completed.

B. References from previous HDD boring installation projects.
1. Owner's name and contact person.
2. Data and duration of project.
3. Size(s) and length(s) of pipe bored.
4. Contents of the pipeline.

C. Provide qualified field supervisor on Site at all times when boring operations are in progress.

D. Demonstrate pipe-joining process, using intended personnel and equipment, to Owner and RFMU prior to initial boring.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Check materials upon delivery to assure that proper material has been received.

B. Store drilling fluid components in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MATERIALS

A. HDPE Pipe:
1. AWWA C906.
2. IPS: DR 11 - 160 psi water pressure.
3. Heat fused joints.
4. NSF: Standard No. 14 and No. 61 (by size and order).
5. PPI Designation: PE 3408.
6. Cell Classification: ASTM D3350 - PE 345444C.
7. Material Description: ASTM D3350 - Type III, Grade PE 34.
8. Color: Blue.
9. Continuously mark pipe with the following information:
a. Size and dimensions.
b. Name of manufacturer.
c. Cell class.
d. ASTM basis.
e. Pipe test category.
f. Plant identification.
g. Production data.
h. Operator number.
i. Resin supplier code.

B. Pipe Adaptors:
1. Mechanical joint, fully restrained.
2. ASTM D3261.
3. Same resin type and cell classification as pipe.
4. Driscopipe, or equal.

2.02 BORING EQUIPMENT

A. High pressure, low volume fluid cutting process capable of dispensing drilling fluid to the surrounding materials as it proceeds.

B. Remotely steerable.

C. Provide for electronic monitoring of depth and location.

D. Capable of placing pipe to a depth of 16.5 feet with a 1-foot tolerance.

E. Capable of a 90-degree turn within a 300-foot radius.

F. Provide for mobile spoils removal from entry and exit pits and return areas caused by fracturing.

G. Include alarm system capable of detecting electrical current.

H. Guidance System:
   1. Capable of measuring inclination, roll, and azimuth.
   2. Independent means to insure accuracy of installation.
   3. Capable of accurately producing installation alignment and profile records.
   4. Steering Equipment:
      a. House in a non-magnetic bottom-hole of the lead drill pipe section.
      b. Provide for in-hole deviation at the front during pilot hole drilling.
      c. Position lead section along same alignment as the proposed crossing from entry to exit.
   5. Separate magnetized pilot work-string from steering guidance probe by means of 2 non-magnetic drill collars behind the bottom-hole assembly.
   6. Include remote tool locating device capable of detecting the position of the cutting head within the following tolerances:
      a. Elevation: 1 inch per 5 feet of depth.
      b. Alignment: 2 inches per 5 feet of depth.

2.03 BENTONITE CLAY COMPONENT

A. Appearance: Off-white to tan powder.

B. Chemical Definition:
   1. Untreated Wyoming bentonite.
   2. Hydrous silicate of alumina composed of sodium montmorillinite clay.

C. Specific Gravity: 2.6 to 2.7.

D. Bulk Density:
   1. Uncompacted: 71 pounds per foot, plus or minus 3.
   2. Compacted: 74 pounds per foot, plus or minus 3.

E. Unit Weight: 2.4 pounds per quart.

F. pH: 8.8 (6 percent in water suspension).

G. Mineralogical Analysis (x-ray diffraction):
   1. Montmorillinite: 85 percent, plus or minus 5.
   2. Quartz: 5 percent, plus or minus 1.
   3. Feldspars: 5 percent, plus or minus 1.
   4. Cristobalite: 2 percent, plus or minus 0.2.
   5. Illite: 2 percent, plus or minus 0.2.
   6. Calcium and Gypsum: 1 percent, plus or minus 0.05.

H. Chemical Analysis:
   1. S_1O_2: 55.44 percent, plus or minus 5.
   2. $A1_2O_3$: 20.14 percent, plus or minus 2.
   3. Fe_2O_3: 3.67 percent, plus or minus 0.2.
   4. CaO: 0.49 percent, plus or minus 0.05.
   5. MgO: 2.49 percent, plus or minus 0.2.
   6. Na_2O: 2.76 percent, plus or minus 0.2.
   7. K_2O: 0.6 percent, plus or minus 0.05.
   8. Bound Water: 5.5 percent, plus or minus 0.05.
   9. Moisture at 220 degrees F: 8 percent, plus or minus 0.5.

2.04 DRILLING FLUID MIXTURE

A. Inert mixture of water and bentonite clay.

B. Add cement of polymer extenders as required.

C. Coordinate with Owner to obtain water supply for on-site mixture.

2.05 ACCESSORIES

A. Tracer Wire:
   1. Copperhead Industries.
   2. Direct burial No. 12 AWG solid, 0.0808-inch diameter.
   3. Steel core hard drawn extra high strength 1,150 pound average tensile break load.
   4. 45 mil high molecular weight-high density polyethylene blue color jacket complying with ASTM D1248.
   5. 30 volt rating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Field verify the location and depth of all utilities and other facilities that are within or adjacent to the proposed boring alignment.

3.02 PREPARATION

A. Excavate access pits in accordance with Section 31 23 33 and the reviewed Shop Drawings.

B. Locate pits to minimize the number required and to facilitate pipe installation in continuous runs.

C. Control ground water as required to maintain pits in a dry and stable condition.

3.03 CONSTRUCTION

A. Initial Boring:
   1. The entry angle of the pilot hole and the boring process shall maintain a curvature that does not exceed the allowable bending radius of the pipe.
   2. Notify RFMU prior to making any adjustments in alignment or grade.

B. Pipe Installation:
   1. After initial boring is complete, install a swivel, circulating sub and reamer at the termination pit and pull pipe back to starting pit.
   2. Apply drilling fluid as required to maintain borehole stability and reduce frictional drag.
   3. Maximum reaming diameter: 1.4 times the pipe diameter.
   4. Protect and support pipe above ground to provide free movement and prevent damage from ground debris.
   5. Pullback forces shall not exceed the allowable pulling forces of the pipe.
   6. Provide sufficient pipe length to extend past termination point for connections to adjacent pipe sections or manholes.
   7. Allow installed pipe to stabilize for 24 hours prior to making tie-ins or connections.
   8. Install connections and tie-ins as shown on Drawings.

C. Pipe Joining:
   1. Heat fusion method.
   2. Perform in accordance with manufacturer's instructions.

D. Install tracer wire along the axis of all HDPE pipe.

3.04 RESTORATION

A. Backfill pits in accordance with Section 31 23 30.

B. Restore Work areas to original condition.

3.05 FIELD QUALITY CONTROL

A. Pressure test all material and joints in accordance with Section 33 11 00 prior to installation.

B. Installation Tolerances:
   1. Inclination:
      a. Accuracy: Plus/minus 0.05 degrees.
      b. Range: Plus/minus 90 degrees.
      c. Repeatability: Plus/minus 0.02 degrees.
   2. Roll:
      a. Accuracy: Plus/minus 0.1 degree.

b. Range: Plus/minus 0 to 360 degrees.

3. Azimuth:
   a. Repeatability: Plus/minus 0.1 degree.
   b. Range: Plus/minus 0 to 360 degrees.

3.06 MATERIAL DISPOSAL

A. Excess drilling fluid and spoil will become property of the Contractor for transport and disposal.

B. Do not discharge excess fluid and spoils into sewer systems or natural waterways.

C. Remove and dispose of drilling fluid that surfaces through fracturing.

END OF SECTION

D. Surface Facility Restoration (33 05 50)

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Restoration of surface facilities after utility construction as follows:
      a. Street Surfaces
      b. Base Course
      c. Curb and Gutter
      d. Sidewalks
      e. Driveways
      f. Shoulders

B. Related Sections:
   1. Section 31 23 30 – Excavation, Backfilling and Compacting
   2. Section 33 05 50 – Surface Facility Restoration

1.02 REFERENCES

A. WisDOT:
   1. 305 - Dense Graded Base
   2. 450 - General Requirements for Asphaltic Pavements
   3. 455 - Asphaltic Materials
   4. 460 - Hot Mix Asphalt Pavements
   5. 465 - Asphaltic Surface
   6. 501 - Concrete
   7. 601 - Concrete Curb and Gutter
   8. 602 - Concrete Sidewalks, Loading Zones, Safety Islands, and Steps

1.03 SUBMITTALS

A. Provide for each aggregate material:
   1. Name and location of source.
   2. Sample gradation.

B. Provide for asphaltic mixture:
   1. Mix design report.

1.04 SCHEDULING

A. Restore all surface facilities within 72 hours after removal.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate Base Materials: WisDOT 305, 1 1/4-inch gradation.

B. Aggregate Surfacing Material: WisDOT 305, 3/4-inch gradation.

C. Tack Coat: WisDOT 455.

D. Asphaltic Patching Mixtures: WisDOT 465.

E. Concrete: WisDOT 501, Grade A.

PART 3 EXECUTION

3.01 PREPARATION

A. Asphaltic Surface:
   1. Saw cut existing bituminous to provide a clean straight edge.
   2. Place tack coat on all edges.

B. Concrete:
   1. Provide a clean straight edge on abutting concrete by breakage at an existing joint or by saw cutting.
   2. Install 1/2-inch preformed expansion joint against all abutting concrete.

3.02 CONSTRUCTION REQUIREMENTS

A. Aggregate Base:
   1. Place material to a uniform depth as specified.
   2. Mechanically compact to a Standard Proctor Density of 100 percent.

B. Aggregate Surfacing:
   1. Place material to a uniform depth as specified.

2. Compact to a Standard Proctor Density of 100 percent.

C. Asphaltic Surfaces:
   1. Place adequate material to provide proper depth when compacted.
   2. Compact until all roller marks are eliminated and there is no further evidence of consolidation.
   3. Surface shall be flush with adjacent surfaces and within 1/8 inch of a 10-foot straight edge in all directions.
   4. Surface shall be smooth and free of open sections.

D. Asphaltic Curb:
   1. Place by means of an approved curb machine that shapes and compacts the mixture to the designated cross section.
   2. Place to staked line and grade.
   3. Finished curb shall be uniform in appearance and texture.

E. Concrete Curb and Gutter:
   1. Install forms to provide designated cross section.
   2. Place and compact concrete in a manner to avoid segregation.
   3. Provide a light brush finish on all exposed surfaces.

F. Concrete Surfaces:
   1. Place and compact concrete in accordance with WisDOT 602.
   2. Surface shall be flush with adjacent surfaces.
   3. Provide a light brush finish on all exposed surfaces.

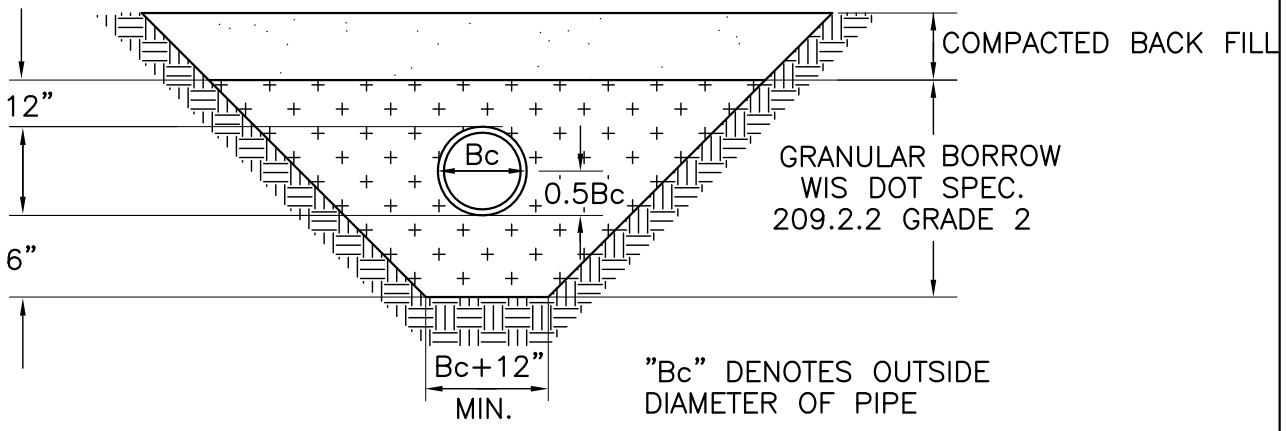
END OF SECTION

E. Common Utility Detail Plates

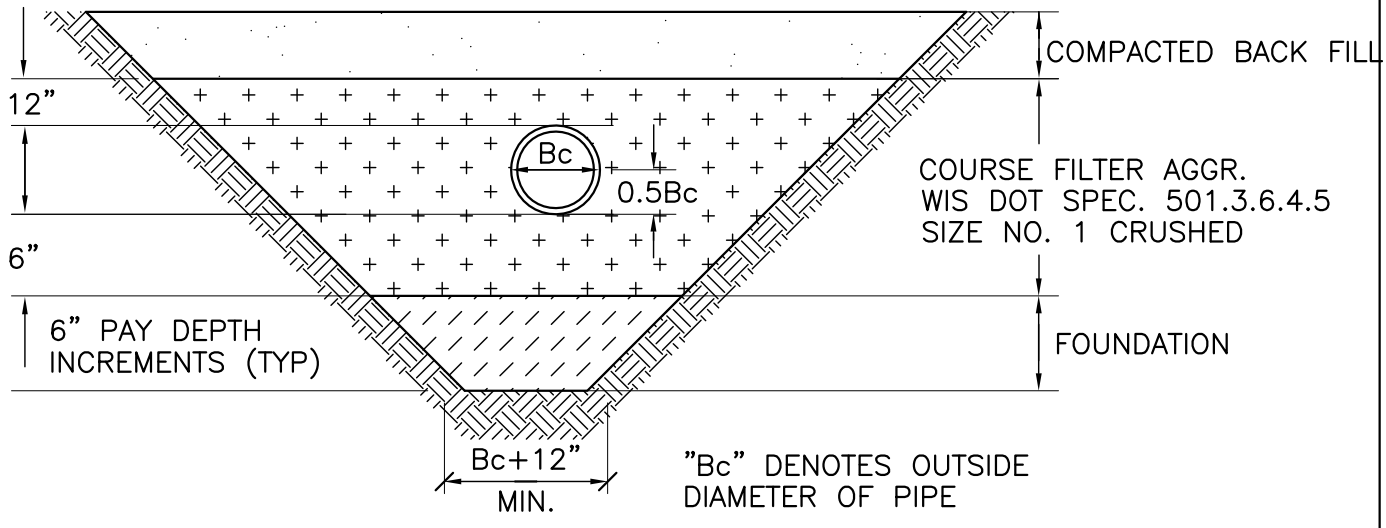
Pipe Bedding for PVC

Pipe Bedding for DIP

Tracer Wire Diagram



PIPE FOUNDATION & BEDDING IN GOOD SOIL



PIPE FOUNDATION & BEDDING IN POOR SOIL

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ENGINEERING GUIDELINES

PIPE BEDDING
FOR PVC

FILE NO.
RFMU0101.00

DATE
07/01/2010

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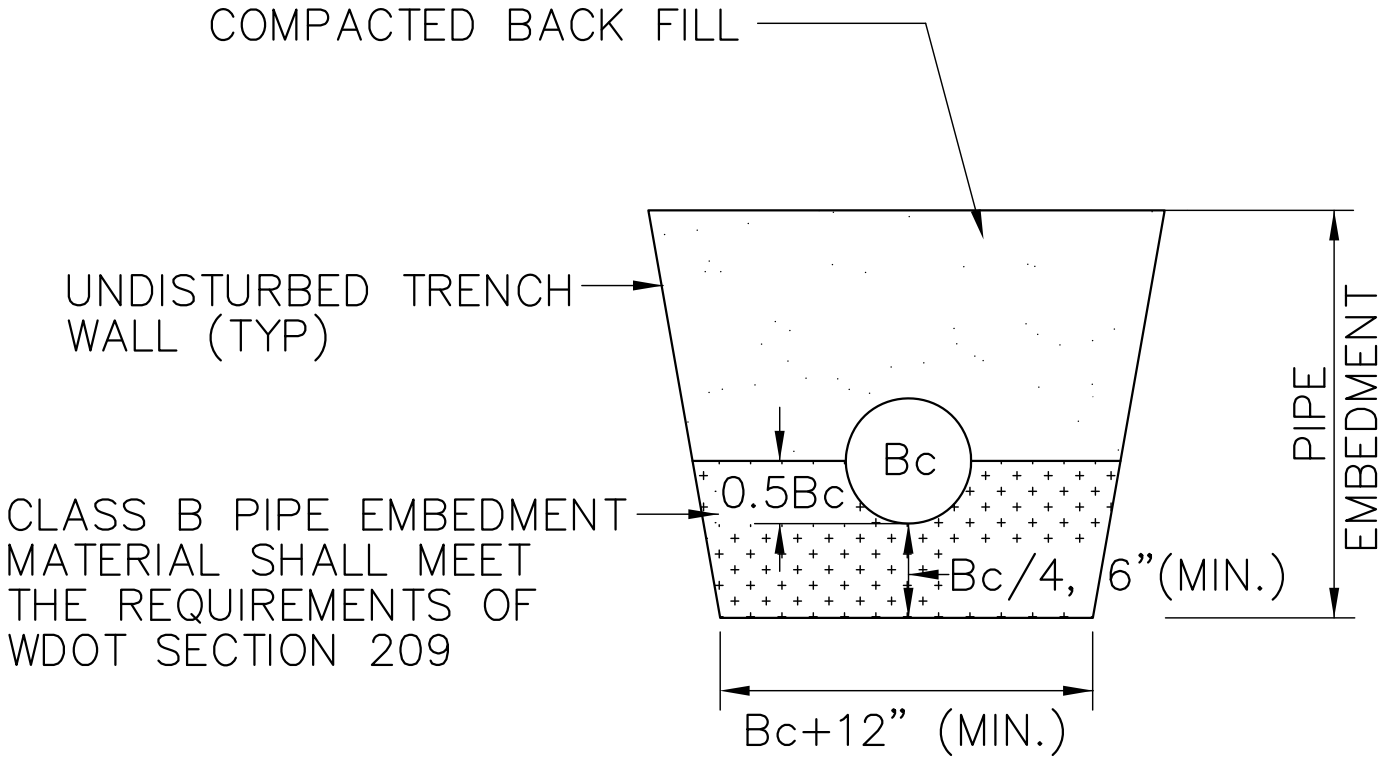

NOTE: CLASS B PIPE EMBEDMENT SHALL BE INCIDENTAL TO ALL PIPE INSTALLATION

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RIVER FALLS MUNICIPAL UTILITIES ENGINEERING GUIDELINES

PIPE BEDDING FOR DIP

FILE NO. RFMU0101.00

DATE 07/01/2010

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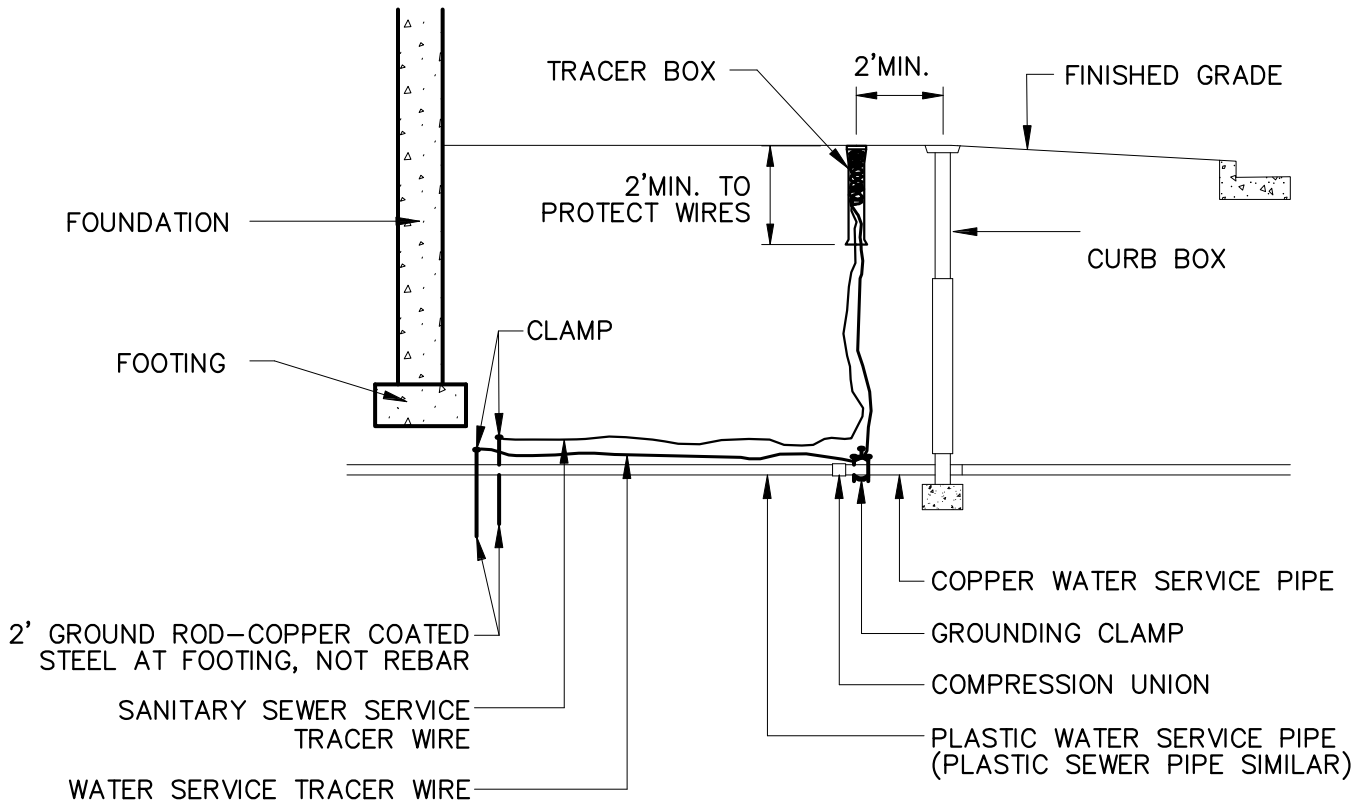

TRACER WIRE DIAGRAM

BOTH TRACER WIRES (WATER & SANITARY) ARE TO BE GROUNDED AT THE FOOTING. REBAR IS NOT ALLOWED DUE TO RUSTING. SEPERATE GROUNDS WITH A MINIMUM HORIZONTAL SEPERATION DISTANCE OF TWO FEET ARE REQUIRED TO PREVENT THE TRACE WIRE FROM BEING LOOPED. TRACER IS TO BE ATTACHED TO THE GROUND ROD WITH A BRASS OR STAINLESS STEEL CLAMP.

ONLY THE WATER TRACER IS TO BE CLAMPED TO THE COPPER SERVICE STUB. (THIS CLAMP MUST BE BRASS OR STAINLESS STEEL.)

THE TRACER BOX IS TO BE MINIMUM OF 2' FROM THE CURB STOP (TOWARD THE HOME). THIS SHOULD AVOID UTILITIES THAT RUN ALONG THE FRONT LOT LINE AND AID IN LOCATING WITH A METAL DETECTOR.

EXTRA TRACER WIRE SHOULD BE BROUGHT UP INTO THE TRACER BOX TO ALLOW FOR FROST SHIFT AND REMOVAL OF THE TRACER COVER.

TRACER WIRE SHALL BE A MINIMUM OF TWO FEET BELOW GRADE TO PROTECT FROM IRRIGATION INSTALLATION AND LANDSCAPING.

SEH JOB #:

DRAWING NAME: $FILE$
LAYERS OFF:

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TRACER WIRE
DIAGRAM

PLATE NO.
TRACER1

DATE
07/01/2010

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III. Water Utilities

A. General Requirements

The general criteria for placement of water utilities within the right-of-way are listed below. Any deviation from these standards must be approved in writing by River Falls Municipal Utilities.

1. General: locate water main within public right-of-way or dedicated public easement.

2. Horizontal alignment: 10 feet north or east of centerline of right-of-way (wherever possible).

3. Pipe sizing:
    a. Based on future service areas, as determined by River Falls Municipal Utilities
    b. Minimum size: 8 inch diameter

4. Vertical depth: Provide minimum of 8 feet of cover.

5. Hydrants:
    a. Waterous WB67

6. Services:
    a. Minimum 1 inch diameter for residential subdivisions
    b. Minimum 8 feet of cover
    c. Material
        i. 2-inch diameter or less: copper
        ii. greater than 2-inch diameter: ductile iron
    d. Note tracer wire requirements in Section II.

7. Insulation: In accordance with detail drawing.

8. Water booster stations:
    a. Reviewed on a case by case basis
    b. Manufacturer shall be USEMCO

9. Water pressure reducing stations:
    a. Reviewed on a case by case basis
    b. Climate controlled dry vault

C. Water Distribution Systems (33 11 00)

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Water Main Pipe and Fittings
   2. Valves and Boxes
   3. Hydrants
   4. Services
   5. Insulation

B. Related Sections:
   1. Section 31 23 30 - Excavation, Backfilling and Compacting
   2. Section 33 05 50 - Surface Facility Restoration

1.02 REFERENCES

A. ANSI/AWWA:
   1. C150/A21.50 - American National Standard for the Thickness Design of Ductile Iron Pipe.
   2. C151/A21.51 - American National Standard for Ductile - Iron Pipe, Centrifugally Cast for Water or other Liquids
   3. C153/A21.53 - American National Standard for Ductile - Iron Compact Fittings, 3-inch through 64-inch, for Water Service
   4. C502 - AWWA Standard for Dry-Barrel Fire Hydrants
   5. C504 - AWWA Standard for Rubber - Seated Butterfly Valves
   6. C515 - AWWA Standard for Reduced-Wall, Resilient-Seated Gate Valves, for Water Supply Service
   7. C600 - AWWA Standard for Installation of Ductile Iron Water Mains and their Appurtenances

1.03 SUBMITTALS

A. Submit Certificate of Compliance for products listed under Article 1.04.

B. Submit proposed method of joint conductivity.

C. Following completion of construction, submit as-built plans to River Falls Municipal Utilities

1.04 QUALITY ASSURANCE

A. Provide Certificates of Compliance from the manufacturer certifying that the products meet the respective requirements listed in Article 1.02.

1.05 DELIVERY, STORAGE AND HANDLING

A. Inspection:
   1. Inspect all pipe and products during the unloading process.
   2. Notify River Falls Municipal Utilities of any cracked, flawed or otherwise defective products.
   3. Remove all products found to be defective by River Falls Municipal Utilities from the Site.

B. Handling and Storage:
   1. Handling and storage of products shall be in accordance with Section 2.2 of ANSI/AWWA C600.
   2. Carefully unload and store pipe to prevent damage to pipe or surface coatings. Pipe shall not be skidded on ground. Repair damaged coatings to satisfaction of River Falls Municipal Utilities.

PART 2 PRODUCTS

2.01 WATER MAIN PIPE

A. Water main and water services larger than 2 inches in diameter: ductile iron pipe, ANSI/AWWA C151/A21.51.

B. Thickness Class: 52.

C. Joints: Push-On or Mechanical Joint conforming to ANSI/AWWA C111.

D. Pipe Sections: At least 16 feet long.

E. Joint Conductivity:
   1. Conductive gaskets as manufactured by American Ductile Iron Pipe Co.
   2. Field Application Methods:
      a. Burndy - Thermoweld by Burndy Corp., Norwalk, Connecticut.
      b. Cadweld by Erico Products Co., Cleveland, Ohio.
   3. Copper Jumpers:
      a. Minimum 1/16-inch by 1/2-inch wide flat copper strip.
      b. Annealed round copper wire conforming to ASTM B152, Type DHP.
   4. Nuts and Bolts: Silicon Bronze.

2.02 FITTINGS

A. Ductile Iron (3-inch thru 16-inch): ANSI/AWWA C153/A21.53.

B. Ductile Iron (18-inch thru 48-inch): ANSI/AWWA C110/A21.10.

C. Cement-Mortar Lining: ANSI/AWWA C104/A21.4.

D. Joints: Mechanical.

E. Working Pressure: 250 psi

2.03 VALVES AND BOXES

A. Gate Valves:
   1. Resilient Seated: AWWA C515.
   2. Working Pressure: 200 psi.
   3. Ends: Mechanical Joint.
   4. Operating Stem: Non-Rising with O-ring Seals.
   5. Operating Nut: 2-inch Square, Open Left.
   6. 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.

B. Butterfly Valves:
   1. Not allowed.

C. Boxes:
   1. Cast Iron, 5-1/4-inch shaft.
   2. Vertical, 3 piece, Buffalo type.
   3. Box length to provide for 8 feet of pipe cover.
   4. Adjustable to 6 inches up or down from standard box length.
   5. For depths greater than 10 feet, extension rods to 6 to 8 feet below finished grade. Minimum 1-inch nominal diameter extra heavy steel pipe.
   6. Include gate valve adapter for each valve box.

2.04 HYDRANTS

A. Dry Barrel: ANSI/AWWA C502.

B. Waterous Pacer WB67.

C. Hose Connections: 2 each at 2-1/2-inch diameter, standard nozzle cap with chain.

D. Steamer Connection: 1 each at 4-1/2-inch diameter, standard nozzle cap with chain.

E. Threads: National Standard.

F. Operating Stem: Open Left with O-ring Seals, 1-inch pentagon.

G. Traffic flange at or within 6-inches above finished grade line.

H. Hub: 6-inch Mechanical Joint.

I. Main Valve Opening: 5-1/4-inch diameter, designed to open against water pressure.

J. Barrel Diameter: 5-inch.

K. Drain to operate only when hydrant is closed.

L. Bury Depth: 8.5 feet (ground to bottom of hub).

M. Upper Standpipe Length: 16 inches

N. Cap Nuts: Pentagon.

O. Color: Red.

P. Provide permanent markings which indicate:
1. Manufacturer's name.
2. Year of manufacture.
3. Bury depth.

2.05 SERVICE PIPE

A. Copper: ASTM B88.

B. Type: K, Soft.

C. Minimum diameter: 1 inch.

2.06 CORPORATION STOPS

A. Type:
1. Compression: Mueller H-15008
2. Flared: Mueller H-15000

B. Inlet: Mueller thread (AWWA CC Thread).

C. Outlet: Copper Service Pipe.

2.07 CURB STOPS AND BOXES

A. Valve:
1. Type: Mueller H-15154 Mark II Oriseal, or approved equal.
2. Inlet: Copper Service Thread.
3. Outlet: Copper Service Thread.

B. Box:
1. Type: Mueller H-10314, Extension, arch pattern base.
2. Length: 8 feet.
3. Upper Section Diameter: 1-inch inside.
4. Adjustable to 6 inches up or down from specified length.
5. Provide stationary rods for all sizes.
6. Provide "two hole" cover

2.08 INSULATION

A. Rigid, extruded polystyrene board insulation.

B. Thermal Resistance (R): 5.0.

C. Thickness: 2-inch.

D. Board Size: 48-inch by 96-inch.

E. Compressive Strength: Minimum 25 psi.

F. Water Absorption in accordance with ANSI/ASTM D2842: 0.1 percent by volume, maximum.

G. Edges: Square.

2.09 ENCASEMENT

A. Polyethylene Sheet

B. Thickness: 8 mil

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Connection to Existing System:
1. Pressure Tap:
a. Install tap in location shown on the Drawings.
b. Use approved tapping machine designed specifically for tapping under pressure.
c. Install tapping sleeve and gate valve as part of assembly.
d. Install blocking as required.
2. Cut-In Connection:
a. Isolate segment of pipe to be cut and drain water from the line.
b. Connect tee and sleeve assembly to pipe ends.
c. Install blocking as required.

3. Connect to Inplace Fitting:
    a. Cut slit in pipe prior to removing any pipe or blocking to relieve air or water pressure in pipe.
    b. Isolate segment of inplace pipe and remove blocking as required.
    c. Remove plug and drain water from the line.
    d. Install blocking as required.
    e. Provide adequate sump and pump to prevent water from entering pipe.

B. Pipe Installation:
1. Install pipe at the alignment and grade shown on the Drawings.
2. Provide a minimum of 8 feet of cover over the pipe.
3. Install appurtenances in the locations shown on the Drawings.
4. Remove all dirt and foreign material from the pipe interior prior to installation.
5. See Section 31 23 33 for pipe foundation and backfill procedures.
6. See Section 31 23 33 in case of conflicts with existing pipes.

C. Valve and Box Installation:
1. Verify that subgrade material is adequate to support valve assembly.
2. Set valve on a compacted foundation.
3. Install valves with stems vertical and plumb.
4. Install boxes plumb and centered over the valve nut.
5. Verify that box remains plumb and centered during backfill.
6. Adjust box cover to required grade.

D. Hydrant Installation:
1. Verify that subgrade material is adequate to support hydrant. Take care to prevent settlement.
2. Place thrust block, crushed rock (not less than one cubic yard) and two layers of 8 mil. Polyethylene in accordance with Drawing details.
3. Install and maintain hydrant in a plumb position.
4. Where groundwater is present, plug drain hole and affix "Pump After Use" tag to the hydrant.

E. Joint Conductivity:
1. Provide electrical bond across all joints between pipes and appurtenances.
2. Install copper jumpers by either shop or field applications.
3. Fasten multiple jumper strips with silicon bronze bolts and nuts.
4. Welding:
    a. Grind surfaces to be welded to remove coating and oxide and to provide clean metal surface.
    b. Use metallic-arc process for stop applications.
    c. Use exothermic process for field applications.
    d. Refinish welded area with protective coating after connection is made.

F. Thrust Restraint:
1. Install thrust restraints at all bends, tees and plugs.
2. Concrete Blocking:
    a. Place between the fitting and undisturbed trench wall.
    b. Minimum thickness: 12 inches.
    c. Minimum area in square feet shall be in accordance with the following:

Pipe	Tee or Plug	1/4 Bend	1/32 and 1/8 Bend	1/16 Bend
6-inch	2.9	3.1	1.6	0.8
8-inch	3.7	5.3	2.9	1.4
10-inch	5.7	8.1	4.4	2.2
12-inch	8.1	13.4	6.6	3.2
16-inch	15.1	21.4	11.6	5.9
20-inch	23.2	30.2	18.1	9.3
24-inch	33.6	48.5	26.1	13.3

    d. Size blocking based on the larger main.
    e. Verify that bolts are accessible after concrete is poured.
3. Timber Blocking:
    a. Use for temporary blocking only for maximum 8-inch mains.
    b. Minimum timber size: 4-inch by 4-inch.

4. Restrained Joints:
    a. For push-on joint pipe and fittings: U.S. Pipe/Field Lok Gasket, American Fast-Grip Gasket, or approved equal
    b. For mechanical joint pipe and fittings: Ebaa Iron/Megalug Series 1100 or approved equal.
    c. Install in accordance with "Thrust Restraint Design for Ductile Iron Pipe".

G. Service Installation:
1. Corporation Stops:
    a. Provide watertight connection with approved tapping machine.
    b. Install under main pressure.
    c. Place a double wrap of Teflon tape around the threads prior to installation.
2. Copper Service Pipe:
    a. Install pipe between corporation stop and curb stop with no joints or unions.
    b. Bury Depth: 8 feet.
    c. Provide minimum 1-foot of slack in the pipe to allow for settlement and movement.
3. Curb Stop and Box:
    a. Install at the location shown on the Drawings.
    b. Verify that subgrade material is adequate to support the curb box assembly.
    c. Install boxes plumb and centered over the tee head.
    d. Verify that box remains plumb and properly aligned during backfill.
    e. Adjust box cover to required grade.
    f. Key all curb stops after backfill to ensure proper operation.

H. Encasement:
1. Wrap all pipe and fittings in the location shown on the Drawings.
2. Clean all surfaces of pipe and appurtenances prior to wrapping.
3. Provide sufficient slack to prevent damage during backfill.
4. Provide minimum 6-inch overlap at joints.
5. Secure overlap and joints with compatible adhesive tape.
6. Repair damaged wrap with tape or polyethylene patch.

3.02 FIELD QUALITY CONTROL

A. 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. Test Duration: 2 hours.
    d. Gage Requirements:
        1) Size: 4-1/2-inch dial.
        2) Range: 0 to 200 psi.
        3) Gradation: 2 psi.
        4) Accuracy: 1/2 percent.
    e. Do not allow pressure to vary more than 5 psi during the test.
    f. Do not allow pressure to vary more than 2 psi during the last hour of the test.
    g. Allowable Leakage: One-half of the volume allowed by ANSI/AWWA C600 in accordance with the following:

$$L = \frac{SD\sqrt{P}}{266{,}400}$$

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 (Gage)

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 Contractor's option, service testing may be done concurrent with main testing.

3. Electrical Conductivity Test:
   a. Perform electrical conductivity test to verify that electrical thawing of the system may be accomplished by Owner.
   b. Test Parameters:
      1) Perform test within 1 week after pressure testing.
      2) Perform test after back-filling is completed and while line is at normal operating pressure.
      3) Test Current: 350 amperes DC plus or minus 10 percent.
      4) Test Duration: 5 minutes.
      5) Test between hydrants in segments of convenient length.
   c. Procedures:
      1) Furnish DC current source, cable and all required equipment of adequate capacity to accomplish the test.
      2) Clamp cables to hydrant flange bolts.
      3) Conduct test with hydrant in the open position and caps on.
      4) Measure current continuously throughout the test with a DC ammeter hooked on a cable lead.
      5) Start test at minimum current level and increase to test level.
      6) Drain hydrant and tighten caps after test.
   d. Failure and Correction:
      1) Failure of a segment shall be determined by current measurements that are insufficient, intermittent or unsteady.
      2) Isolate and correct defective contact points as indicated by failed tests.
      3) Retest failed segments after correction.

3.03 DISINFECTION

A. Disinfect all newly installed water mains, appurtenances and services in accordance with ANSI/AWWA C651.
   1. At connection to existing water main, swab new fittings, valves, pipe and exposed existing pipe with municipal water containing 500 ppm of free chlorine.
   2. Use self adhesive chlorine tablets.
   3. Retain chlorinated water for 24 hours minimum. Flush until no odor of chlorine can be detected or until a check is made for residual chlorine.

B. Flush system after disinfection is completed.

C. Sampling and Testing:
   1. After final flushing, obtain samples:
      a. One sample for every 1,200 feet of main.
      b. One sample at each dead-end.
      c. Ensure that 1 sample is obtained from each branch of main.
      d. Minimum samples required: 2
   2. Perform coliform tests on each sample.
   3. Rechlorinate if any sample tests positive for coliform.

END OF SECTION

D. Water Utility Detail Plates

Gate Valve & Box

Fire Hydrant

Joint Restraint

Dead End Blocking

Water Main Insulation

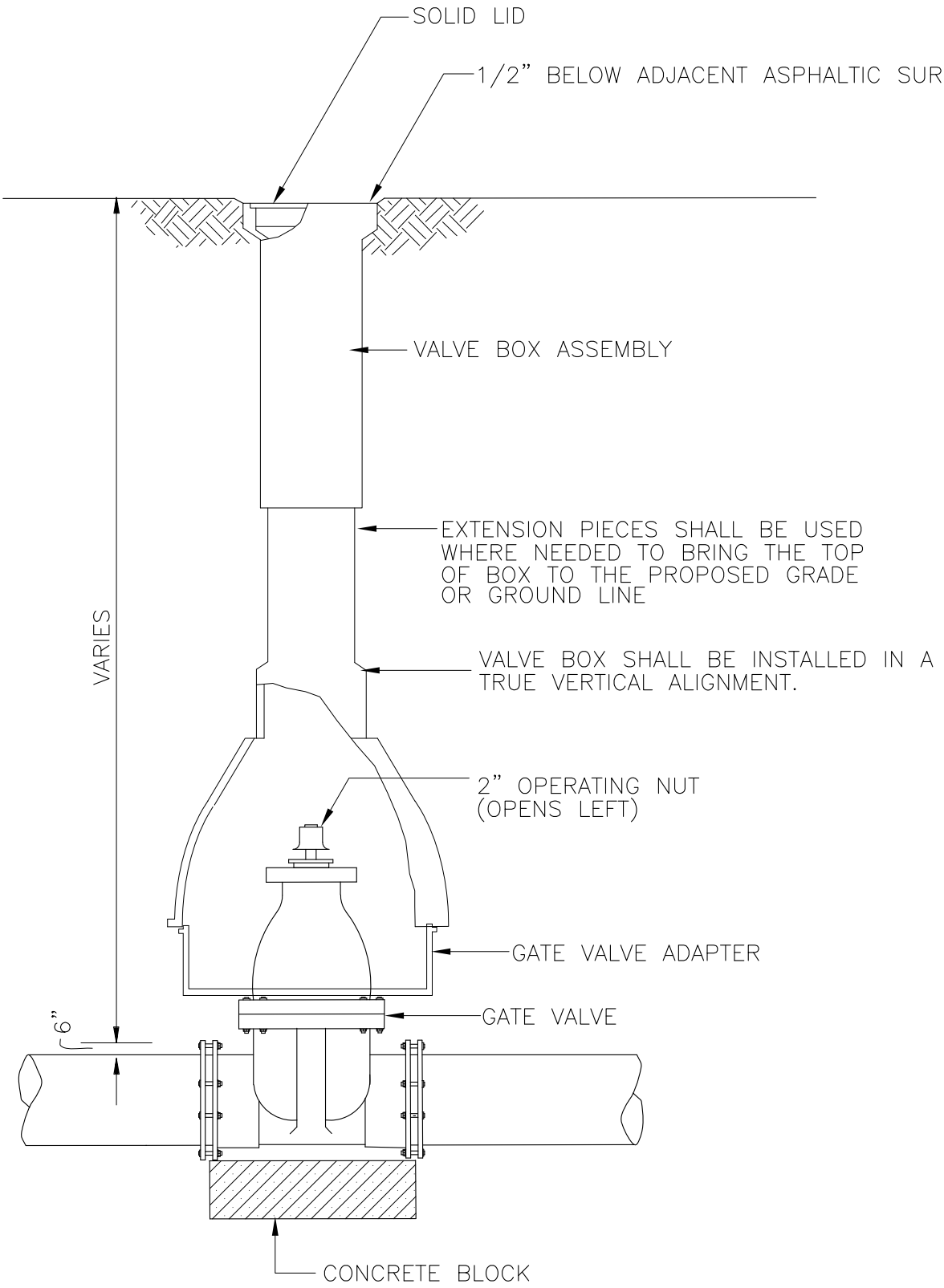
1-Inch Water Service Connection

2-Inch Water Service Connection

Meter Manhole

Valve Manhole

Air Release Manhole



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RIVER FALLS MUNICIPAL UTILITIES ENGINEERING GUIDELINES

GATE VALVE & BOX DETAIL

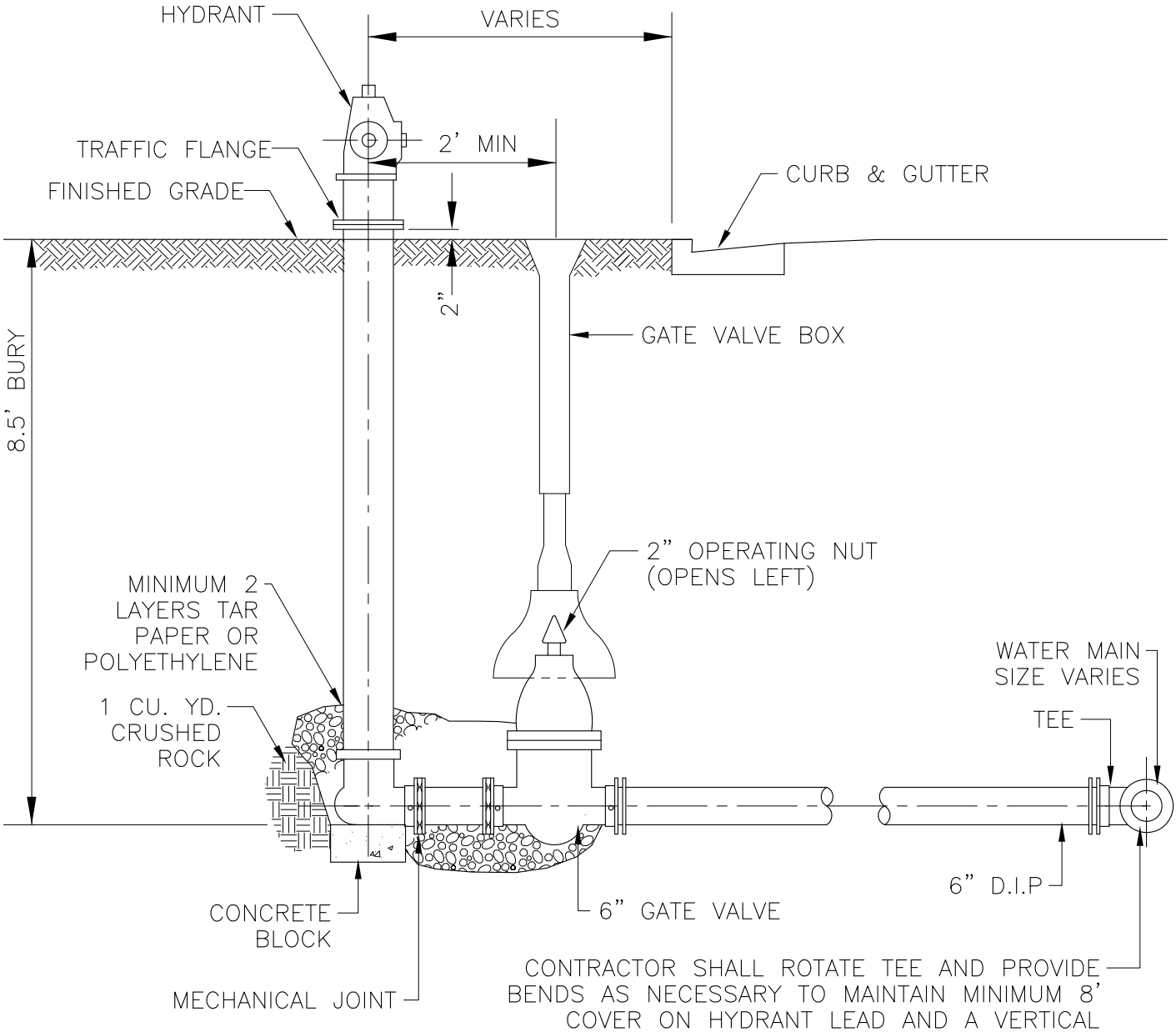
PLATE NO. WMGV1

DATE 07/01/2010

1 / 1

ALL JOINTS SHALL BE MECHANICAL TYPE WITH RETAINER GLANDS

WHERE HYDRANT BASE IS IN OR NEAR WATER TABLE, THE DRAIN PORT SHALL BE PLUGGED AND A TAG FURNISHED AND PLACED ON THE HYDRANT.



CONTRACTOR SHALL ROTATE TEE AND PROVIDE BENDS AS NECESSARY TO MAINTAIN MINIMUM 8' COVER ON HYDRANT LEAD AND A VERTICAL HYDRANT INSTALLATION OR MAY INSTALL A OFFSET FITTING

HYDRANT AND GATE VALVE TO BE MEGA-LUGGED TO MAIN. IF HYDRANT LEAD EXCEEDS 20 FEET, USE RETAINER GLANDS OR RODS TO RESTRAIN PUSH ON PIPE JOINT.

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RIVER FALLS MUNICIPAL UTILITIES ENGINEERING GUIDELINES

FIRE HYDRANT DETAIL

PLATE NO. WMHYD1

DATE 07/01/2010

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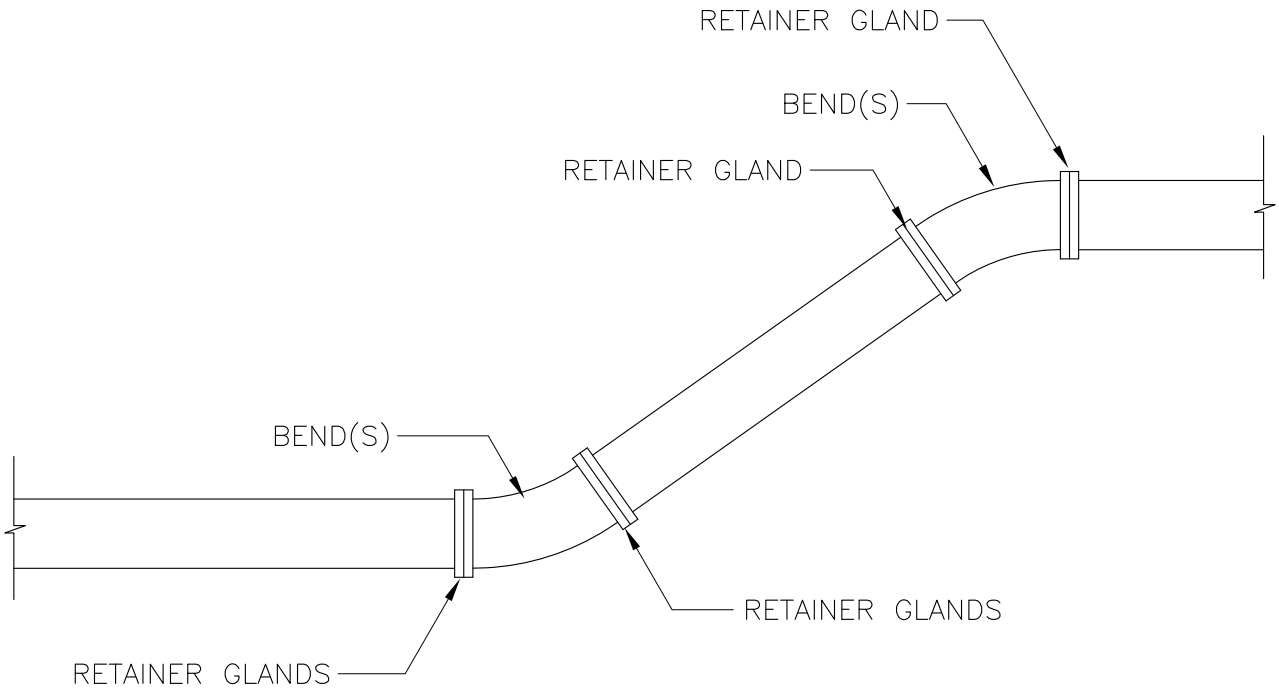

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RIVER FALLS MUNICIPAL UTILITIES ENGINEERING GUIDELINES

JOINT RESTRAINT DETAIL

PLATE NO. WMJNTR

DATE 07/01/2010

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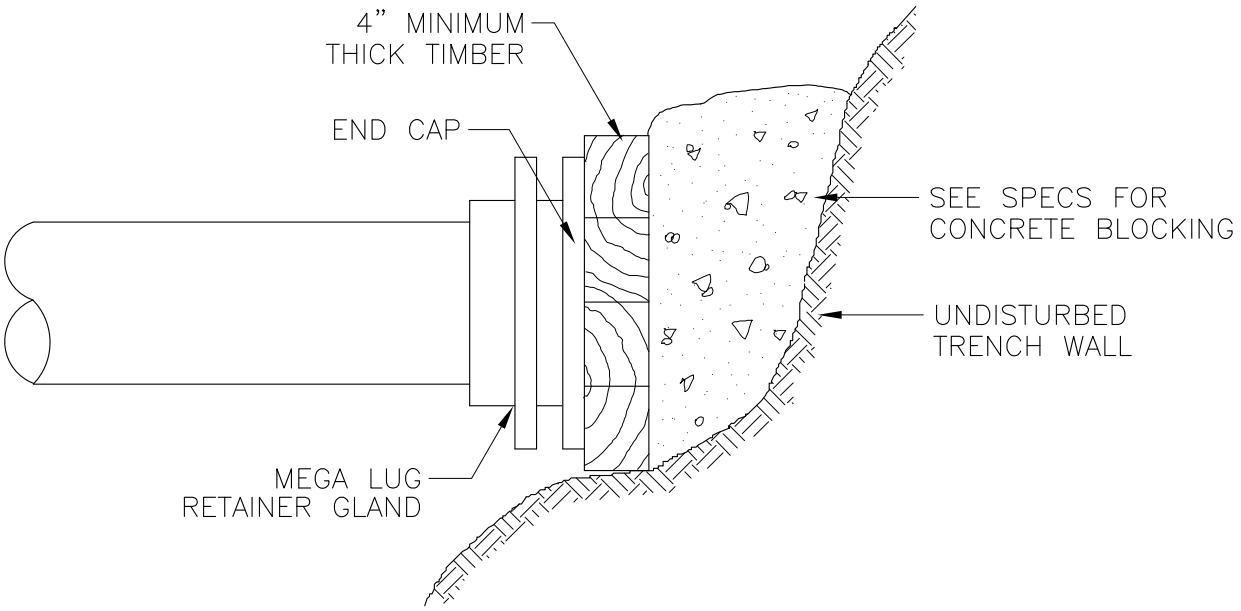

NOTE:
IN LIEU OF CONCRETE THRUST BLOCKING
PROVIDE CALCULATIONS INDICATING
ADDITIONAL PIPE JOINTS TO BE RESTRAINED.

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RIVER FALLS
MUNICIPAL UTILITIES
ENGINEERING GUIDELINES

DEAD END
BLOCKING DETAIL

PLATE NO.
WMBLCK

DATE
07/01/2010

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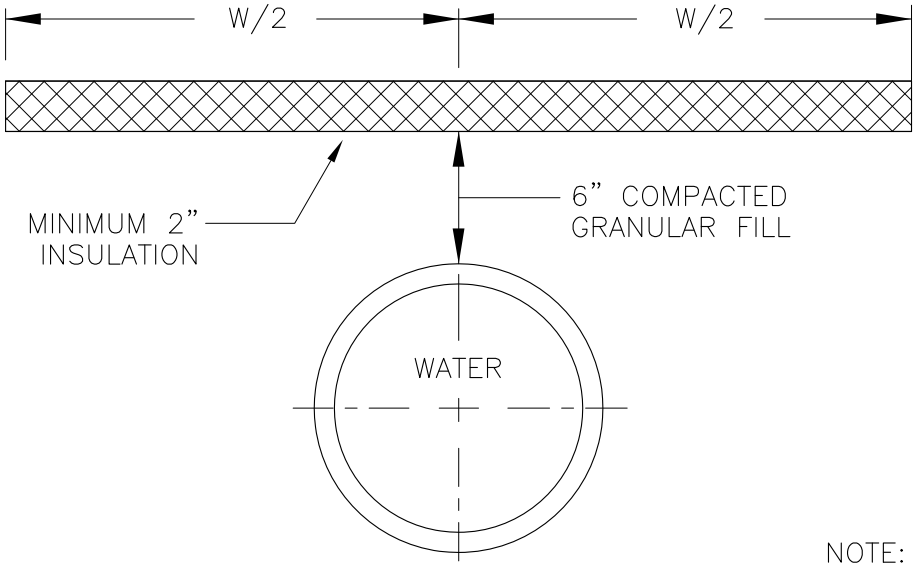

NOTE:
DIMENSIONS OF INSULATION REQUIRED SHOWN ON PLANS

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

Figure 82.30–1. Frost protection zones.

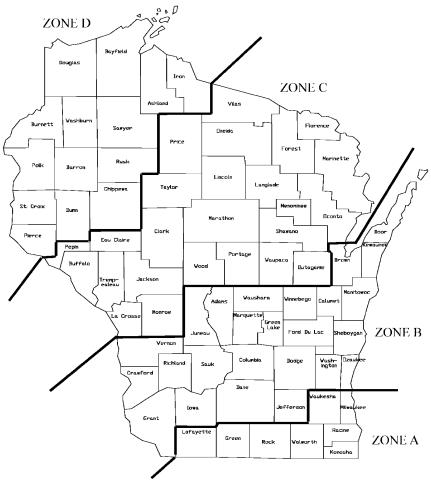

Table 82.30–5
MINIMUM THICKNESS OF INSULATION

Frost Protection Zone	Extruded Polystyrene Foam (in inches)	Insulating Concrete (in inches)
A	1.0	6
B	1.5	9
C	2.0	12
D	2.5	15

Table 82.30–6
PREDICTED DEPTH OF FROST IN VARIOUS TYPES OF BACKFILL SOIL (in feet)

Soil Type	Frost Protection Zone			
	A	B	C	D
Clay, Clay Loam	2.5	3.0	3.5	4.0
Silt Loam, Silty Clay Loam	3.5	4.0	4.5	5.5
Sandy Clay Loam	4.0	4.5	5.5	6.0
Sandy Loam, Loamy Sand	4.5	5.0	6.0	6.5
Sand	5.0	5.5	6.5	7.5
Gravelly Sand	6.0	7.5	9.0	10.0

b. Extruded polystyrene foam insulation shall be installed using a box method. The 3–sided box shall be formed with 3 lengths of polystyrene foam insulation where the top of the box extends horizontally to the farthest edge of both vertical sides. The insulation shall be installed at or below a depth of at least 12" below finished grade and 6" inches above the top and 6" from each side of the building sewer or private interceptor main sewer. The minimum thickness of the foam insulation shall be determined from Figure 82.30–1 and Table 82.30–5.

Note: See Appendix for further explanatory material.

DRAWING NAME: DETAIL 5
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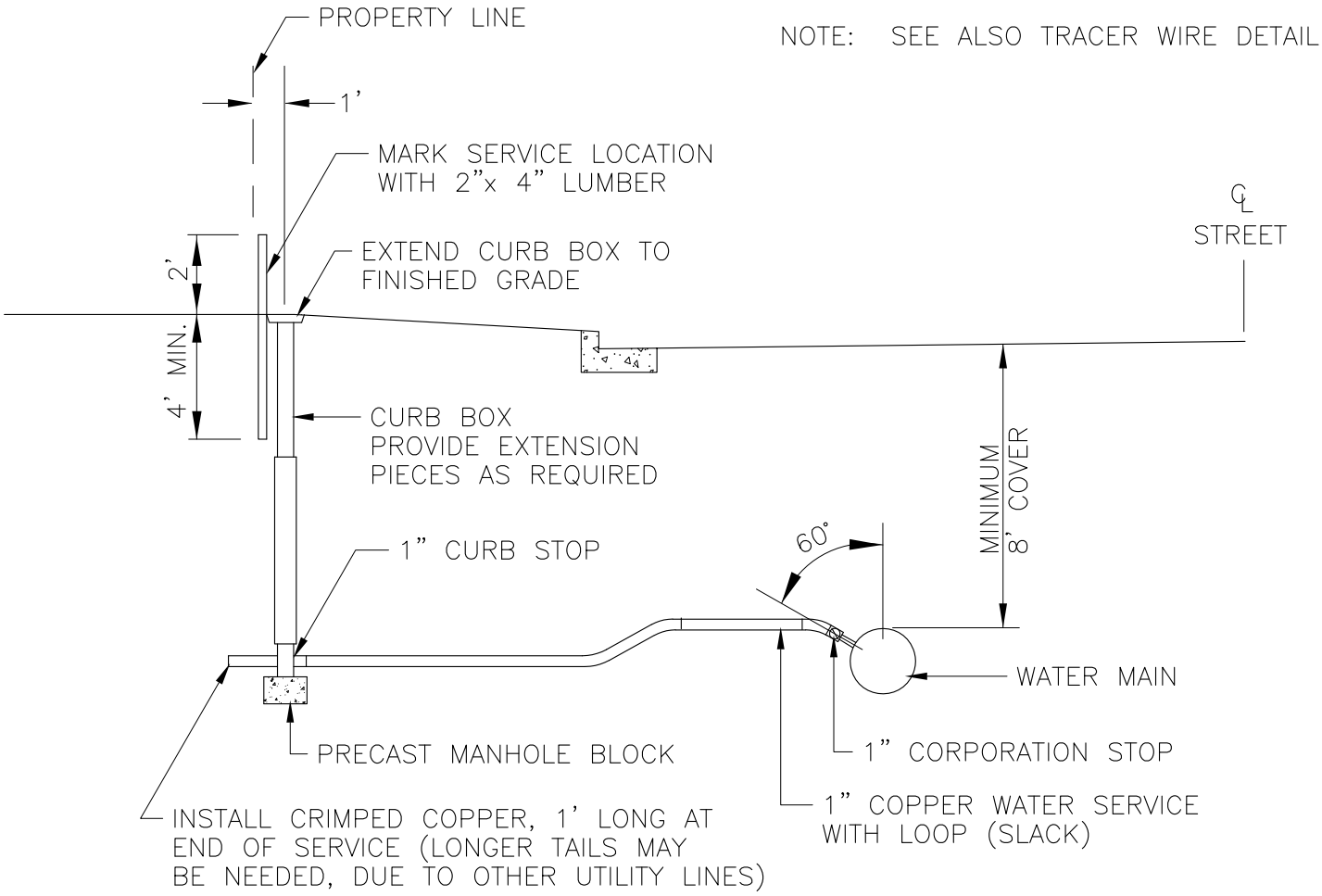
RIVER FALLS MUNICIPAL UTILITIES ENGINEERING GUIDELINES

WATER MAIN INSULATION DETAIL

PLATE NO. INSUL1

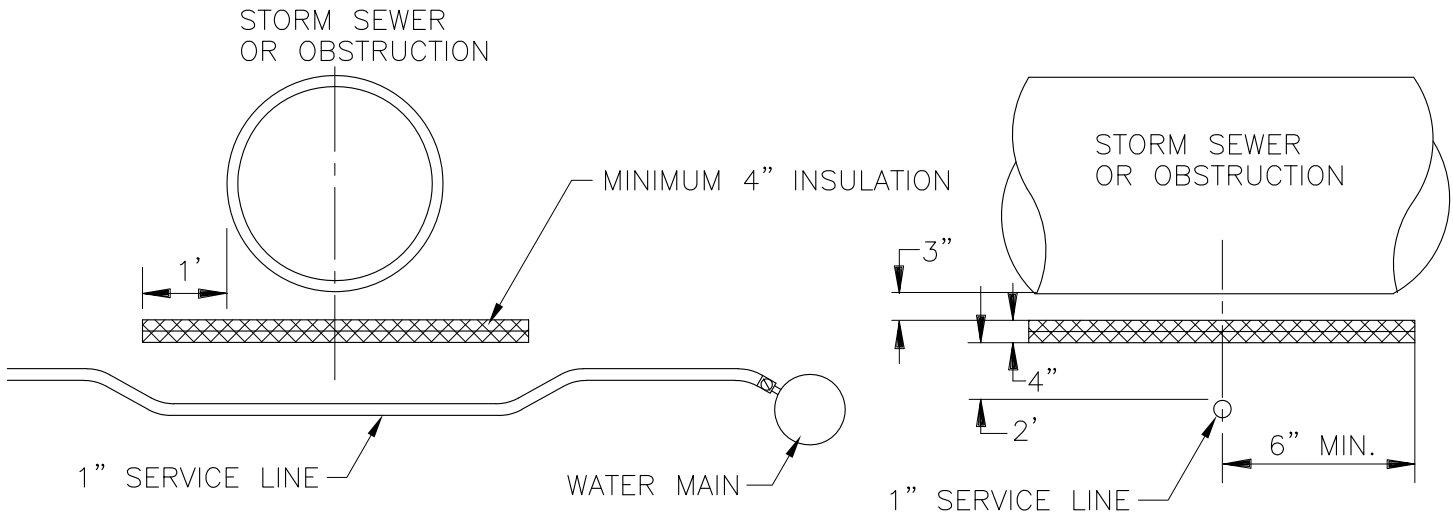
DATE 07/01/2010

1 / 1



NOTE: SEE ALSO TRACER WIRE DETAIL

WATER SERVICE CONNECTION



INSULATED WATER SERVICE

(IF STORM SEWER IS WITHIN 3 FEET OF WATER SERVICE)

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1" WATER SERVICE CONNECTION DETAIL

PLATE NO. WMSER1

DATE 07/01/2010

1 / 1

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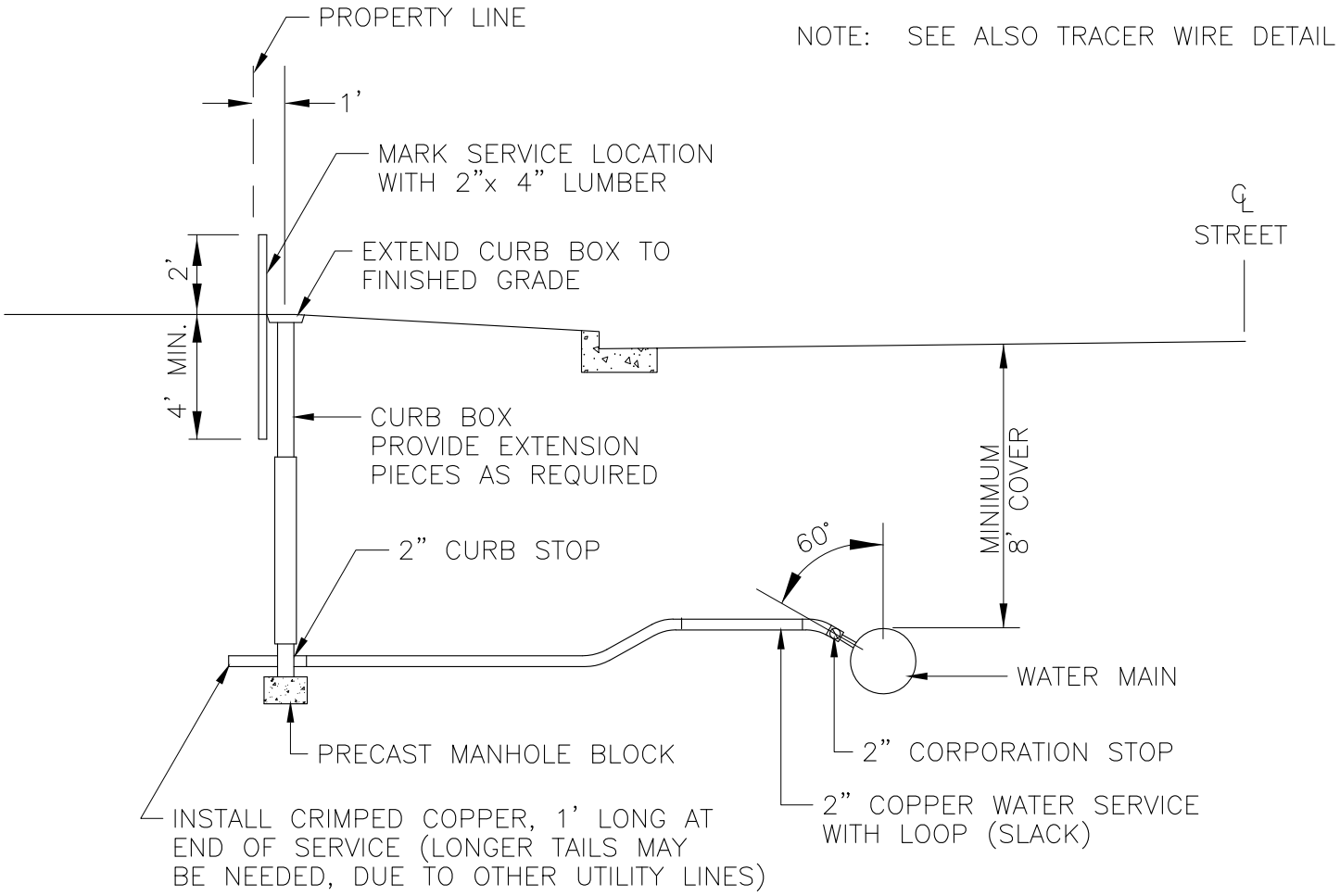
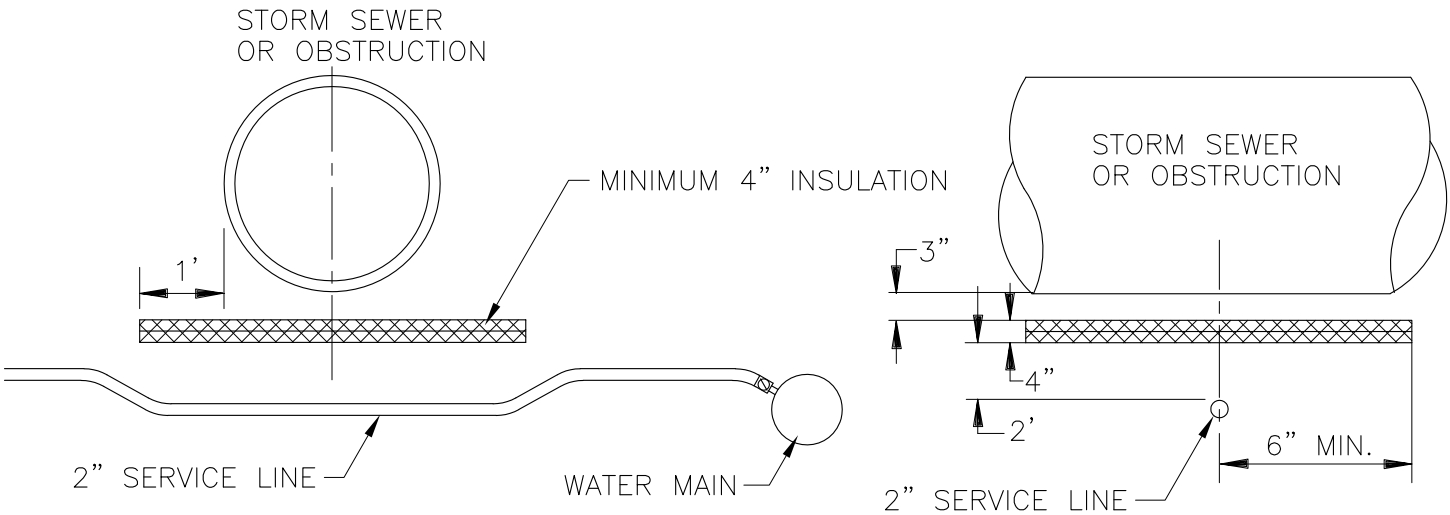


WATER SERVICE CONNECTION



INSULATED WATER SERVICE

(IF STORM SEWER IS WITHIN 3 FEET OF WATER SERVICE)

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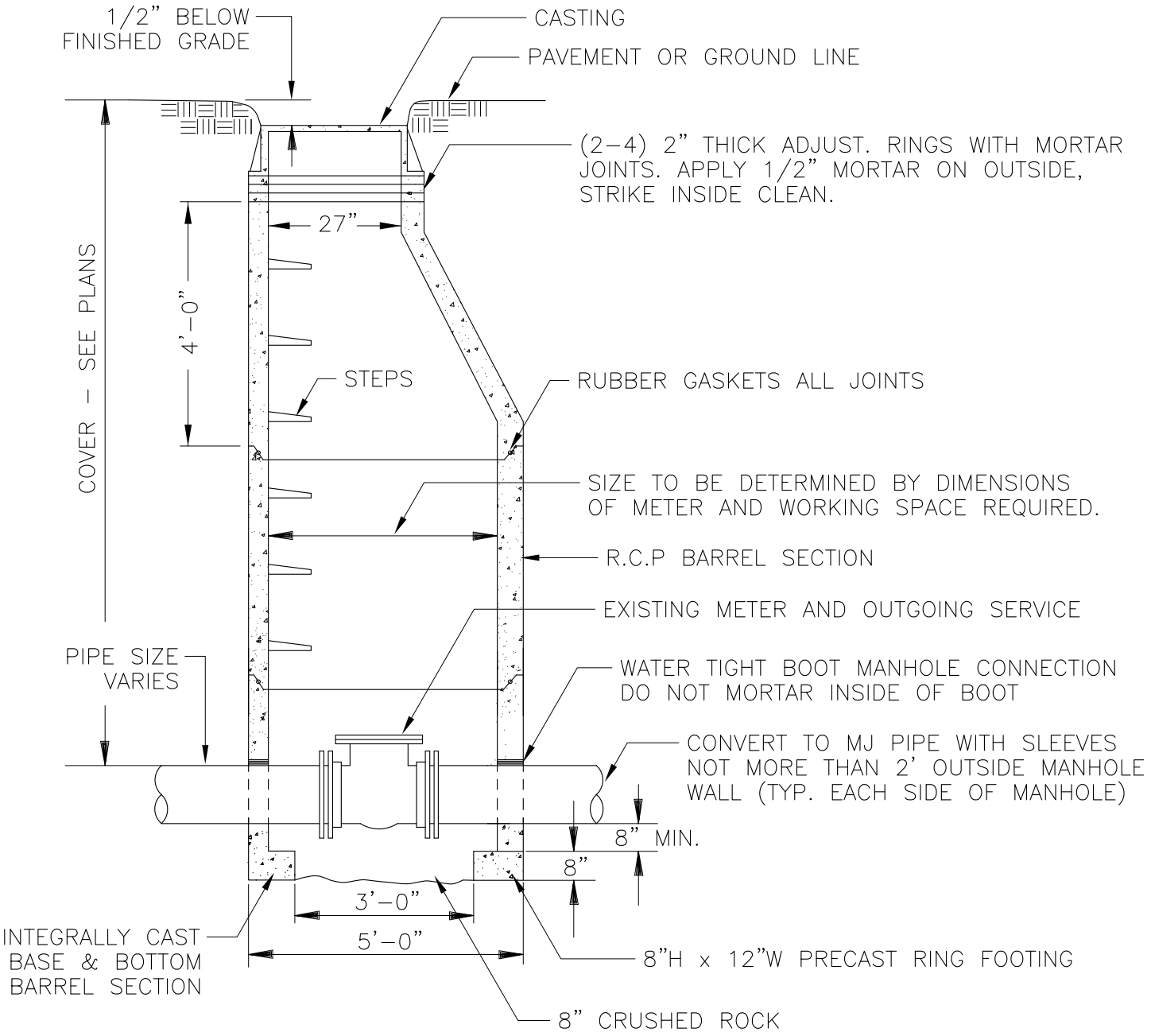
RIVER FALLS MUNICIPAL UTILITIES ENGINEERING GUIDELINES

2" WATER SERVICE CONNECTION DETAIL

PLATE NO. WMSER2

DATE 07/01/2010

1 / 1



NOTE:

ALL MANHOLES TO BE CL 3
RCP ASTM SPEC C 478

ALL FITTINGS INSIDE METER
MANHOLES TO BE FLANGED FITTINGS

IF GROUND WATER WILL BE
ABOVE BOTTOM OF BASE, THEN
MANHOLE SHALL BE WATER
TIGHT AND VACUUM TESTED,
IF REQUIRED BY UTILITY.

DRAWING NAME: DETAIL 8
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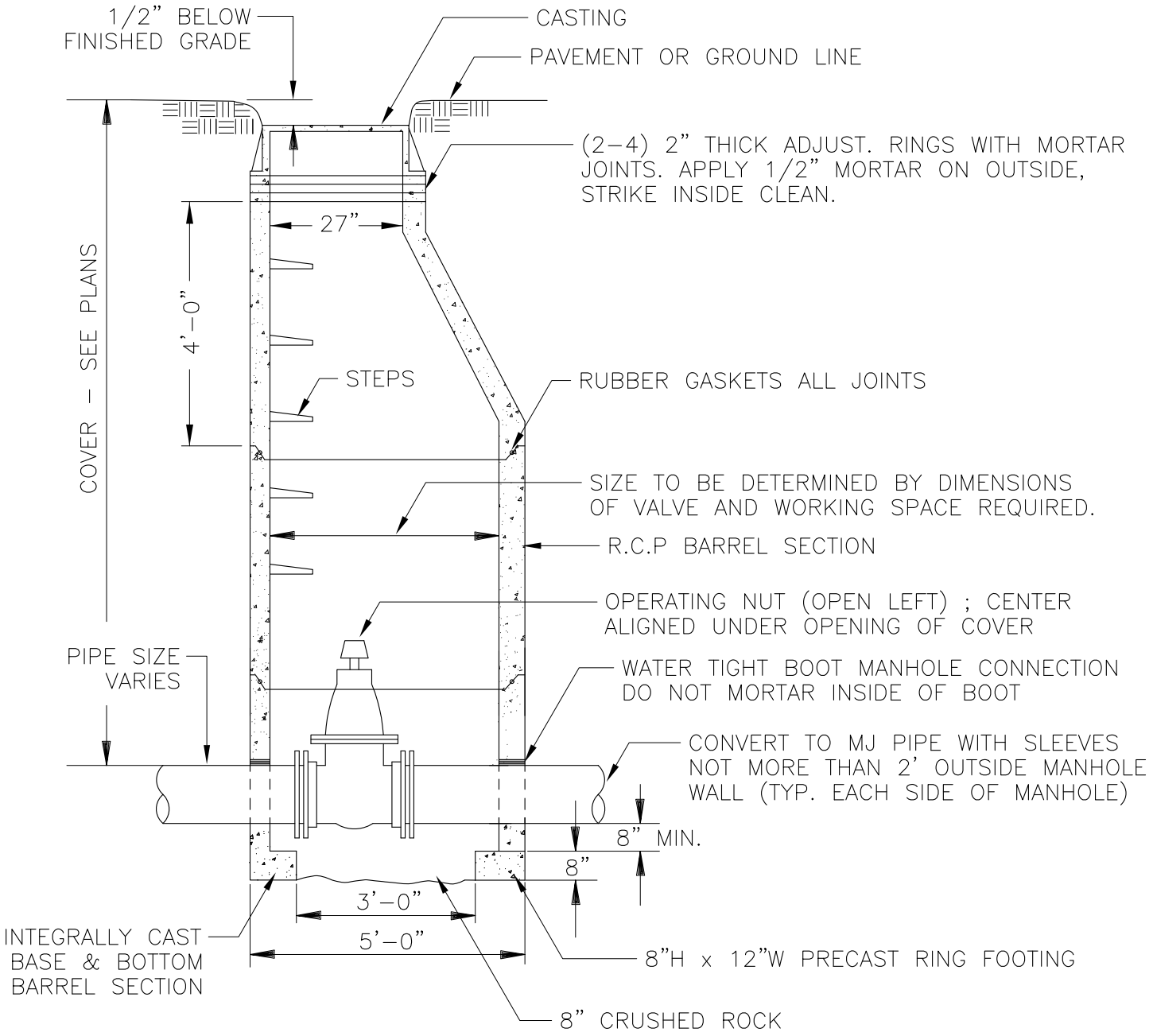
RIVER FALLS MUNICIPAL UTILITIES ENGINEERING GUIDELINES

METER MANHOLE DETAIL

PLATE NO. WMMH1

DATE 07/01/2010

1/1



NOTE:

ALL MANHOLES TO BE CL 3
RCP ASTM SPEC C 478

ALL FITTINGS INSIDE VALVE
MANHOLES TO BE FLANGED FITTINGS

IF GROUND WATER WILL BE
ABOVE BOTTOM OF BASE, THEN
MANHOLE SHALL BE WATER
TIGHT AND VACUUM TESTED,
IF REQUIRED BY UTILITY.

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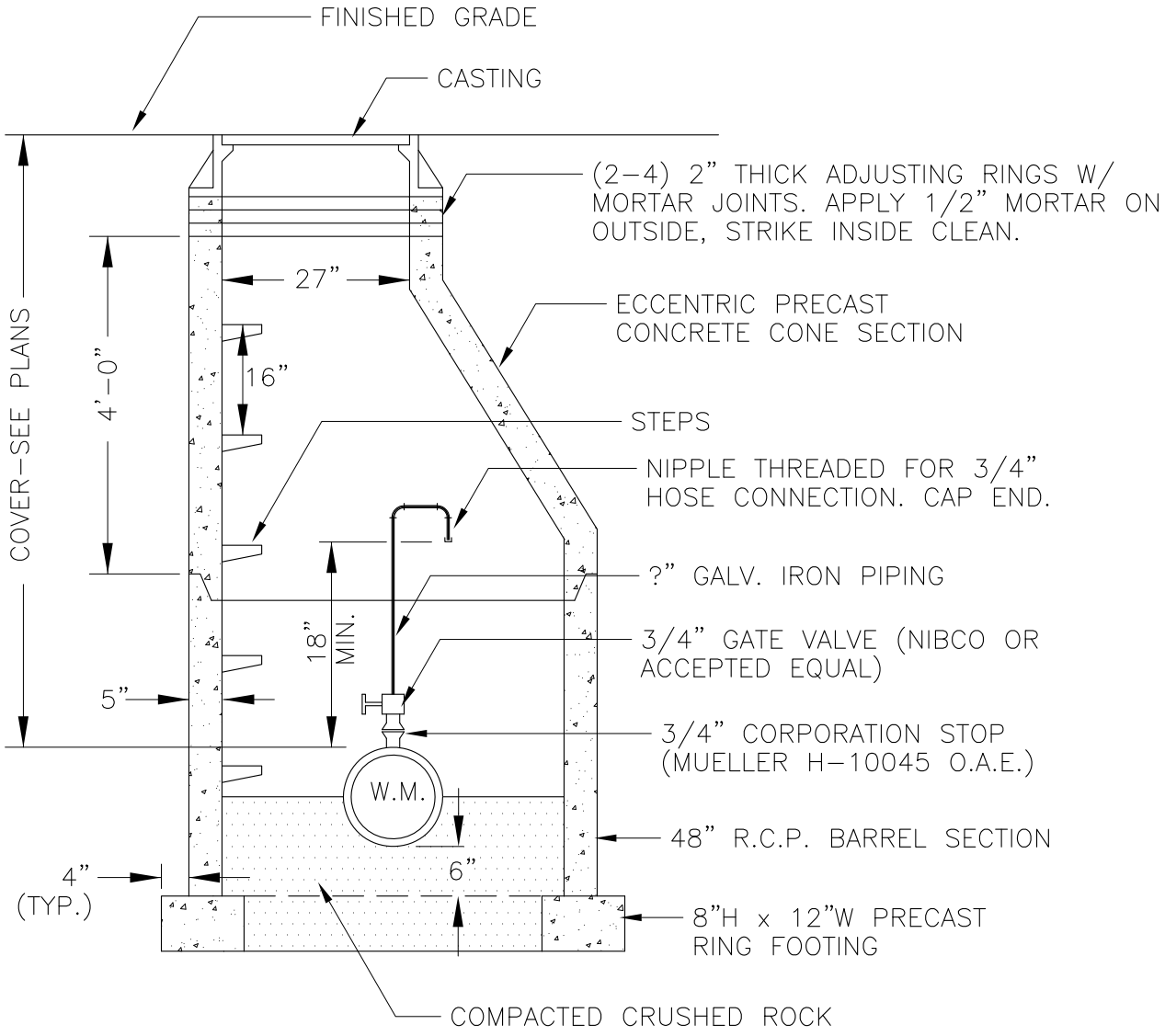
RIVER FALLS MUNICIPAL UTILITIES ENGINEERING GUIDELINES

VALVE MANHOLE DETAIL

PLATE NO. WMMH2

DATE 07/01/2010

1/1



DRAWING NAME: DETAIL 10
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SEH RIVER FALLS MUNICIPAL UTILITIES 222 LEWIS STREET RIVER FALLS, WI 54022 PHONE: 715.425.0906	RIVER FALLS MUNICIPAL UTILITIES ENGINEERING GUIDELINES	WATER MAIN AIR RELEASE MANHOLE DETAIL	PLATE NO. WMMH3 DATE 07/01/2010	1 / 1

IV. Sanitary Sewer Utilities

A. General Requirements

The general criteria for placement of sanitary sewer utilities within the right-of-way are listed below. Any deviation from these Standards must be approved in writing by River Falls Municipal Utilities.

1. Horizontal alignment: Centerline of right-of-way.

2. Pipe sizing: Based on future service areas, as determined by River Falls Municipal Utilities

3. Pipe slope: In accordance with Wisconsin Administrative Code § NR 110.13(2)(c):

Sewer Size	Minimum Slope (ft./100 ft.)
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12
21	0.10
24	0.08

4. Extent: Sewer mains shall be placed to furthest property lines at adequate size to serve future areas.

5. Vertical depth:
    a. Provide minimum of 10 feet of cover in future areas.
    b. Maximum depth: 20 feet unless approved by RFMU; to the maximum extent possible to eliminate lift stations; to be reviewed by RFMU on a case-by-case basis.

6. Manhole spacing: maximum 400 feet.

7. Lift stations:
    a. Reviewed on a case by case basis
    b. At a minimum: wet well dry well type with sumps and controls located in dry well
    c. Manufacturer: USEMCO
    d. Gate valve and box is required on force main within six feet of dry well discharge

8. Services shall not be connected to manholes. Note tracer wire requirements in Section II.

9. Cut in service installation: flex saddle by HEFCO Plastics, Inc.

B. Sanitary Sewer Systems (33 31 00)

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Gravity Sanitary Sewer Pipe
2. Sanitary Manholes and Appurtenances
3. Service Connections
4. Service Pipe
5. Riser Pipe

B. Related Sections:
1. Section 31 23 30 - Excavation, Backfilling and Compacting
2. Section 33 05 50 - Surface Facility Restoration

1.02 REFERENCES

A. ANSI:
1. A21.4 - Standard for Cement - Mortar Lining for Ductile Iron Pipe and Fittings
2. A21.11 - Standard for Rubber - Gasket Joints for Ductile Iron Pressure Pipe and Fittings
3. A21.51 - Standard for Ductile Iron Pipe Centrifugally Cast
4. A21.53 - Standard for Ductile Iron Compact Fittings, 3-inch through 16-inch

B. ASTM:
1. A48 - Specification for Gray Iron Castings
2. A74 - Specification for Cast Iron Soil Pipe and Fittings
3. C76 - Specification for Reinforced Concrete Pipe
4. C361 - Specification for Reinforced Concrete Low Head Pressure Pipe
5. C425 - Specification for Compression Joints for VCP and Fittings
6. C478 - Specification for Precast Reinforced Concrete Manhole
7. C564 - Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
8. D2321 - Recommended Practice for Installation of Flexible Thermo-plastic Sewer Pipe
9. D3034 - Specification for PVC Sewer Pipe and Fittings
10. F477 - Elastomeric Seals for Joining Plastic Pipe
11. F714 - Specification for PE Sewer Pipe and Fittings

1.03 SUBMITTALS

A. Submit Shop Drawings for each manhole.

B. Quality Assurance/Control Submittals:
1. Submit Certificates of Compliance from manufacturers certifying that materials meet reference specifications listed in Article 1.02.
2. Submit record of service connections weekly to River Falls Municipal Utilities.

C. Record Drawings: Accurately record locations of service laterals and field changes on a set of Drawings. Prior to final application for payment, deliver record drawings to River Falls Municipal Utilities.

1.04 HANDLING AND DELIVERY OF MATERIALS

A. Inspect pipe and materials during unloading process and notify River Falls Municipal Utilities of cracked, flawed or otherwise defective material.

B. Pipe shall not be skidded along ground.

1.05 STAKING

A. River Falls Municipal Utilities will provide sanitary sewer offset stakes at 50-foot intervals once.

B. Provide River Falls Municipal Utilities at least 3 work days' notice of need of staking.

1.06 MAINTAINING SEWER SYSTEM

A. Maintain flow in sanitary sewers on continuous basis while construction is underway.

B. Plug sewers with inflatable plug. Provide pumps, portable generators, hoses, and related items appurtenant to the Work.

C. Interruption of Service

1. Notify users a minimum of 24 hours prior to interrupting service.
2. Sewer service lines to individual users may be temporarily disconnected for a period not to exceed 4 hours for businesses and 8 hours for all other users.
3. Restore all interrupted or disconnected services at the end of each work day.

D. Bypass Pumping
1. Submit a schedule for bypass pumping to River Falls Municipal Utilities for review and approval prior to beginning any bypass pumping.
2. Include
   a. Bypass location
   b. Bypass pipe material
   c. Duration of bypass
   d. Type and style of pumps
   e. Power source for pumps
3. Have on site
   a. One pump of sufficient size to handle peak daily flow for each bypass location
   b. An additional back-up pump of sufficient size to independently handle peak daily flow
4. Remain on site while bypass pumping occurs
5. All lines must be restored to gravity flow at the end of the work day.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. Provide PVC pipe meeting the following requirements, unless otherwise approved in writing by River Falls Municipal Utilities:

Material (1)	Class	Joint
Reinforced Concrete	ASTM C76 (2)	R-4 (Round O-Ring Gasket)
PVC	SDR 35 ASTM D3034 ASTM F477	Elastomeric Gasket Water Stop Gasket
Cast Iron Soil Pipe	Service Weight ASTM A74 ASTM C564	Rubber Gasket
HDPE	SDR 17	Butt-Fusion
(1) Pipe material to be determined by DNR, Utility, and/or City requirements. (2) Pipe class to be determined based on depth of cover.		

B. Each pipe shall be stamped or indelibly marked with:
1. Type
2. Class
3. Manufacturer's name or mark

C. Provide pipe and fittings of each material type from same manufacturer.

D. Tees and wyes:
1. Inline fittings consisting of a standard or short length of main sewer with a factory-fabricated spur attached.
2. Where laterals will not be extended, provide manufacturer's standard approved stopper suitable to withstand pressure or leakage tests.

E. Risers and laterals:
1. PVC sewer pipe
2. 4-inch diameter
3. Joints: ring gasket or solvent weld
4. For depths greater than 20 feet: ASTM D1785, Schedule 80 PVC pipe with Schedule 80 sanitary fittings

2.02 MANHOLES

A. Precast Sections:
1. ASTM C478.
2. Cone: Eccentric.
3. Pipe and Manhole Section Joints: Gasketed, water-tight.
4. Bases: minimum 6-inch thick, integral to first riser.

5. Built in place manholes may be allowed for unusual circumstances if pre-approved by the Utility.

B. Covers and Frames:
   1. ASTM A48
   2. Type A: Neenah R-1726 A.
   3. Traffic-rated, unless otherwise noted.
   4. Covers: O-ring gaskets and concealed pick holes.
   5. Bolt down cover, if required: Neenah R-1916 D.

C. Steps:
   1. ASTM C478 Paragraph 11.
   2. Cast aluminum by Modern Metals Foundry (A-12).
   3. Polypropylene coated steel by MA Industries.

D. Adjusting Rings: Flat and wedge design, precast reinforced concrete or equal.

E. Gaskets:
   1. Resilient joint gaskets: rubber ring conforming to ASTM C443 or plastic conforming to ASTM C990.
   2. Provide at joint connection to manholes to create a watertight seal.

F. Chimney Seals:
   1. Adaptor, Inc. I/E.A
   2. Cretex Specialty Products External Manhole Chimney Seal.

G. Pipe/Boot Connection Seals:
   1. Provide at pipe entrance holes
   2. Press-Seal PSX, Scales/Res-Seal, A-Lok Products or equal

H. Rubber Riser Rings:
   1. Provide on all manholes
   2. 2-inch thick
   3. Single-piece
   4. Manufactured from 90% recycled tires
   5. Adaptor, Inc., Tread-Tech, or equal.

PART 3 EXECUTION

3.01 PREPARATION

A. Line and Grade:
   1. Provide means for accurately transferring line and grade from ground surface stakes to working point in trench:
      a. Laser beam equipment
      b. Other approved methods
   2. Submit method of transfer to River Falls Municipal Utilities at least three working days prior to beginning work. Methods that do no produce accurate control for setting line and grade will not be permitted.
   3. For projects where River Falls Municipal Utilities will provide line and grade, give three working days notice.

B. Water Stops: Provide in manholes as required to prevent infiltration into system.

3.02 CONSTRUCTION REQUIREMENTS

A. Pipe Installation:
   1. Comply with ASTM D2321 for PVC installation.
   2. Inspect pipe for defects and cracks while suspended before lowering into trench. Only pipe which is suitable for use shall remain on site.
   3. Lower pipe into trench using ropes, slings, or other devices.
   4. Place pipe bell at upstream end of pipe length.
   5. Install pipe from lower to higher invert elevation.
   6. Place plug in end of incomplete piping at end of day and when Work stops.
   7. Provide watertight plugs at future connection plugs.
   8. When water is present in trench, seals are to remain in-place while trench is pumped completely dry.
   9. See Section 31 23 33 for pipe foundation and backfill.

B. Manhole Installation:
   1. Place precast manhole base on compacted granular subgrade.
   2. Locate steps within 1 inch of vertical alignment and within 1 inch of required vertical spacing.
   3. Provide monolithic base for drop manholes.
   4. Provide watertight covers for manholes during construction.

C. Service Pipe:
   1. Extend pipe to right-of-way. Exact location shall be designated in the field by River Falls Municipal Utilities.
   2. Place pipe as nearly as possible perpendicular to main sewer.
   3. Install pipe at minimum grade of ¼-inch per foot or 1/8-inch per foot where main sewer is less than 9 feet deep.
   4. Use 1/8 or 1/16 bends for turns in line.
   5. Place gasketed plug at end of pipe.
   6. Mark end of service with a 4-inch by 4-inch by 8-foot timber terminating 3 feet above grade.
   7. Reconnect existing laterals at right-of-way with suitable pipe coupling.
   8. Maintain a record of each service connection as follows to be submitted to River Falls Municipal Utilities prior to final application for payment.:
      a. Type of service connection.
      b. Distance from downstream manhole.
      c. Length of riser/depth of service at stub-in.

D. Riser Pipe:
   1. Extend riser from service connection at 45-degree angle above horizontal to a point 11 feet below street grade.
   2. Install riser pipe against undisturbed trench wall.
   3. Place concrete collar around service connection as shown on Drawings.
   4. Where laterals will not be extended, provide block fittings with manufacturer's standard approved stopper suitable to withstand pressure or leakage tests.
   5. Deep sewer installations: vertical riser as approved by RFMU.

3.03 FIELD QUALITY CONTROL

A. Remove all dirt and foreign material from pipe interior prior to testing.

B. Gravity Sewer Pipe:
   1. Pipe diameter 27 inches and smaller: Air test.
   2. Pipe diameter larger than 27 inches: Infiltration test.

C. Perform the following tests upon completion of sewer construction and prior to any external plumbing connections:
   1. Infiltration test:
      a. Manholes shall be watertight, with no leakage permitted.
      b. Place 90-degree V-notch weirs in locations directed by River Falls Municipal Utilities to measure leakage in sewer lines.
      c. Allowable leakage rate shall be 100 gallons/day/inch diameter/mile of sewer between any adjacent manholes.
      d. Provide corrective measures for lines exceeding the allowable leakage rate.
   2. Air test:
      a. Place inflatable sewer stoppers in manhole at each end of reach to be tested.
      b. Connect 1 end of an air hose to plug used for air inlet.
      c. Connect other end of hose to portable air control equipment.
      d. This equipment consists of valves and pressure gages used to control the rate air flows to the test section and to monitor air pressure inside the pipe.
      e. Connect an air hose between compressor (or other source of compressed air) and control equipment.
      f. Add air to pipe section. Monitor air pressure so pressure inside pipe does not exceed 5.0 psig.

g. When pressure reaches 4.0 psig, stop air supply so internal pressure is maintained for 2 minutes.
h. These 2 minutes allow time for air temperature to come to equilibrium with the pipe walls.
i. During this time check plugs with soap solution to detect any plug leakage. If plugs are found to leak, bleed off air, tighten plugs, and begin again by supplying air.
j. After temperature has been allowed to stabilize for 2 minutes, disconnect air supply and allow pressure to decrease to 3.5 psig.
k. At 3.5 psig, start stopwatch to determine time required for pressure to drop to 2.5 psig.
l. Provide corrective measures for any line not meeting requirements.
m. Test results are usually better if sewer pipe walls are damp at time of testing.
n. Time shall be equal to or greater than the allowable time shown in table at end of this Section.

3. Deflection Test:
   a. Perform on PVC pipe at least 30 days after trench backfill has been placed.
   b. Perform test by pulling a mandrel through each line between manholes without aid of mechanical pulling devices.
   c. Mandrel diameter: 95 percent of nominal pipe size.
   d. The line will be considered acceptable if mandrel can progress through line without binding.
   e. Provide corrective measures for lines not meeting these requirements.

Time Required for a 0.5 PSIG Pressure Drop for Size and Length of Pipe Indicated

1 Pipe Diameter (inches)	2 Minimum Time (minutes:seconds)	3 Length for Minimum Time (feet)	4 Time for Longer Length (seconds)	Specified Minimum for Length (L) Shown (minutes:seconds)							
				100 feet	150 feet	200 feet	250 feet	300 feet	350 feet	400 feet	450 feet
4	1:53	597	.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23
42	19:74	57	20.942 L	34:54	52:21	69:49	87:15	104:42	122:10	139:37	157:04
48	22:67	50	27.352 L	45:35	68:23	91:11	113:58	136:46	159:33	182:21	205:09

END OF SECTION

C. Sewage Force Mains (33 34 00)

PART 1 GENERAL

1.01 SUMMARY

A. Section includes installation of sewage force main.

B. Related Sections:
1. Section 31 23 30 - Excavation, Backfilling and Compacting
2. Section 33 31 00 - Sanitary Sewer Systems

1.02 REFERENCES

A. ANSI:
1. A21.4 - Standard for Cement - Mortar Lining for Ductile Iron Pipe and Fittings
2. A21.11 - Standard for Rubber - Gasket Joints for Ductile Iron Pressure Pipe and Fittings
3. A21.51 - Standard for Ductile Iron Pipe, Centrifugally Cast
4. A21.53 - Standard for Ductile Iron Compact Fittings

B. ASTM D2241 - Specification for PVC Pressure-Rated Pipe

1.03 QUALITY ASSURANCE

A. Provide certificates from manufacturers certifying that the following materials meet the referenced requirements:
1. Pipe
2. Fittings

1.04 DELIVERY OF MATERIALS

A. Inspect all pipe and materials during the unloading process.

B. Notify RFMU of any cracked, flawed, or otherwise defective material.

C. Remove all materials found to be unsatisfactory by RFMU from the Site.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. Provide:

Material	Class	Joint
Cement-Lined Ductile Iron Pipe	CL 350	Push-On
Cement-Lined Ductile Iron Fittings	53	Mechanical
Polyvinyl Chloride Pipe	CL150 DR 18	Gasket
HDPE	CL may depend on depth of bury	Fusion

B. Provide all pipe and fittings of each material type from the same manufacturer.

PART 3 EXECUTION

3.01 PIPE INSTALLATION

A. Inspect pipe for defects and cracks while suspended.

B. Remove all dirt and foreign material from pipe interior prior to lowering into trench.

C. Install pipe at a depth to maintain 8 feet of cover from final surface elevation.

D. Install pipe at the elevations and grades indicated by Drawings and field stakes.

E. Pipe Foundation and Backfill Procedures: See Section 31 23 30.

F. Remove all dirt and foreign material from the pipe interior prior to testing.

3.02 FITTING INSTALLATION

A. Anchor fittings by means of restrained joint devices installed according to manufacturer's recommendations.

3.03 FIELD QUALITY CONTROL

A. Perform the following tests upon completion of force main construction and prior to connection to lift station.
   1. Pressure Test:
      a. Subject the entire length of force main to hydrostatic pressure test of 100 psi for a period of 1 hour.
      b. Measure pressure at lowest pipe elevation.
      c. Maintain constant pressure throughout test period.
      d. Provide pumps, gages, connections and other necessary apparatus.
   2. Leakage Test:
      a. Measure water volume required to maintain test pressure.
      b. Allowable leakage shall be determined by the formula:

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

L = Allowable Leakage in Gallons

S = Length of Pipe Tested in Feet

D = Nominal Diameter of Pipe in Inches

P = Test Pressure in Pounds/Square Inch

B. Provide corrective measures for any line exceeding allowable leakage.

END OF SECTION

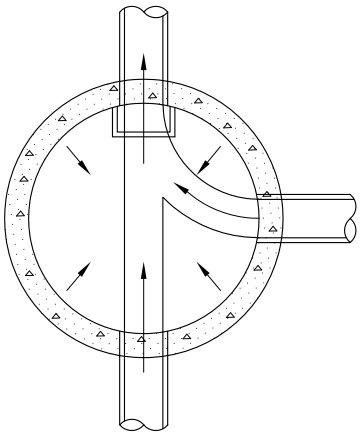
D. Sanitary Sewer Detail Plates

Sanitary Manhole

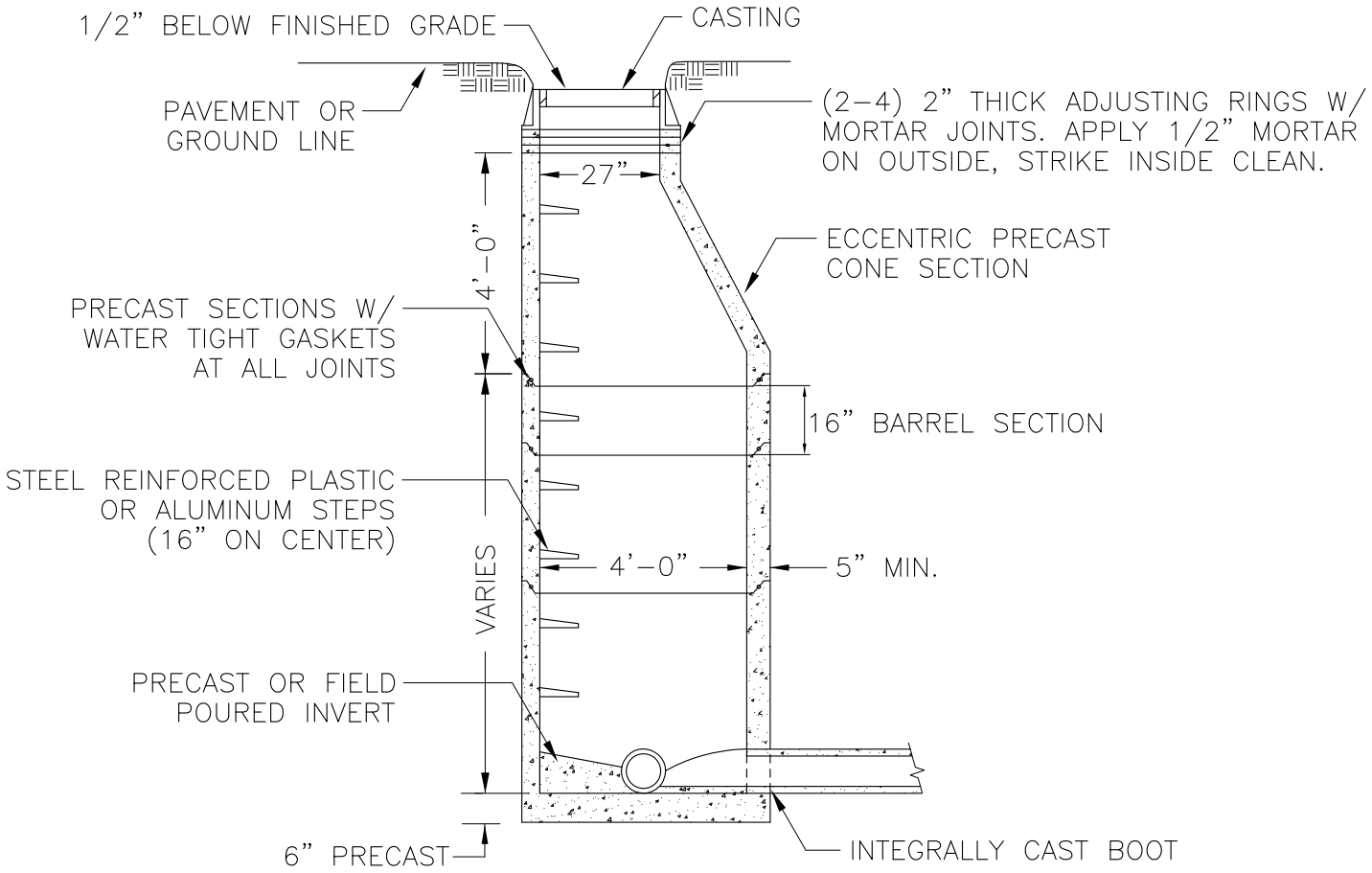
Sanitary Drop Manhole (Outside)

Sanitary Sewer Service

Sanitary Sewer Service Riser



PLAN



SECTION

BASE TO BE CAST INTEGRALLY WITH BOTTOM BARREL SECTION

PROVIDE FOR 0.1' DROP THROUGH INVERT OF MANHOLE

DRAWING NAME: DETAIL 11
PATH: P:\PT\R\RFMUN\010100\DWG\3.28.07DETAILS\DETAIL 11

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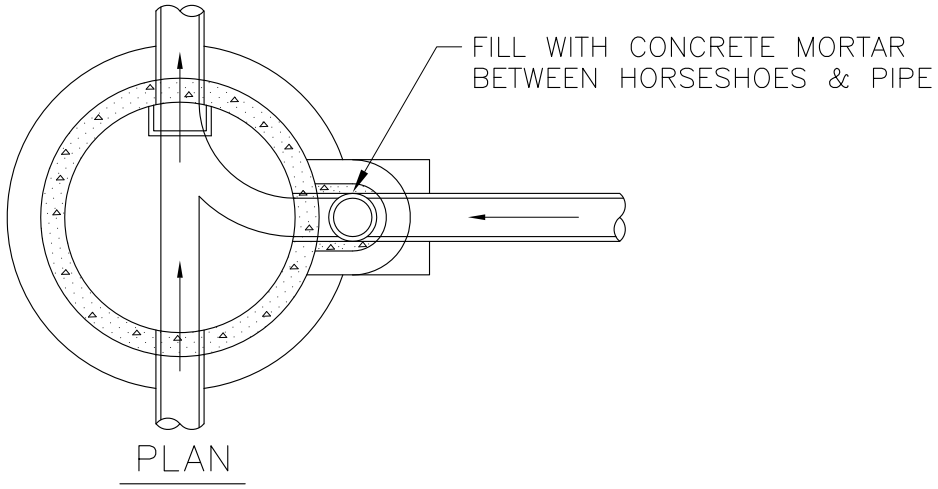
222 LEWIS STREET
RIVER FALLS, WI 54022
PHONE: 715.425.0906

RIVER FALLS MUNICIPAL UTILITIES ENGINEERING GUIDELINES

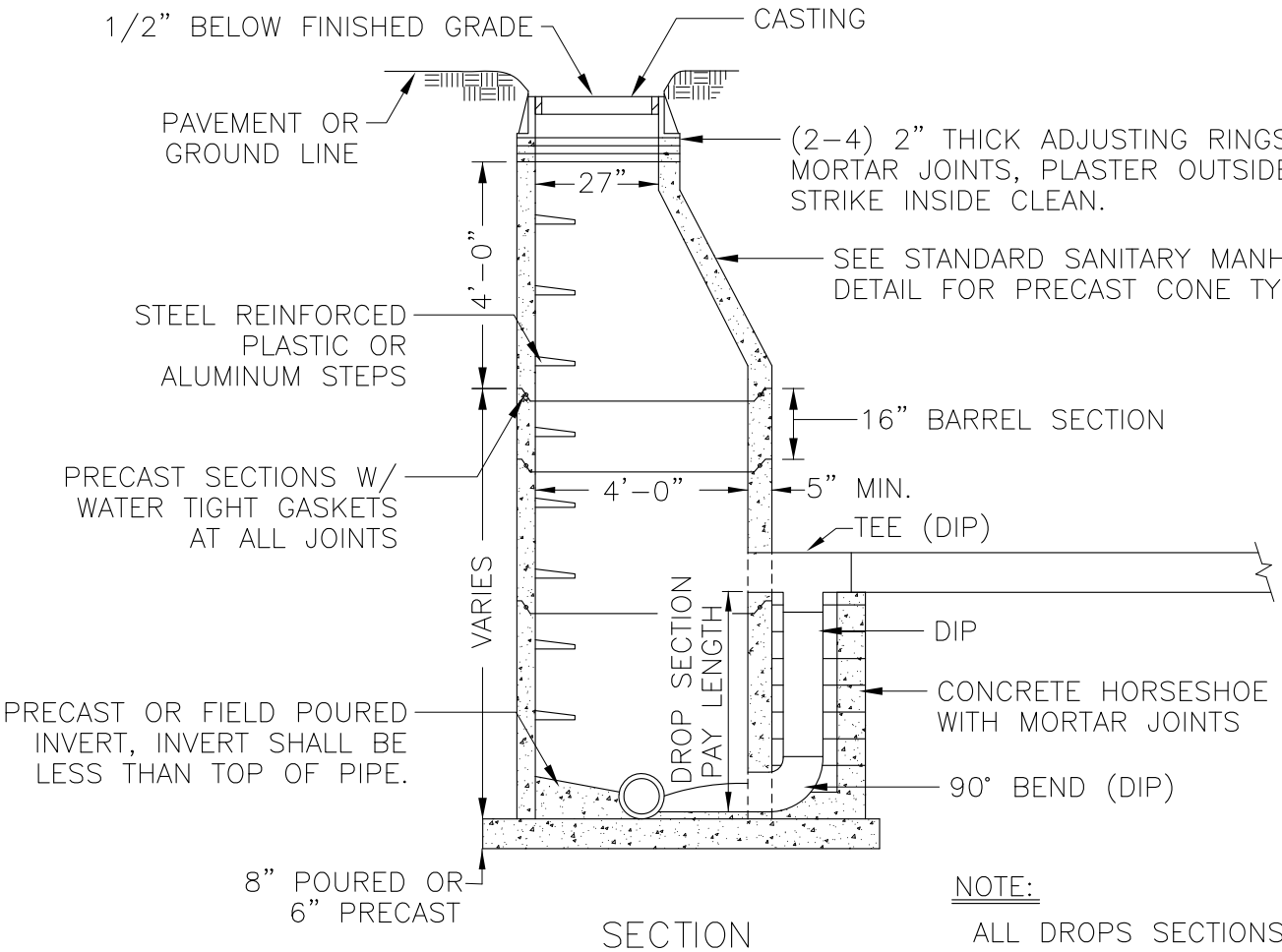
SANITARY MANHOLE DETAIL

PLATE NO. SSMH1

DATE 07/01/2010



PLAN



SECTION

NOTE:

ALL DROPS SECTIONS SHALL MATCH INCOMING PIPE SIZE UNLESS OTHERWISE NOTED.

DROP MANHOLES ARE REQUIRED WHEN DROP DISTANCES EXCEED 24 INCHES.

DRAWING NAME: DETAIL 12
PATH: P:\PT\R\RFMUN\010100\DWG\3.28.07DETAILS\DETAIL 12

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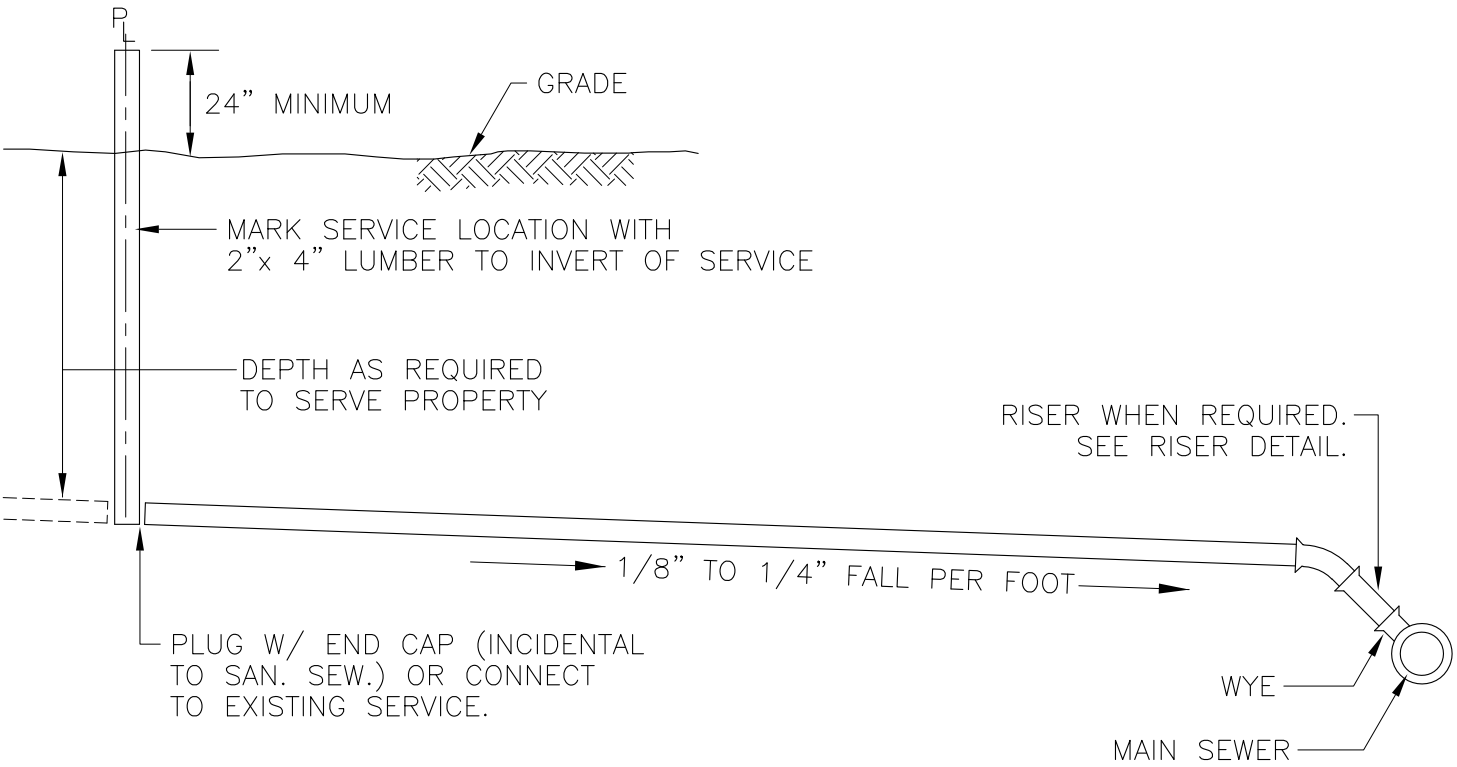
SANITARY DROP MANHOLE (OUTSIDE) DETAIL

PLATE NO. SSMH3

DATE 07/01/2010

1/1



NOTE: SEE TRACER WIRE DETAIL.

DRAWING NAME: DETAIL 13
PATH: P:\PT\R\RFMUN\010100\DWG\3.28.07DETAILS\DETAIL 13

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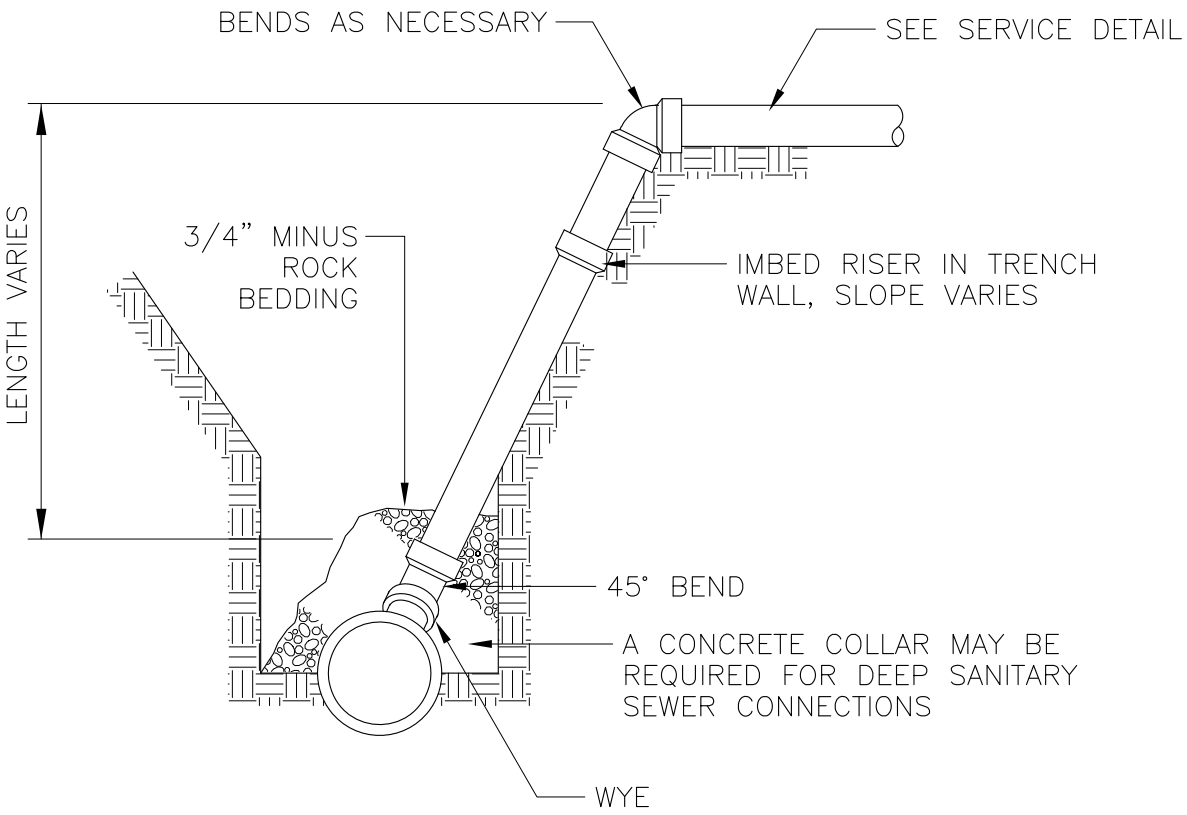
ENGINEERING GUIDELINES

SANITARY SEWER
SERVICE DETAIL

PLATE NO.
SSSER4

DATE
07/01/2010

1
1



NOTE:

FOR SIZE AND TYPE OF MATERIALS SEE SPECS

SEE ALSO TRACER WIRE DETAIL

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SANITARY SEWER SERVICE RISER DETAIL

PLATE NO. SSRISE

DATE 07/01/2010

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