

**Hudson Public Water Utilities  
Water Distribution Technical Specification  
City of Hudson, Wisconsin**

**February 2012**

**DOCUMENT 00 01 10**

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**SECTION 01 51 00**

**TEMPORARY UTILITIES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Temporary utility services including, but not limited to:
  - 1. Temporary utility services and facilities.
  - 2. Construction water.
  - 3. Temporary water service.
- B. Related Sections:
  - 1. Section 33 11 00 – Water Distribution Systems
- C. Method of Measurement:
  - 1. Temporary Water System
    - a. Lump sum price for “Temporary Water Supply System” as listed on the Bid Form.
    - b. Payment shall be compensation in full for furnishing labor, equipment, and materials to provide and maintain individual, temporary water service to buildings.
    - c. Disinfection and header-pipe ramping and trenching shall be considered incidental.
- D. Basis of Payment:
  - 1. Payment for acceptable quantities of water main and appurtenances shall be at the Contract Unit Price as listed on the Bid Form. All associated Work items shall be considered incidental

**1.02 QUALITY ASSURANCE**

- A. Comply with requirements of local laws and regulations governing construction and local industry standards, in the installation and maintenance of temporary utility services.

**PART 2 PRODUCTS**

**2.01 MATERIALS AND EQUIPMENT**

- A. Provide all required materials and equipment for temporary services and facilities.
- B. Used materials and equipment may be used, if acceptable to Engineer.
- C. Provide only materials and equipment that are suitable for intended use and comply with appropriate standards.
- D. Submit product list for approval by Engineer for all temporary utility systems.

**2.02 UTILITIES**

- A. Where local utility company provides only a portion of temporary utility, provide remainder with matching, compatible materials and equipment. Comply with utility company’s recommendations and requirements.

**2.03 SUBMITTALS**

- A. Submit proposed materials and pipe sizes to be used with temporary water service system.
- B. Submit proposed staging and operations plan for temporary water service system for approval by Engineer.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Provide each temporary service and facility ready for use at each location when service or facility is first needed.
- B. Locate temporary utilities where they will serve Project and result in minimum interference with performance of the Work.

Temporary Utilities

- C. Locate temporary utilities where they will allow ADA accessibility to all adjacent properties.
- D. Maintain, relocate, modify, and extend utilities as required during course of Work.
- E. Use qualified tradepersons for installation of temporary utilities.

### **3.02 TEMPORARY WATER SERVICE**

- A. During construction, maintain potable water service to existing users on a continuous basis until service from newly installed mains can be constructed, tested, and placed into service.
- B. Provide temporary service prior to disrupting existing service.
- C. Provide minimum 48-hour notice to Utility staff, Engineer and all affected property owners prior to service disruption.
- D. Obtain at connection approved by Owner where usage can be metered and system sanitation can be maintained.
- E. Coordinate installation with Hudson Water Utility staff.
- F. Contractor to make all connections, including flushing of existing water meters.
- G. Avoid damage to permanent plumbing at source of temporary water.
- H. Adapters, fittings, and piping materials must be pre-approved by the City Engineer.
- I. Disinfect service lines, headers, connections, and appurtenances in accordance with Wisconsin DNR rules and regulations.
- J. All piping and appurtenances shall pass disinfection tests per paragraph 3.03 prior to being put into service.

- K. Maintain temporary water distribution system to avoid damage to existing or new construction.
- L. Protect temporary water system from freezing.

### **3.03 CONSTRUCTION WATER**

- A. Owner will pay for water used for temporary water service purposes.
- B. Secure water necessary for construction and testing and pay service connection charges.
- C. Install potable water service and distribution piping of sizes and pressures adequate for property uses.
- D. Install water service and distribution piping of sizes and pressures adequate for construction purposes.
- E. Where available supply of potable water is inadequate, provide non-potable water for purposes other than drinking and washing.
- F. Where non-potable water is used, provide warning signs on the discharge end of each length of hose and at the shut-off nozzles.
- G. Where shut-off nozzles are used at water hose discharge, provide heavy-duty abrasion-resistant hoses with a pressure rating at least twice the maximum pressure of the water distribution system.
- H. Trades needing a larger source of water are responsible for the source and distribution.
- I. Exercise control over usage to conserve water.
- J. Sterilize temporary water piping for potable water prior to use.
  - 1. Disinfect all newly installed water mains, appurtenances and services in accordance with AWWA C651.
    - a. Granular or Continuous Feed Method:

- 1) Hold chlorine solution in pipe for a minimum period of 24 hours.
  - a) Initial dosage: 50 ppm minimum.
  - b) Residual dosage after hold period: 10 ppm minimum.
2. Flush system 24 - 48 hours after initial dosage of chlorine.
3. Sampling and Testing:
  - a. After final flushing, obtain 2 sets of samples taken a minimum of 24 hours apart.
  - b. Each sample set shall include:
    - 1) One sample for every 1,200 feet of main.
    - 2) One sample at each dead-end.
    - 3) Ensure that 1 sample is obtained from each branch of main.
    - 4) Minimum sample required: 2
  - c. Perform coliform tests on each sample.
  - d. Rechlorinate if any sample tests positive for coliform.
  - e. Provide accepted coliform testing results to Engineer prior to connection of temporary water system to existing properties or services.
- K. Maintain distribution system to avoid damage to existing or new construction.
- L. Avoid damage to permanent plumbing at source of temporary water.
- B. Operate temporary services and facilities in a safe and efficient manner.
  1. Do not overload temporary services or facilities.
  2. Protect from damage by freezing temperatures and similar elements.
  3. Prevent water-filled piping from freezing by use of ground covers, insulation, draining, or by temporary heating.
  4. Maintain distinct markers for underground lines.
  5. Protect from damage during excavation operations.
- C. Unless Engineer requests that it be maintained for a longer period of time, remove each temporary service and facility promptly when no longer needed, when it has been replaced by the authorized use of a permanent facility, or no later than Substantial Completion.
- D. Complete or restore permanent Work which may have been delayed because of interference with temporary service or facility.
- E. Repair damaged Work, clean exposed surfaces, and replace Work which cannot be satisfactorily repaired.
- F. Materials and facilities that constitute temporary services and facilities are, and will remain, the property of Contractor.
- G. At Substantial Completion, clean and renovate permanent services and facilities that have been used to provide temporary services and facilities during construction, including but not limited to:
  1. Replace significantly worn parts and parts that have been subject to unusual operating conditions.

### **3.04 OPERATION, TERMINATION, AND REMOVAL**

- A. Enforce strict discipline in use of temporary services and facilities at the Site.
  1. Limit availability of temporary services and facilities to essential and intended uses to minimize waste and abuse.
  2. Do not permit temporary installations to be abused or endangered.
  3. Do not allow hazardous, dangerous, or unsanitary conditions to develop or persist on Site.

**END OF SECTION**

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**SECTION 31 23 33**

**TRENCH EXCAVATION AND BACKFILL**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Trench Excavation
  - 2. Special Pipe Foundation
  - 3. Trench Backfill
  - 4. Compaction
  - 5. Pipe Grade and Alignment Conflicts
  
- B. Related Sections:
  - 1. Section 33 11 00 - Water Distribution Systems
  
- C. Method of Measurement
  - 1. Trench Excavation and Backfill:
    - a. Incidental to associated pipe installation.
  - 2. Rock Excavation:
    - a. Measure by volume in cubic yards.
    - b. Measure vertically from top of rock to 6 inches below pipe exterior.
    - c. Measure horizontally to 12 inches on each side of pipe exterior.
    - d. Consider boulders less than 1 cubic yard incidental to excavation.
  - 3. Special Pipe Foundation Materials:
    - a. Measure by weight in tons of materials acceptably placed.
    - b. Weight shall be based on sum of individual load tickets provided within 24 hours of time of delivery to Site.
    - c. Bid price includes removal and disposal of material replaced.
  - 4. Replacement Backfill:
    - a. Measure by weight in tons of material acceptably placed.
    - b. Weight shall be based on sum of individual load tickets provided within 24 hours of time of delivery to Site.
    - c. Bid price includes removal and disposal of material replaced.

- 5. Compaction: Incidental to associated pipe installation.
- 6. Dewatering: Incidental to associated pipe installation.

- D. Basis of Payment
  - 1. Payment for quantities measured in this section shall be at the contract unit price as listed on the Bid Form. All associated work items shall be considered incidental.

**1.02 SUBMITTALS**

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

**1.03 SITE CONDITIONS**

Groundwater: Provide trench dewatering if groundwater surface is above or within 3 feet of the pipe zone.

**1.04 WARRANTY**

- A. Contractor to repair all trench settlements and resulting damage or displacement of surface facilities that occurs within two years after final project approval.

**PART 2 PRODUCTS**

**2.01 SOIL MATERIALS, GENERAL**

- A. Soil for fill and backfill shall be free of organic matter, debris, frozen soils, ice, and other objectionable materials. Rock particles larger than maximum size specified shall be removed.
  
- B. Select existing material excavated from Site may be used if it meets requirements specified. If necessary, furnish additional

Trench Excavation and Backfill

approved material from suitable off-site sources.

## 2.02 GRANULAR BASE, BEDDING, AND BACKFILL

- A. Use select soils complying with ASTM D2487 soil classification groups GW (well-graded gravel), GP (poorly graded gravel), SW (well-graded sand), SP (poorly graded sand), or combinations thereof. Aggregate shall pass a 3/4-inch sieve and not more than 35 percent shall be retained on a No. 10 sieve. Maximum 3 percent by weight may pass a No. 200 sieve.

## PART 3 EXECUTION

### 3.01 CONSTRUCTION REQUIREMENTS

- A. Trench Excavation
1. Trench Safety
    - a. All excavations shall conform to OSHA Standards for Excavating, Trenching and Shoring.
  2. Alignment and Grade
    - a. Excavate trench to alignment and grade as staked.
    - b. Excavate no more than 100 feet in advance of pipe laying operation.
  3. Trench Width at Pipe Zone
    - a. Center trench on pipe alignment.
    - b. Minimum Width: Pipe O.D. + 12 inches.
    - c. Maximum Width: Pipe O.D. + 24 inches (except rock excavation).
  4. Excavated Materials
    - a. Use stable material for backfill.
    - b. Waste unstable material as directed.
    - c. Do not place materials on sidewalk, driveways or drainageways.
  5. Drainage
    - a. Provide dewatering trenches when required.
    - b. Drain trench water into natural channels or storm sewer.
    - c. Do not drain trench water into sanitary sewer.

B. Pipe Foundations

1. Engineer to determine stability of the trench bottom.
  2. Stable trench bottom.
    - a. Shape trench bottom to conform to bottom half of pipe.
    - b. Excavate bell holes to permit proper jointing.
- C. Trench Backfill
1. Pipe Zone
    - a. Use native material free of rocks and other unsuitable debris.
    - b. Deposit material uniformly on both sides of pipe throughout entire trench width.
    - c. Place material in 6-inch lifts and mechanically compact.
  2. Above Pipe Zone
    - a. Use native materials free of debris and rock, concrete or clay lumps with a volume greater than 1/3 cubic foot.
    - b. Place in uniform lifts no more than 1-foot thick.
    - c. Mechanically compact each lift of the upper 3 feet of the trench to a Standard Proctor Density of 100 percent.
    - d. Mechanically compact each lift under the upper 3 feet of the trench to a Standard Proctor Density of 95 percent.
    - e. Do not backfill unless approved compaction equipment is operating.
    - f. Fine grade street subgrade to staked elevation and cross section.
  3. Excess or Deficiency of Backfill Material
    - a. Dispose of excess backfill material as directed after all trenches are backfilled.

### 3.02 FIELD QUALITY CONTROL

- A. Density tests on backfill materials will be as directed by the Engineer.
- B. Contractor to recompact all areas represented by failed density tests.



- C. Owner will provide for initial test and first retest.
- D. Costs of subsequent retests to be deducted from Contractor's payment.

### **3.03 PIPE CLEARANCES AND CONFLICTS**

- A. Provide clearance between sewers and watermain as follows:
  - 1. Maintain 10-foot horizontal between pipes.
  - 2. Maintain 18-inch vertical separation between pipes.
- B. When 18-inch vertical separation between sewer and watermain cannot be maintained, provide special pipe crossing as follows:
  - 1. Advise Engineer of pipe conflict.
  - 2. Lower watermain in accordance with plan detail or as directed.
  - 3. Provide 18-inch vertical separation between pipes.
  - 4. Construct sewer using pipe material and joints equal to watermain at the crossing point.
  - 5. Center pipe lengths at the crossing point.
  - 6. Provide special foundation material for both pipes.
  - 7. Place insulation as directed.

**END OF SECTION**

## SECTION 31 71 30

### HORIZONTAL DIRECTIONAL DRILLING (HDD) PIPE INSTALLATION

#### 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 33 - Trench Excavation and Backfill
  - 2. Section 33 11 00 - Water Distribution Systems
- C. Method of Measurement:
  - 1. Tapping Saddles: Tapping saddles are considered incidental to the corporation stop.
  - 2. HDD Pipe Installation:
    - a. HDD pipe installation is incidental to installation of the associated utility pipe.
    - b. Tracer wire and test stations are considered incidental to the installation of the water main.
- D. Pipe installation by the method of Horizontal Directional Drilling (Guided Boring) must be approved by the Hudson Water Utility.

##### 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. HDD Specialty Subcontractor: Firm engaged in the trenchless construction of underground pipelines and with demonstrated competency using HDD method if installation.
- C. DIPS: Ductile Iron Pipe Size.
- D. HDPE: High Density Polyethylene.

##### 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. Stabilize the bore hole with drilling fluids approved by Wisconsin DNR Bureau of Drinking Water and Groundwater.
  - 6. Remove toolhead and install drill string and pipe in receiving pit.
  - 7. Pull drill string and pipe back to drilling pit along pilot hole alignment.

8. Pilot hole is enlarged as required to accommodate pipe during pullback.
9. 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, boring machine operators, and personnel conducting HDPE pipe joining operations.
2. Previous HDD boring project references.

### D. Revised Drilling Equipment, Methods and Procedures:

1. If the Contractor determines that modifications to the methods and equipment, as stated in the submittals, are necessary during construction, the Contractor shall immediately notify the Engineer verbally, followed by a plan in writing, within 24 hours, describing the modifications, including reasons for the changes.

### E. Drilling Fluid Testing Results During Drilling and Pullback:

1. Fluid Density.
2. Marsh Funnel Viscosity.
3. pH.
4. Sand Content.
5. Gel Strength.
6. Filtrate and Filter Cake.

### F. A plot of horizontal and vertical alignment of pilot hole in intervals of 30 feet or less. Notify Engineer verbally of deviation from plan alignment and profile. Provide daily plot of alignment and profile.

### G. Logs of pullback pressures for each setup upon completion of the bore and pipe installation.

### H. Certificates: Provide Certificates of Compliance from the manufacturer certifying that the HDPE pipe and fittings meet the requirements listed in this section.

## 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 Engineer prior to initial boring.
- E. Minimum Qualifications for HDPE Pipe Joining Personnel:
  - 1. The personnel in the field joining the HDPE pipe by the heat fusion method shall be factory trained and further qualified by having more than 1 year experience joining plastic piping materials. The joiner shall also have experience and knowledge of inspection and evaluating fusion joints by visual examination and destructive testing. The joiner shall perform a satisfactory field joining in the presence of the manufacturer's expert joiner prior to the start of the project. A copy of their qualifications shall be submitted in accordance with Section 1.05.
- F. HDPE Field Joint Destructive Tests:
  - 1. The heat fusion field test joint(s) shall be evaluated according to the following procedures by the Contractor under observation of the Engineer.
    - a. The specimens are prepared by cutting a fusion joint into strips approximately 10 inches long by 1 inch wide. Only one test is to be made on a single strip. Prior to the testing of the specimens, allow a time interval of at least 60 minutes from the end of the heat fusion procedure to allow the specimens to cool.
    - b. Failure of the joint in any of the tests will be indicated by visual evidence of splitting, cracking, breaking or tearing and shall be cause for disqualification of the joiner.
    - c. Specimens shall be retained following tests and tagged with the joiner's name and date of test.
  - 2. Test Descriptions:
    - a. Root Bend: Bend until outside pipe walls are within 30 degrees of contact.
    - b. Face Bend: Bend until inside pipe walls are within 30 degrees of contact.
    - c. Impact: Place specimen in vise with joint above the vise jaws. Strike the specimen with a 3-pound hammer on the pipe walls, close to the joint.
    - d. Bend testing of Socket Fusion Joints:
      - 1) Cut at least 3 strips 1 inch wide lengthwise through the socket so that about 10 inches of pipe remains on each side of the fitting.
      - 2) Hold each strip at the ends and bend the sample.
      - 3) Continue to hold each sample in the bent position and thoroughly examine the entire fusion area. If any separation, cracks or voids are observed, the fusion is defective.
      - 4) A joint is considered satisfactory if all bent samples are completely free of cracks or voids in the fusion area.
      - 5) Specimens shall be retained following test and tagged with the joiner's name and date of test.

**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.

**1.08 SITE CONDITIONS**

- A. The Contractor is responsible for all costs associated with encountering obstructions. Adjust methods, alignment, or perform open cut operations to dislodge stuck equipment

or product at no additional cost to the Owner.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. High Density Polyethylene Pipe (HDPE) AWWA C906:
  - 1. DIPS (Ductile Iron Pipe Size) DR 11 – 160 psi water pressure.
  - 2. Heat fused joints.
  - 3. NSF, Standard #14 and #61 (by size and order).
  - 4. PPI Designation: PE 3408.
  - 5. Cell Classification: ASTM D3350 - PE 345444C.
  - 6. Material Description: ASTM D3350 – Type 111 Grade PE 34.
  - 7. Continuously mark pipe with size, dimension, manufacturer's name, cell class, ASTM basis, pipe test category plant identification, production date, operator number, and resin supplier code.
  - 8. Color: Black with blue stripe.
- 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.  $Al_2O_3$ : 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 or polymer extenders as required.
- C. Coordinate with Owner to obtain water supply for on-site mixture.

**2.05 ACCESSORIES**

- A. Tracer Wire:
  - 1. Contractor shall provide and install #12 AWG Solid (0.0808" diameter) CCS extra high strength hard drawn horizontal directional drill tracer wire manufactured by Copperhead Industries, LLC or approved equal.
  - 2. Tracer wire shall have a minimum 45 mil HDPE, 30 volt minimum rating, and

- 1150 pound minimum average break strength.
- 3. Tracer wire shall be blue for watermain and green for sanitary sewer.
- 4. Attach tracer wire to pipe in a manner that ensures it remains intact throughout the entire installation process.

- B. Test Station:
  - 1. Tracer wire test stations shall be installed at each boring pit location (including gate valve and/or hydrant locations and air release manholes).
  - 2. Each tracer wire test station shall be marked and identified with a Tri-View Flex test station containing two internal terminals manufactured by Rhino Marking & Protection Systems or approved equal.
  - 3. Test stations for water shall be blue with Rhino Part #TVTI72BB2 or approved equal and shall contain one decal on each side of test station with Rhino Part #GD8-1332K or approved equal.

**2.06 TAPPING SADDLES**

- A. High Density Polyethylene (HDPE) Watermain:
  - 1. One of the following saddles shall be used for tapping into HDPE watermain:
    - a. Side fusing tapping saddle as manufactured by Poly-Cam, Inc. or approved equal.
    - b. Electrofusion Corp. saddle as manufactured by Central Plastics Company or approved equal.

**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.

- b. Anti-thrust restraint glands with stainless steel pipe stiffeners.
  - 1) Anti-thrust restrain glands shall be Megalug by Ebaa Iron, or approved equal.
  - 2) Pipe stiffeners shall be Model CPS as manufactured by Cascade Waterworks Mfg., or approved equal.

**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 Engineer 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 ream bore hole as necessary prior to pulling pipe back to starting pit.
  - 2. Apply drilling fluid as required to maintain borehole stability and reduce frictional drag.
  - 3. Maximum reaming diameter: 2 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. Fill pipe with water and 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. Connection from High Density Polyethylene Pipe (HPDE) to Ductile Iron Pipe (DIP).
  - 1. Connections shall be made by one of the following unless approved by the City Engineer.
    - a. Mechanical joint adaptors (fused to HDPE pipe) approved by the City Engineer.

- D. Tracer Wire Installation
  - 1. Tracer wire shall be installed along the axis of all HDPE pipe.
  - 2. Ensure tracer wire remains intact throughout the entire installation process.
  - 3. See Section 2.05 for tracer wire product information.
  - 4. Except for approved splice connections and repairs, install in continuous manner.
  - 5. Install tracer wire parallel with and above centerline axis of pipe.
  - 6. Do not spiral wrap or tape tracer wired to pipe.
  - 7. Do not install under service saddles.
- E. Test Station Installation
  - 1. A tracer wire test station shall be installed at each boring pit location (including gate valve and/or hydrant locations and air release manholes).
  - 2. Each test station shall be installed according to manufacture recommendations in a location approved by the engineer.
  - 3. See Section 2.05 for test station product information.

**3.04 RESTORATION**

- A. Backfill pits in accordance with Section 31 23 33.
- B. Restore Work areas to original condition.

**3.05 FIELD QUALITY CONTROL**

- A. All testing procedures for HDPE watermain shall be performed in accordance to Section 33 11 00 except for conductivity testing.

- B. Conductivity (Tracer Wire) Testing:
  1. All tracer wire for HDPE shall be tested for continuity after the installation is completed Test continuity of conduction in the presence of the Engineer.
  2. Connect signal generator at wire termini and trace signal throughout the installation.
  3. Locate and repair all breaks in conductivity.
  4. Failure and Correction
    - a. Failure of a segment shall be determined by current measurements that are insufficient, intermittent, or unsteady.
    - b. Isolate and correct defective contact points as indicated by failed tests.
    - c. Retest failed segments after correction.

- C. Perform drill fluid testing at a rate of one test per 2-hour interval during drilling and pullback.
  1. Fluid Density:
    - a. Measure with a mud balance.
    - b. Report results in pounds per gallon.
  2. Marsh Funnel Viscosity:
    - a. Measure with a marsh funnel and record time to fill a 1-quart container.
    - b. Report results in seconds per quart.
  3. Sand Content:
    - a. Determine volume of solids larger than the No. 200 sieve.
    - b. Measure with a sand content kit.
    - c. Report in percent of total volume.
  4. pH:
    - a. Measure and report pH using pH strips or a pH meter.

- D. Perform additional drill fluid tests at a rate of 2 per day in the event of a drill hole collapse, the product pipe or drill head becomes stuck, or the hole is abandoned.
  1. Gel Strength:
    - a. Measure and calculate using a shearometer by dropping a 5-gram cylinder through a calibrated measuring device.

- b. Report in pounds per 100 square feet.
- 2. Filtrate and Filter Cake:
  - a. Measure with a filter press.
  - b. Report filtrate in cubic centimeters.
  - c. Report filter cake in 1/32 of an inch.
- E. 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 DISENFECTION**

- A. Disinfect all newly installed watermain, appurtenances, and services in accordance with Section 33 11 00.

**3.07 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**



**SECTION 33 05 50**

**SURFACE FACILITY RESTORATION**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section includes restoration of surface facilities after utility construction as follows:
  - 1. Street Surfaces
  - 2. Base Course
  - 3. Curb and Gutter
  - 4. Sidewalks
  - 5. Driveways
  - 6. Shoulders
  
- B. Related Sections:
  - 1. Section 31 23 33 - Trench Excavation and Backfill
  
- C. Method of Measurement
  - 1. Aggregate Base
    - a. Measure by volume in inch - square yards.
    - b. Multiply individual areas in square yards by specified depth in inches.
  - 2. Aggregate Surfacing
    - a. Measure by weight in tons of material acceptably placed.
  - 3. Bituminous Surface
    - a. Measure by volume in inch - square yards.
    - b. Multiply individual areas in square yards by specified depth in inches.
    - c. Bid price includes bituminous material.
  - 4. Concrete Surface
    - a. Measure by area in square yards for each uniform depth.
  - 5. Curb and Gutter
    - a. Measure by length in linear feet.
  
- D. Basis of Payment
  - 1. Payment for acceptable quantities of Surface Facility Restoration items shall be at the contract unit price as listed on the Bid Form. All associated work items shall be considered incidental.

**1.02 REFERENCES**

- A. WDOT 304 – Aggregate for Subbase Courses
  
- B. WDOT 407 – Asphaltic Concrete Wearing Course
  
- C. WDOT 501 – Concrete
  
- D. WDOT 601 – Concrete Curb and Gutter

**1.03 SUBMITTALS**

- A. Provide for each aggregate material:
  - 1. Name and location of source.
  - 2. Sample gradation.
  
- B. Provide for bituminous 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 - shall be in accordance with WDOT 304, Gradation/Crushed Stone
  
- B. Asphaltic Concrete Wearing Surface - shall be in accordance with WDOT 407, Grade A.
  
- C. Concrete - shall be in accordance with WDOT 501.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Bituminous Surface
  1. Sawcut 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 sawcutting.
  2. Install ½-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. Bituminous 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. Bituminous 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.
2. Surface shall be flush with adjacent surfaces.
3. Provide a light brush finish on all exposed surfaces.

### **END OF SECTION**

**SECTION 33 11 00**

**WATER DISTRIBUTION SYSTEMS**

**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 33 - Trench Excavation and Backfill
2. Section 33 05 50 - Surface Facility Restoration
3. Section 317130 – Horizontal Directional Drilling (HDD) Pipe Installation
4. Section 01 51 00 – Temporary Utilities

**C. Method of Measurement**

1. Water main
  - a. Measure by distance in linear feet.
  - b. Measure along pipe axis with no deduction for fittings or valves.
  - c. Measure in the horizontal plane unless pipe grade exceeds 15 percent.
2. Fittings
  - a. Measure by weight in pounds.
  - b. Basis of Weight (without accessories):
    - 1) Fittings 3 inches - 16 inches: ANSI/AWWA C153/A21.53-88
    - 2) Fittings 18 inches - 48 inches: ANSI/AWWA C110/A21.10-87
3. Valves and Boxes
  - a. Measure valve and box of each size and type as a unit.
4. Hydrants
  - a. Measure hydrants of each size and type as a unit.
  - b. Unit includes installation of hydrant, base, thrust-restraint, drain rock, and poly.
5. Corporation Stops

- a. Measure corporation stops of each size and type as a unit.

**6. Curb Stops and Boxes**

- a. Measure curb stops and boxes of each size and type as a unit.

**7. Service Pipe**

- a. Measure by distance in linear feet.
- b. Measure each size separately.
- c. Measure from center of water main to center of curb stop plus 1 foot for slack.

**8. Insulation**

- a. Measure by quantity of 2 inch by 4-foot by 8-foot sheets.

**D. Basis of Payment**

1. Payment for acceptable quantities of water main and appurtenances shall be at the Contract Unit Price as listed on the Bid Form. All associated work items shall be considered incidental.
2. Payment for water main and appurtenances will be based on the following schedule:

<b>Item No.</b>	<b>Item</b>	<b>Unit</b>
2660.4__	4" DIP Water Main, Cl. 52	L.F.
2660.406	6" DIP Water Main, Cl. 52	L.F.
2660.408	8" DIP Water Main, Cl. 52	L.F.
2660.4__	10" DIP Water Main, Cl. 52	L.F.
2660.4__	12" DIP Water Main, Cl. 52	L.F.
2600.4__	16" DIP Water Main, Cl. 52	L.F.
2660.450	DIP Fittings	Lb.
2660.5__	4" Gate Valve & Box	Each
2660.506	6" Gate Valve & Box	Each
2660.5__	8" Gate Valve & Box	Each
2660.5__	10" Gate Valve & Box	Each
2660.5__	12" Gate Valve & Box	Each
2660.5__	16" Gate Valve & Box	Each
2660.5__	>30" Butterfly Valve & Box	Each
2660.58_	__" Gate Valve & Manhole	Each
2660.59_	__" Butterfly Valve & Manhole	Each
2660.600	Hydrant	Each
2660.610	Relocate Hydrant Assembly	Each
2660.711	1" Copper Service Pipe	L.F.
2770.7__	1 ½ " Copper Service Pipe	L.F.
2660.712	2" Copper Service Pipe	L.F.

2660.731	1" Corporation Stop	Each
2660.7__	1 ½ " Corporation Stop	Each
2660.732	2" Corporation Stop	Each
2660.751	1" Curb Stop & Box	Each
2660.7__	1 ½ " Curb Stop & Box	Each
2660.752	2" Curb Stop & Box	Each
2660.800	Insulation (2" x 4' x 8')	Sheet
2660.910	__" x __" Pressure Tap w/ __" Gate Valve & Box	Each
2660.920	__" Cut-In Connection	Each
2660.930	Connect to Inplace Fitting	Each

## 1.02 REFERENCES

- A. ASTM:
1. A126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings
  2. A536 - Ductile Iron Castings
  3. B88 - Seamless Copper Water Tube
  4. B152 - Copper Sheet, Strip, Plate, Rolled Bar
  5. D429 - Tests for Rubber Adhesion to Rigid Surfaces
  6. D2842 - Test for Water Absorption of Rigid Cellular Materials
  7. D1248 - Polyethylene Plastics Extrusion Materials for Wire and Cable
- B. AWWA:
1. C150 - Thickness Design of Ductile Iron Pipe
  2. C151 - Ductile-Iron Pipe, Centrifugally Cast for Water or other Liquids
  3. C153 - Ductile-Iron Compact Fittings for Water Service
  4. C502 - Dry-Barrel Fire Hydrants
  5. C504 - Rubber-Seated Butterfly Valves
  6. C509 - Resilient-Seated Gate Valves for Water Supply Service
  7. C515 - Reduced-Wall, Resilient-Seated Gate Valves, for Water Supply Service
  8. C600 - Installation of Ductile Iron Water Mains and their Appurtenances
  9. C800 – Underground Service Line Valves and Fittings

## 1.03 SUBMITTALS

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

B. Submit proposed method of joint conductivity.

C. Submit proposed method and type of thrust restraint.

## 1.04 QUALITY ASSURANCE

A. A pre-construction conference shall be held to ensure the understanding of, and compliance with, the approved plans and specifications. All pertinent parties shall attend or be represented, and specifically the Contractor's job site supervisor /foreman shall be in attendance.

B. Any work on water system infrastructure shall be witnessed by Water Utility personnel, City Engineer, or authorized resident project representative before acceptance by the Utility.

C. Developer's Responsibility - Furnish Hudson Water Utility with:

1. "As-Built" drawings.
2. Copies of recorded easements.
3. Copies of conductivity tests, pressure tests, and bacteriological confirmation sampling results.
4. Statement saying construction was accomplished according to these approved specifications.
5. Payment for costs of inspections by the City Engineer.
6. Payment for costs (i.e., labor, materials, transportation, and laboratory analyses) attributed to the proper methods and procedures involved with abandonment, installation, valving, flushing, conductivity tests, pressure tests, bacteriological sampling, and punch lists.

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

1. Water Main
2. Fittings
3. Valves

4. Hydrants
5. \_\_\_\_\_
6. \_\_\_\_\_

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Inspection
  1. Inspect all pipe and products during the unloading process.
  2. Notify the City Engineer of any cracked, flawed or otherwise defective products.
  3. Remove all products found to be defective by the City Engineer from the site.
  4. Remove all products not approved for this project.
- B. Handling and Storage
  1. Handling and storage of products shall be in accordance with ANSI/AWWA C600.

**PART 2 PRODUCTS**

**2.01 COUNTRY OF ORIGIN**

- A. All materials must be manufactured in the United States unless approved by Water Utility Engineer.

**2.02 WATER MAIN PIPE**

- A. Ductile Iron - ANSI/AWWA C151/A21.51
- B. Cement-Mortar Lined - ANSI/AWWA C104/A21.4
- C. Thickness Class 52
- D. Mechanical Joint, Tyton push joint, or approved equal.
  1. Gasket joint restraint system shall be installed for Tyton push joints in all situations that require thrust restraint. At a minimum, this shall include three full-length pipe joints prior to dead ends; three full-length pipe joints upstream and downstream of valves, tees, and fittings; and all joints in poor foundation areas and grades 10% or greater as

determined a necessity by the City Engineer.

- a. Field Lok 350 by U.S. Pipe of Birmingham, AL
  - b. Or approved equal
2. Anti-thrust restraint glands on all mechanical joints.
    - a. Megalug by Ebaa Iron of Eastland, TX

**E. Joint Conductivity**

1. Field Application Methods
  - a. Burndy - Thermoweld by Burndy Corp., Norwalk, Connecticut.
  - b. Cadweld by Erico Products Co., Cleveland, Ohio.
2. Copper Jumpers
  - a. Minimum 1/16 inch by 3/4 inch wide flat copper strip.
  - b. Annealed round copper wire conforming to ASTM B152, Type DHP.
3. Nuts and Bolts: Silicon Bronze (w/ANSI/AWWA Specification).

**2.03 FITTINGS**

- A. Ductile Iron - ANSI/AWWA C153/A21.53 - Tyler or approved equal.
- B. Protective Fusion-Bonded Epoxy Coatings – ANSI/AWWA C116/A21.16
- C. Mechanical Joint, Tyton push joint or approved equal.
  1. Gasket joint restraint system shall be installed on all Tyton push joints.
    - a. Field Lok 350 Gasket Joint Restraint System by U.S. Pipe of Birmingham, AL on all mechanical joints.
  2. Anti-thrust restraint glands on all mechanical joints.
    - a. Megalug by Ebaa Iron of Eastland, TX
- D. Solid D.I. sleeves shall be minimum 12 inches long.
- E. Nuts and Bolts - Cor-Blue or approved equal.

## 2.04 VALVES AND BOXES

### A. Gate Valves

1. Resilient Seated - ANSI/AWWA C515 Waterous AFC 2500 all compact D.I. or approved equal.
2. Rated Working Pressure: 250-PSI Minimum.
3. Ends: Mechanical Joint, Tyton push joint or approved equal.
4. Valve body bonnet and stuffing box bolts and nuts shall be 304 stainless steel.
5. Operating Stem: Non-Rising with "O" Ring Seals.
6. Operating Nut: 2-inch Square, Open Left.
7. 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
8. Any valve greater than 9½ foot bury shall be provided with approved valve box operating nut extensions.
9. Valves 16 inches or larger shall be provided with appropriate gearbox and/or 6-inch valved bypass.

### B. Butterfly Valves

1. Shall be used on all pipe greater than 30 inches in diameter.
2. Rubber Seated - ANSI/AWWA C504.
3. Class: 150B.
4. Body Type: Mechanical joint end with anti-restraint gland.
5. Disc:
  - a. 316 stainless steel
6. Seat:
  - a. 3-inch through 20-inch: Bond to body per ASTM D429, Method B.
  - b. 24-inch and larger: Retain in body without use of metal retainers.
7. Operator:
  - a. Traveling nut actuator
  - b. Open left.
8. Operating Stem: Non-Rising with "O" Ring Seals.

9. Operating Nut: 2-inch Square
10. Markings to be cast on the body:
  - a. Open indicating arrow
  - b. Manufacturer's name
  - c. Class
  - d. Year of manufacture
  - e. Size

### C. Boxes

1. Cast Iron, 5¼-inch shaft, screw-type.
2. Vertical, 3 piece, Buffalo type. Tyler 6860 Series Style "F" with two bottom length sections or approved equal.
3. Box length adjustable from 63 inches to 84 inches so as to maintain 7 feet of pipe cover and be adjustable to 6 inches up or down from finished grade.
4. No "threaded insert" sections allowed. Tyler 2 to 4 inch risers with approved sealant are acceptable.
5. Valve boxes outside the roadway (such as right-of-ways and easements) shall be marked w/U-style steel fence post 4 feet above grade painted blue.

## 2.05 HYDRANTS

- A. Dry Barrel - ANSI/AWWA C502
- B. Waterous Pacer AFC WB67-250 all D.I. or approved equal.
- C. Rated Working Pressure: 250 PSI.
- D. Hose Connections: 2 each at 2½ inch diameter.
- E. Steamer Connection: 1 each at 4½ inch diameter.
- F. Threads: National Standard
- G. Operating Stem: Two-piece Open Left with "O" Ring Seals; Pentagon Nut (1½-inch F.T.P.) w/weather shield.
- H. Traffic flange (w/16-inch break-off).
- I. Hub: Epoxy coated, Mechanical Joint, Tyton push joint or approved equal.

1. 8-inch for 10-inch pipe connection and larger
  2. 6-inch for less than 10-inch pipe connection
  3. Gasket joint restraint system shall be installed on all Tyton push joints.
    - a. Field Lok 350 by U.S. Pipe of Birmingham, AL
    - b. Or approved equal
  4. Anti-thrust restraint glands on all mechanical joints.
    - a. Megalug by Ebaa Iron of Eastland, TX
    - b. Or approved equal
  5. All joints in a hydrant lead shall be restrained to the tee, and all leads shall be valved. 8" mechanical joint may be required as directed by engineer.
- J. Main Valve Opening: 5 1/4-inch minimum diameter. Bronze Valve Seat and Insert.
- K. Barrel Diameter: 7 inches
- L. Hydrant bottom bolts and nuts shall be 304 stainless steel.
- M. Drain to operate only when hydrant is closed.
  1. Where groundwater is present, the hydrant shall not have weep holes in the brass valve seat; and a "Pump After Use" tag must be affixed to the hydrant nozzle section. Factory tapped and plugged drain holes are allowed.
- N. Bury Depth: 8 foot (Ground line groove to bottom of hub).
- O. Cap Nuts: Pentagon (1 1/2 inch F.T.P.).
- P. Color: Red
- Q. Five foot HydraFinder Fiberglass Rod Marker w/red and white reflective markings and spring base or approved equal.
- R. Provide permanent markings which indicate:
  1. Manufacturer's name.
  2. Year of manufacture.
  3. Bury depth.

- S. Accessories
1. Grade adjustment fitting shall be installed on all fire hydrants
    - a. Gradelok by Assured Flow Sales, Inc. of Sarasota, FL
    - b. Or approved equal
  2. Where required, extensions shall not be greater than 42-inch long.
    - a. Hydrant extension kits shall be manufactured by Waterous / AFC of Saint Paul, MN.
  3. Food grade oil must be replaced in reservoir.
  4. Break-off rod coupling to be moved to proper location.
  5. Hydrant shall be operated and pressurized for proper operation and visual inspection for leaks.
  6. Bury depth extension tab reinstalled.
  7. Extension size tab installed.

## 2.06 SERVICE PIPE

- A. Copper - ASTM B88
1. Type: K, Soft.
    - a. 1-inch to 1.5-inch diameter.
    - b. 2-inch diameter allowed only by approval from Hudson Public Water Utility Commission.
- B. Ductile Iron - ANSI/AWWA C151/A21.51.
1. Cement - Mortar Lined - ANSI/AWWA C104/A21.4.
  2. Thickness Class 52.

## 2.07 CORPORATION STOPS

- A. Type: Mueller B-25008, or equal.
1. Inlet: AWWA taper thread.
  2. Outlet: Copper service thread w/flare or compression joint.
  3. All fittings shall conform to ANSI/AWWA Standard C800, latest revision.
  4. All brass components in contact with potable water must be made from either CDA/UNS Brass Alloys C89520 or C89833 with a maximum lead content of 0.25% by weight. Brass alloys not listed in ANSI/AWWA C800 Paragraph

4.1.2 are not approved. Brass saddles shall be made from CDA/UNS C83600.

5. All service fittings shall be certified as suitable for contact with drinking water by an ANSI accredited organization accordance with ANSI/NSF Standard 61, Drinking Water Systems Components – Health Effects.
6. All fittings shall be stamped or embossed with a mark or name indicating that the product is manufactured from the low-lead alloy as specified in paragraph 4.

## **2.08 CURB STOPS AND BOXES**

### **A. Curb Stop (Valve)**

1. Type: Mueller 300 Ball B-25154, B-25155 or approved equal.
2. Inlet: Copper Service Thread w/ flare or compression joint.
3. Outlet: Copper Service Thread w/flare or compression joint.
  - a. There shall be 15 feet of copper service pipe installed beyond the curb stop with the copper end flared and installed with flare nut and plug. End shall be marked with 4-inch x 4-inch timber to 12 inches above grade. (See Detail Plate SER-5)
4. All fittings shall conform to ANSI/AWWA Standard C800, latest revision.
5. All brass components in contact with potable water must be made from either CDA/UNS Brass Alloys C89520 or C89833 with a maximum lead content of 0.25% by weight. Brass alloys not listed in ANSI/AWWA C800 Paragraph 4.1.2 are not approved.
6. All service fittings shall be certified as suitable for contact with drinking water by an ANSI accredited organization accordance with ANSI/NSF Standard 61, Drinking Water Systems Components – Health Effects.
7. All fittings shall be stamped or embossed with a mark or name indicating that the product is manufactured from the low-lead alloy as specified in paragraph 5.

### **B. Box**

1. Type: Minneapolis Pattern, Extension.
2. Length: 6.5 feet (78 inches) to 7.5 feet (90 inches) adjustable.
3. Installed to be adjustable to 6 inches up or down from finished grade.
4. 1 inch services - 1 ¼ inch upper section box Mueller H-10300 or approved equal; 1½ and 2-inch services - 1½ inch upper section Box Mueller H-10302, or approved equal.
5. Marked w/T-style steel fence post 4 feet above grade painted blue in boulevard ROW (see Detail Plate WAT-11).

## **2.09 INSULATION**

- A. Rigid extruded polystyrene board insulation closed cell
  1. Dow Chemical or approved equal.
- B. Thermal Resistance (R): 5.0.
- C. Thickness: 2 inches.
- D. Board Size: 48 inches by 96 inches.
- E. Compressive Strength: Minimum 25 psi.
- F. Water Absorption in accordance with ANSI/ASTM D2842: 0.1 percent by volume, maximum.
- G. Edges: Square.

## **PART 3 EXECUTION**

### **3.01 CONSTRUCTION REQUIREMENTS**

- A. See attached “Hudson Standard Plates” for examples.
- B. 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. Tapping sleeve shall be all-stainless full circle Smith-Blair 662 Series or approved equal for all C.I. and D.I. applications.
  - d. All tapping sleeve and flange bolts and nuts shall be stainless steel.
  - e. Install blocking and thrust restraint as required.
  - f. Install conductivity straps on existing and new main and fittings. Disinfect all fittings.
2. Cut-In Connection
- a. Isolate segment of pipe to be cut and drain water from the line.
  - b. Connect tee and sleeve (minimum 12-inch D.I. solid sleeve) assembly to pipe ends.
  - c. Install blocking and thrust restraint as required.
  - d. Install conductivity straps on existing and new main and fittings. Be sure new fittings are disinfected.
  - e. Interruption of Service.
    - 1) Customer notification by contractor 24 hours previous to interruption.
    - 2) Water Utility must be notified 24 hours previous to scheduled operation of valves.
    - 3) Valves to be operated by Water Utility personnel only.
3. Connect to Inplace Fitting
- a. Isolate segment of inplace pipe and remove blocking as required.
  - b. Remove plug and drain water from the line.
  - c. Install blocking and thrust restraint as required.
  - d. Install conductivity straps on existing and new main and fittings. Be sure new fittings are disinfected.
  - e. If joints cannot be pressure tested, visual inspection of joints at static pressure must be conducted prior to placing backfill.
  - f. Interruption of service.
    - 1) Customer notification by contractor 24 hours previous to interruption.
    - 2) Water Utility must be notified 24 hours previous to scheduled operation of valves.
    - 3) Valves to be operated by Water Utility personnel only.
- C. Pipe Installation
- 1. Install pipe at the alignment and grade shown on the drawings.
  - 2. Provide 7 feet of cover over the pipe. Any cover less than 7 feet or more than 8 feet shall be approved by the City Engineer.
    - a. Pipes shall be insulated with closed cell insulation to maintain 7 feet of cover (1 inch of closed cell insulation equals 1 foot of soil) or as approved by the City Engineer in all situations that apply to prevent freezing.
  - 3. Install appurtenances in the locations shown on the drawings.
  - 4. Remove all dirt and foreign material from the pipe interior prior to installation of the pipe. After installation of each pipe, the gasket shall be examined for proper seating.
  - 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.
  - 7. Absolutely NO ROCKS within 1 foot of pipe zones.
  - 8. All storm sewer conflicts or intersections between the water and storm shall be insulated as approved by the City Engineer to equate to 7 feet of cover (1 inch closed cell insulation = 1 foot of soil).
  - 9. Any soil inconsistencies as determined by the City Engineer in the pipe foundation area shall be bedded with approved granular within 1 foot of pipe zone.
  - 10. All other utility construction such as natural gas, power, telephone, and cable TV, etc. in right-of-ways and easements (minimum 30 foot) shall be coordinated so to maintain 10 foot horizontal distance from water lines.

11. Easements shall be minimum 30 feet wide with water lines constructed 10 feet from one side and 20 feet from other side.
  - a. The City Engineer must approve any cuts or fills in easements.
12. Dead-ends shall be kept to an absolute minimum.
13. All dead-end services (larger than 2 inches) shall be installed with minimum 1 inch corp., stop, stand, and copper pigtail to facilitate testing and flushing.
14. All water main dead-ends shall be installed with a hydrant to facilitate flushing.
15. All water mains shall be flushed at a minimum velocity of 10 feet per second.
16. All grades (10% or greater) shall be analyzed by the City Engineer to determine the necessity of installing thrust restraint.

#### D. Valve and Box Installation

1. Verify that subgrade material is adequate to support valve assembly.
2. Install valves with stems vertical and plumb.
3. Install boxes plumb and centered over the valve nut.
4. Verify that box remains plumb and centered during backfill. This shall be verified by sliding the gate valve alignment tool up and down the valve box with no restrictions and centered on operating nut.
  - a. Gate valve alignment tool shall be Schedule 3034 – 4 1/4 –inch OS diameter thin wall PVC sewer pipe (furnished by the Utility, refer to Detail Plate WAT-10).
5. Adjust box cover to required grade. This will be accomplished so box is adjustable 6 inches up or down.
6. Valve boxes located in concrete shall be sleeved and adjusted ½ inch below grade.
7. Valve boxes located in asphalt shall be adjusted ½ inch below grade.
8. Any valve greater than 9½ foot bury shall be installed with an approved valve operating nut extension.

9. No “threaded insert” sections allowed. Tyler 2 to 4 inch risers with approved sealant are acceptable.
10. Valve boxes outside the roadway (such as right-of-ways and easements) shall be marked w/U-style steel fence post 4 feet above grade painted blue.
11. Valve boxes shall not be located in rain gardens.

#### E. Hydrant Installation

1. All joints in a hydrant lead shall be restrained to the tee, and all leads shall be valved.
2. Verify that subgrade material is adequate to support hydrant.
3. All storm sewer conflicts or intersections between the water and storm shall be insulated as approved by the City Engineer to equate to 7 feet of cover (1 inch closed cell insulation = 1 foot of soil).
4. Place concrete block, washed drain rock and 4-mil polyethylene in accordance with Hudson Standard Plates (WAT-2).
5. Install and maintain hydrant in a plumb position.
6. Where groundwater is present, the hydrant shall not have weep holes in the brass valve seat; and a “Pump After Use” tag must be affixed to the hydrant nozzle section. Only factory made drain holes will be allowed.
7. Hydrant ground flange shall be 3 to 6 inches above finished grade.
8. Install 5 foot HydraFinder Fiberglass Rod Marker w/red and white reflective markings and spring base or approved equal (on back nozzle section bolt opposite bury depth tag).
9. Provide permanent markings that indicate:
  - a. Manufacturer’s name.
  - b. Year of manufacture.
  - c. Bury depth.
10. All hydrants shall be cleaned properly and finish coated upon completion of utility construction to the original equipment manufacturers (OEM) specifications.

- a. Use power tools to clean all rust and other contamination from the hydrant body.
  - b. Apply two coats of touch up paint where prime coating has been damaged.
  - c. Paint shall meet the original equipment manufacturers (OEM) specifications.
11. Hydrants shall be marked with approved "Out of Service" tags when installed.
12. Extensions
- a. Grade adjustment fitting shall be installed on all fire hydrants
    - 1) Gradelok by Assured Flow Sales, Inc. of Sarasota, FL
    - 2) Or approved equal
  - b. Where required, extensions shall not be greater than 42-inch long.
  - c. Hydrant extension kits shall be manufactured by Waterous / AFC of Saint Paul, MN.
  - d. Waterous food grade oil must be replaced in reservoir.
  - e. Break-off rod coupling to be moved to proper location.
  - f. Hydrant shall be operated and pressurized for proper operation and visual inspection for leaks.
  - g. Bury depth extension Tab reinstalled.
  - h. Extension size tab shall be installed.
  - i. The Water Utility must be notified 24 hours in advance and witness all hydrant maintenance. Failure to notify Water Utility will result in non-acceptance.
- F. Joint Conductivity
- 1. Provide electrical bond across all joints between pipes and appurtenances, including mechanical joints with anti-thrust restraint glands.
  - 2. Epoxy coated fittings, valves, and hydrants and stainless steel appurtenances shall have an electrical bond from pipe to pipe across the entire appurtenance.
  - 3. Install copper jumpers by either shop or field applications. (Minimum 1/16-inch by 3/4-inch).
- 4. Fasten multiple jumper strips with silicon bronze bolts and nuts.
  - 5. Welding
    - a. Grind surfaces to be welded to remove coating and oxide and to provide clean metal surface.
    - b. Use metallic-arc process for shop applications.
    - c. Use exothermic process for field applications.
      - 1) Utilize Cadweld system by Erico International of Solon, OH or approved equal.
    - d. Refinish welded areas, and areas impacted by grinding, with anticorrosive protective coating after connection is made and welded area has cooled to the touch.
      - 1) Gunk T1617R Tite-Seal Rubberized Auto Body Undercoating
      - 2) Or approved equal
- G. Thrust Restraint
- 1. Submit method and type to the City Engineer for approval, minimum of 5 working days prior to starting construction.
  - 2. Install in accordance with "Thrust Restraint Design for Ductile Iron Pipe", 6<sup>th</sup> Ed., Ductile Iron Pipe Research Association.
  - 3. Install thrust restraints at all bends, tees, plugs, sleeves, valves and hydrants.
    - a. At a minimum, this shall include three full length pipe joints prior to dead ends; three full length pipe joints upstream and downstream of valves, tees, and fittings; and all joints in poor foundation areas and grades 10% or greater as determined to be a necessity by the City Engineer.
    - b. Fill areas shall require thrust restraint as determined by the City Engineer.
  - 4. Gasket joint restraint system shall be installed on all Tyton push joints.
    - a. Field Lok 350 by U.S. Pipe of Birmingham, AL
    - b. Or approved equal

- 5. Anti-thrust restraint glands on all mechanical joints.
  - a. Megalug by Ebaa Iron of Eastland, TX
  - b. Or approved equal
- 6. All Tyton push joints with gasket joint restraint system shall be marked with plastic tape that indicates "Restrained Joint." If plastic tape is unavailable, the top of hub and spigot shall be painted "Blaze Orange" with the initials "R-J."
- 7. Concrete Blocking
  - a. Concrete blocking for thrust restraint is not allowed unless approved by City Engineer.
  - b. Place between the fitting and undisturbed trench wall with fabric between concrete and fitting to allow no concrete to be in contact with bolts, fittings, flanges, and pipe.
  - c. Minimum thickness: 12 inches.
  - d. Minimum area in square feet shall be in accordance with the following:

Pipe	Tee or Plug	¼ Bend	1/8 Bend	1/16 Bend
6"	2.9	3.1	1.6	0.8
8"	3.7	5.3	2.9	0.4
10"	5.7	8.1	4.4	2.2
12"	8.1	13.4	6.6	3.2
16"	15.1	21.4	11.6	5.9
20"	23.2	30.2	18.1	9.3
24"	33.6	48.5	26.1	13.3

- e. Size blocking based on the larger main.
- f. Verify that bolts are accessible after concrete is poured.

H. Service Installation

- 1. Corporation Stops
  - a. Provide watertight connection with approved tapping machine. Tapping bit must be inspected and approved by the City Engineer.
  - b. Install under main pressure and in upper quadrant.

- c. Place a double wrap of Teflon tape around the threads prior to installation.
  - d. 1¼, 1½, and 2-inch taps (and any size taps in 4" DIP) shall be installed w/double strap tapping service saddle Ford Style F202, (W/AWWA CC Thread) or approved equal.
  - e. No taps allowed in hydrant leads.
  - f. Interruption of Service.
    - 1) Customer notification by contractor 24 hours previous to interruption.
    - 2) Water Utility must be notified 24 hours previous to scheduled operation of valves.
    - 3) Valves to be operated by Water Utility personnel only.
2. Copper Service Pipe
- a. Install pipe between corporation stop and curb stop with no joints or unions.
  - b. Bury Depth: 7 feet - any cover less than 7 feet or greater than 8 feet shall be approved by the City Engineer.
  - c. Where 7 feet of cover cannot be provided, as approved by City Engineer, services shall be insulated with closed cell insulation to maintain the equivalent insulation value of 7 feet of cover.
    - 1) 1 inch of closed cell insulation equals 1 foot of soil
    - 2) Or as approved by the City Engineer
  - d. Provide minimum 1 foot of slack ("Goose-Neck" at corporation) in the pipe to allow for settlement and movement.
  - e. There shall be 15 feet of copper service pipe installed beyond the curb stop with the copper end flared and installed with flare nut and plug. End shall be marked with 4-inch x 4-inch timber to 12 inches above grade. (See Detail Plate SER-5)
  - f. All storm sewer conflicts or intersections between the water and

- storm shall be insulated as approved by the City Engineer.
- g. All copper connections shall be reamed and sized by approved sizing tool and any approved joints shall be installed with Mueller H-15400, H-15403, or approved equal.
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 (no doglegs) and centered over the tee head.
  - d. Verify that box remains plumb and properly aligned during backfill.
  - e. Adjust box cover to required grade. This shall be accomplished so box is adjustable 6 inches up or down.
  - f. Mark w/T-style steel fence post 4 feet above grade painted blue.
  - g. Key all curb stops after backfill to assure proper operation.
  - h. Any curb box greater than 9-½ foot bury shall be installed with an approved curb stop operating extension.
  - i. Valve boxes shall not be located in rain gardens.
4. Ductile Iron Service Pipe
- a. Bury Depth: 7 feet - any cover less than 7 feet or greater than 8 feet shall be approved by the City Engineer.
  - b. Where 7 feet of cover cannot be provided, as approved by City Engineer, services shall be insulated with closed cell insulation to maintain the equivalent insulation value of 7 feet of cover.
    - 1) 1 inch of closed cell insulation equals 1 foot of soil
    - 2) Or as approved by the City Engineer
  - c. Ductile iron services will be valved within 3 feet to 5 feet of the main (unless wet tap), and all joints in the service line shall be restrained. These services shall have conductivity and be included in the conductivity test.
- d. Ductile iron services (stub to lot) shall be installed with minimum 1-inch corporation stop, stand, and copper pigtail to facilitate testing, voiding of air, and flushing. The end of the ductile iron service shall be marked with 4-inch x 4-inch timber to 48 inches above grade.
  - e. Ductile iron services (main to building, tapped or connected) shall be flushed clean and voided of air.
  - f. Full pipe flush at a minimum of 10 feet per second velocity is required.
  - g. Pressure test, conductivity test, and bacteria test shall be completed.
  - h. After installation of each pipe, the gasket shall be examined for proper seating.
  - i. All storm sewer conflicts or intersections between the water and storm sewer shall be insulated as approved by the City Engineer.

### 3.02 FIELD QUALITY CONTROL

- A. Perform the following tests upon completion of the system and prior to being placed into service. These tests shall be witnessed by Water Utility Personnel, the City Engineer, or authorized representative.
- B. **Prior to initiating test sequence, the disinfection process must be completed through Paragraph E of Section 3.03.**
- C. Test Sequence
  - 1. Tests shall be conducted in the following order:
    - a. Conductivity
    - b. Pressure
    - c. Bacteriological
  - 2. Electrical Conductivity Test:
    - a. Perform electrical conductivity test to verify that electrical thawing of the system may be accomplished by the Owner.
    - b. Test Parameters
      - 1) Perform prior to pressure testing.

- 2) Perform test after backfilling is completed and while line is at normal operating pressure.
  - 3) Test Current: 350 amperes DC  $\pm 10\%$ .
  - 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. Pressure Test:
- a. This test must be accomplished through corporation stop and all air must be voided from the system.
  - b. After the pipe has been laid, all newly laid pipe or any valved section of it shall be subjected to a hydrostatic pressure of 150 psi per square inch for a period of 2 hours.
  - c. A drop in pressure over the 2-hour period exceeding 3 psi shall be cause for rejection of the project. All leaks shall be corrected.
  - d. The test shall be repeated until the pressure drop is within the 3 psi limit. This includes testing after any corrective action has been accomplished.
- e. The total water main system installed in this project shall be tested for pressure requirements in sections and sequence with the approval of the City Engineer.
- 1) Measure and record the amount of water required to pump the test section back to 150 psi.
  - 2) Gauge shall be glycerin-filled and have scale in 1-psi increments, a minimum 4-inch diameter, and be proofed for proper calibration and approved by the City Engineer.
  - 3) Pressure test apparatus, hose, barrels, and water shall be disinfected by the contractor and approved by Water Utility Personnel, the City Engineer, or authorized resident project representative prior to starting test.
4. Testing Water Services
- a. Perform separate pressure test on the services with the corporation stops open.
  - b. Test Pressure: 100 psi.
  - c. Duration: 2 hours.
  - d. Allowable Pressure Drop: None.
  - e. At the Contractor's option, service testing may be done concurrent with main testing.
- D. Before the system is placed into service, all valve boxes, curb stop boxes, and hydrants shall be accessible, adjusted to grade, operational, and marked according to these specifications.

### **3.03 DISINFECTION**

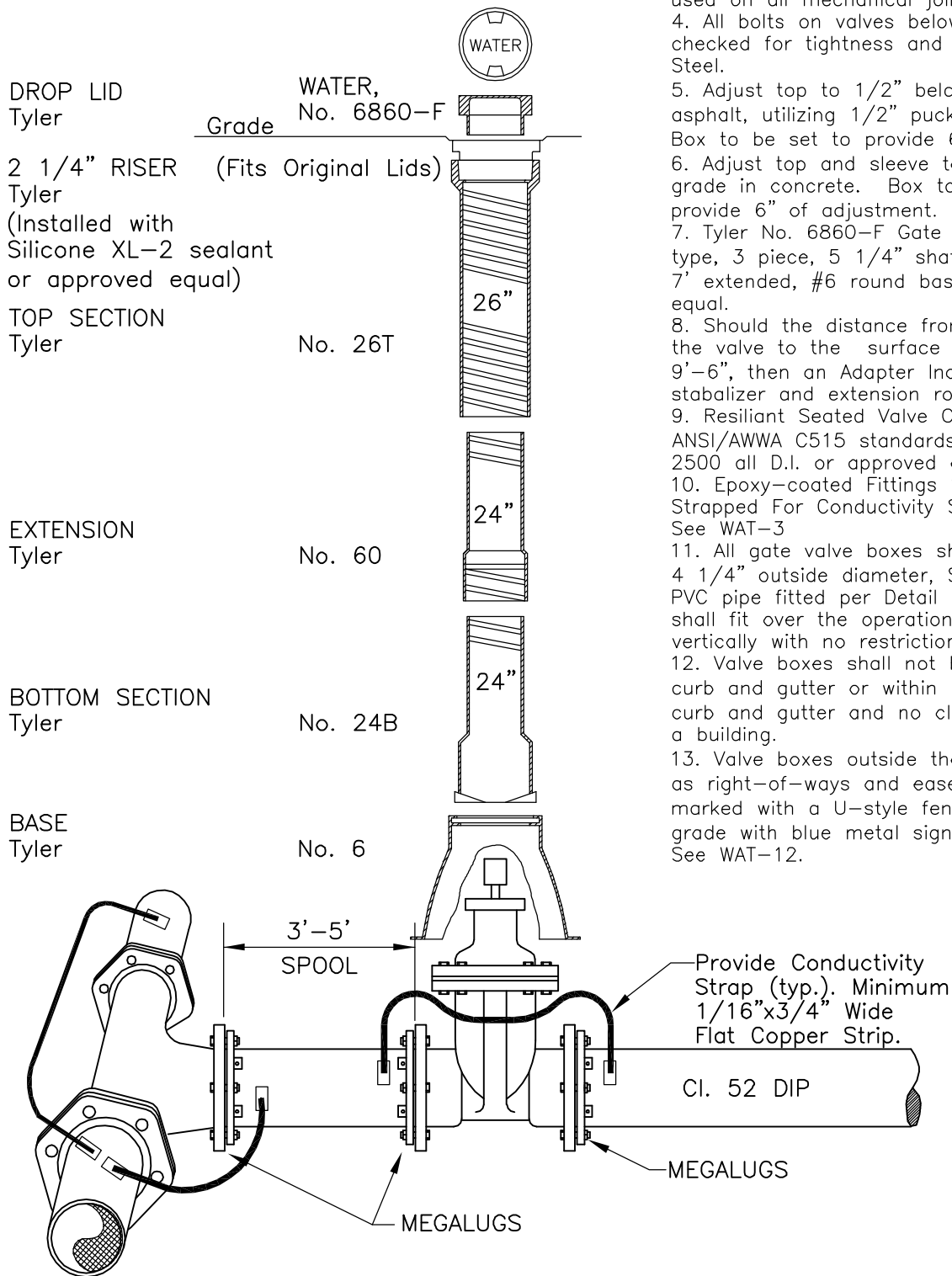
- A. Disinfect all newly installed water mains, appurtenances and services in accordance with ANSI/AWWA C651. Granular calcium hypochloride shall be used.

**END OF SECTION**

- B. Water Utility shall be notified 24 hours before any operation of valves, hydrants, and sampling.
- C. Fill water main slowly with appropriate hydrants and other accessible locations, usually locations at the highest elevation, open to void the system of as much air as possible.
- D. Disinfectant contact time shall be a minimum of 24 hours and a maximum of 48 hours.
- E. Flush system with a high velocity flush (ten feet per second) within 24 hours after disinfectant contact time is completed.
  - 1. This must be accomplished prior to proceeding with test sequence. (See Section 3.02)
  - 2. Required de-chlorination shall be accomplished by the Contractor and approved by the City Engineer.
- F. System shall be flushed after conductivity and pressure tests, but before bacteriological sampling. Chlorine residuals shall match existing system residuals in the area.
- G. Bacteriological water samples shall be taken a minimum of 24 hours after the above flush in Paragraph F.
- H. Bacteriological water samples (at least one) will be taken at locations to be determined by the City Engineer. A coliform test will be performed on each sample. The bacteriological water sample site locations shall be, at a minimum, one for each 1,000 feet of water main installed and one at all dead-ends less than 1,000 feet.
  - 1. Water Utility personnel will furnish the lab form and sample bottle, take the sample, and deliver to the lab. All associated costs will be borne by the Developer.
- I. Rechlorinate as required if any samples test positive for coliform.

NOTES:

1. No threaded insert sections are allowed. Tyler 2 1/4" to 4" risers with Silicone XL-2 sealant or approved equal are acceptable.
2. 7' Minimum cover required over top of water main.
3. "MEGA LUG" thrust restraint gland to be used on all mechanical joints.
4. All bolts on valves below grade must be checked for tightness and be 304 Stainless Steel.
5. Adjust top to 1/2" below grade in asphalt, utilizing 1/2" pucks when paving. Box to be set to provide 6" of adjustment.
6. Adjust top and sleeve to 1/2" below grade in concrete. Box to be set to provide 6" of adjustment.
7. Tyler No. 6860-F Gate valve box, screw type, 3 piece, 5 1/4" shaft, series F box, 7' extended, #6 round base or approved equal.
8. Should the distance from the top nut of the valve to the surface be greater than 9'-6", then an Adapter Inc. valve box stabilizer and extension rod shall be used.
9. Resilient Seated Valve Conforming to ANSI/AWWA C515 standards. Waterous AFC 2500 all D.I. or approved equal.
10. Epoxy-coated Fittings Shall Be Strapped For Conductivity Similar To Valves, See WAT-3
11. All gate valve boxes shall be plumb. A 4 1/4" outside diameter, Schedule 3034 PVC pipe fitted per Detail Plate WAT-11 shall fit over the operational nut and slide vertically with no restrictions.
12. Valve boxes shall not be located in curb and gutter or within 12" of lip of curb and gutter and no closer than 10' to a building.
13. Valve boxes outside the roadway (such as right-of-ways and easements) shall be marked with a U-style fence post 4' above grade with blue metal sign labeled "GV." See WAT-12.



GATE VALVE AND BOX INSTALLATION

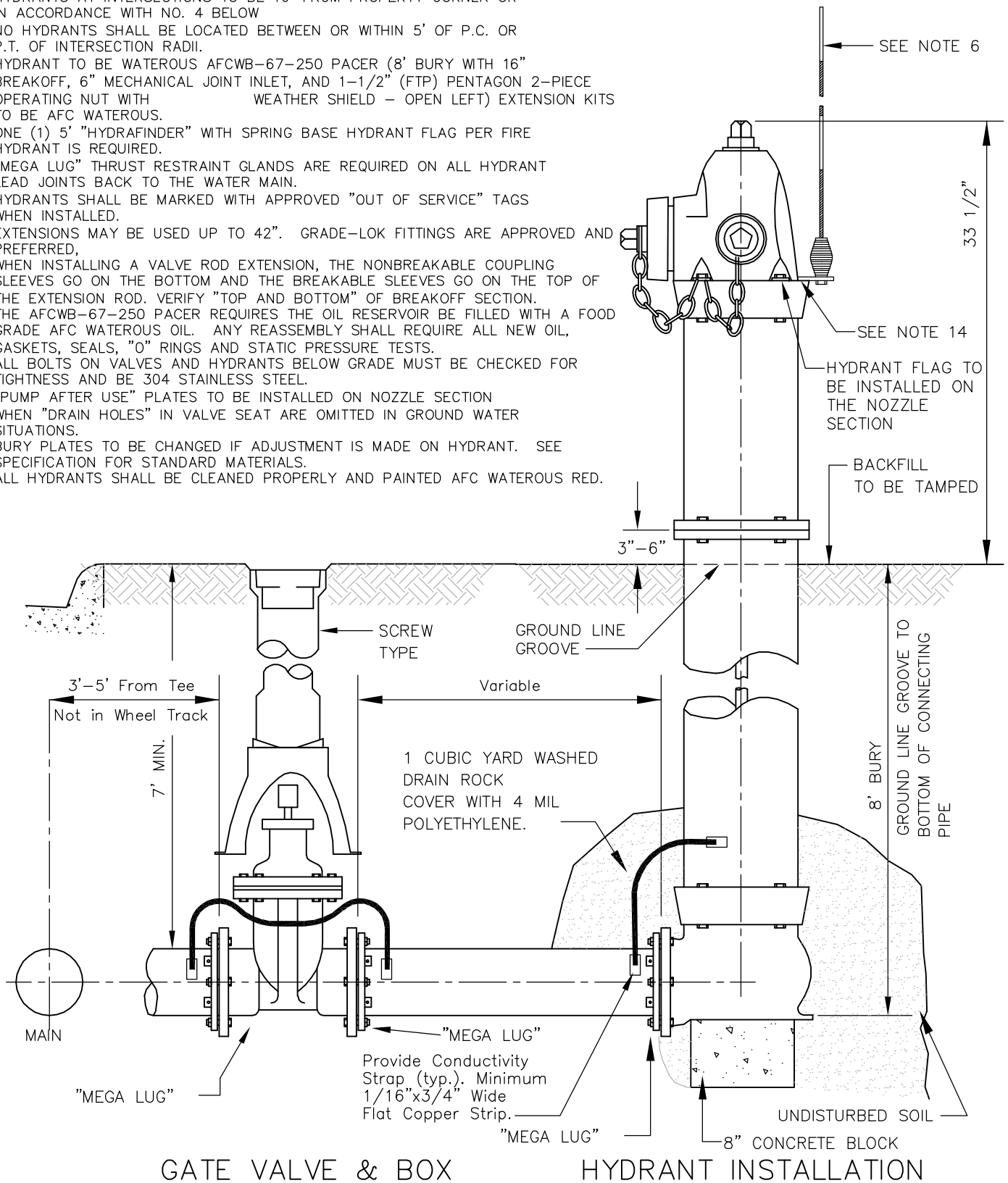
HUDSON, WISCONSIN

PLATE NO. WAT-1



NOTES:

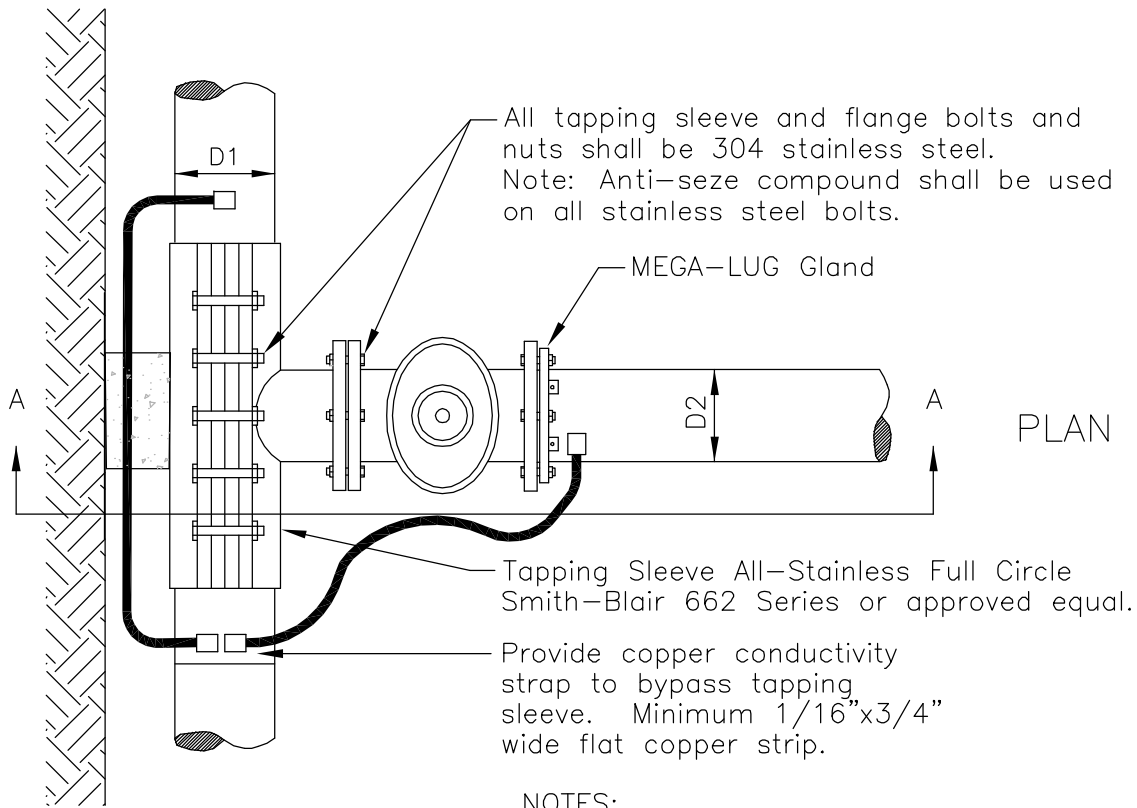
1. ALL HYDRANT LEADS SHALL BE VALVED.
2. HYDRANTS TO BE 7' BEHIND BACK OF CURB.
3. HYDRANTS AT INTERSECTIONS TO BE 10' FROM PROPERTY CORNER OR IN ACCORDANCE WITH NO. 4 BELOW
4. NO HYDRANTS SHALL BE LOCATED BETWEEN OR WITHIN 5' OF P.C. OR P.T. OF INTERSECTION RADII.
5. HYDRANT TO BE WATEROUS AFCWB-67-250 PACER (8' BURY WITH 16" BREAKOFF, 6" MECHANICAL JOINT INLET, AND 1-1/2" (FTP) PENTAGON 2-PIECE OPERATING NUT WITH WEATHER SHIELD - OPEN LEFT) EXTENSION KITS TO BE AFC WATEROUS.
6. ONE (1) 5' "HYDRAFINDER" WITH SPRING BASE HYDRANT FLAG PER FIRE HYDRANT IS REQUIRED.
7. "MEGA LUG" THRUST RESTRAINT GLANDS ARE REQUIRED ON ALL HYDRANT LEAD JOINTS BACK TO THE WATER MAIN.
8. HYDRANTS SHALL BE MARKED WITH APPROVED "OUT OF SERVICE" TAGS WHEN INSTALLED.
9. EXTENSIONS MAY BE USED UP TO 42". GRADE-LOK FITTINGS ARE APPROVED AND PREFERRED.
10. WHEN INSTALLING A VALVE ROD EXTENSION, THE NONBREAKABLE COUPLING SLEEVES GO ON THE BOTTOM AND THE BREAKABLE SLEEVES GO ON THE TOP OF THE EXTENSION ROD. VERIFY "TOP AND BOTTOM" OF BREAKOFF SECTION.
11. THE AFCWB-67-250 PACER REQUIRES THE OIL RESERVOIR BE FILLED WITH A FOOD GRADE AFC WATEROUS OIL. ANY REASSEMBLY SHALL REQUIRE ALL NEW OIL, GASKETS, SEALS, "O" RINGS AND STATIC PRESSURE TESTS.
12. ALL BOLTS ON VALVES AND HYDRANTS BELOW GRADE MUST BE CHECKED FOR TIGHTNESS AND BE 304 STAINLESS STEEL.
13. "PUMP AFTER USE" PLATES TO BE INSTALLED ON NOZZLE SECTION WHEN "DRAIN HOLES" IN VALVE SEAT ARE OMITTED IN GROUND WATER SITUATIONS.
14. BURY PLATES TO BE CHANGED IF ADJUSTMENT IS MADE ON HYDRANT. SEE SPECIFICATION FOR STANDARD MATERIALS.
15. ALL HYDRANTS SHALL BE CLEANED PROPERLY AND PAINTED AFC WATEROUS RED.



GATE VALVE & BOX

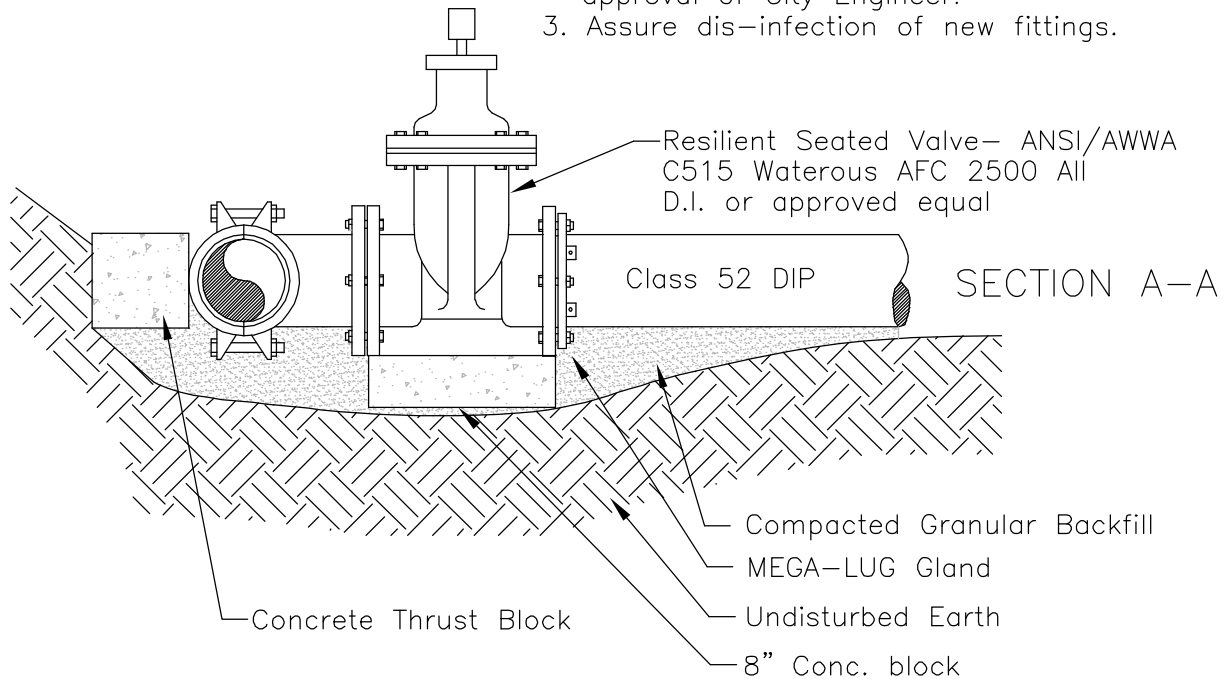
HYDRANT INSTALLATION

HYDRANT WITH GATE VALVE & BOX INSTALLATION



NOTES:

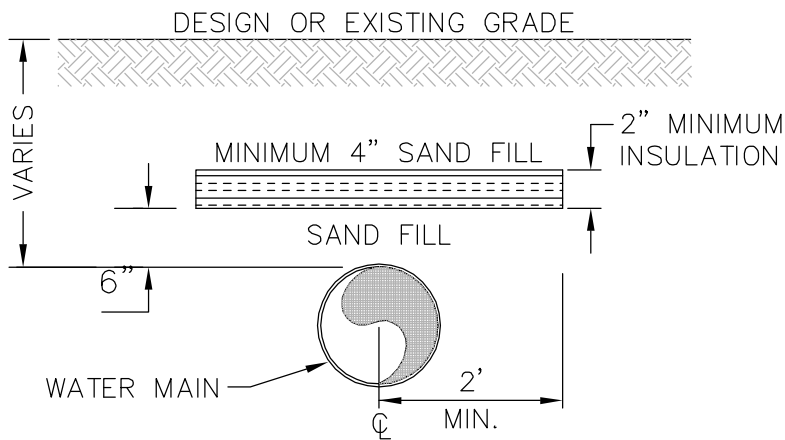
1. Anti-corrosive protection coating required on all grinded and welded areas.
2. 7.0' cover required over top of water main. Any thing <7.0' or >8.0' shall require approval of City Engineer.
3. Assure dis-infection of new fittings.



WATER MAIN WET TAP

HUDSON, WISCONSIN

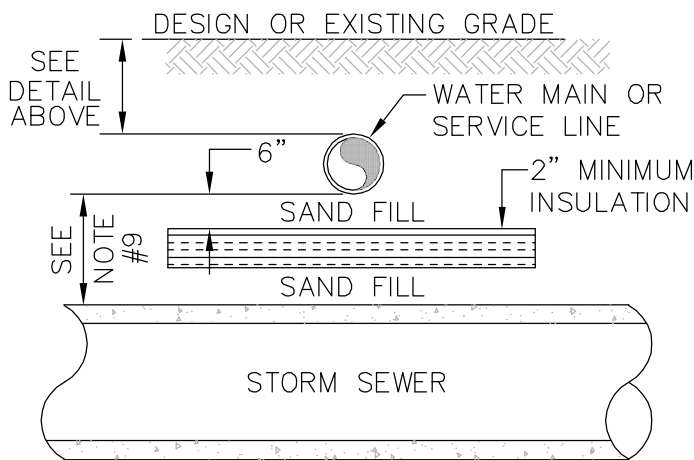
PLATE NO. WAT-3



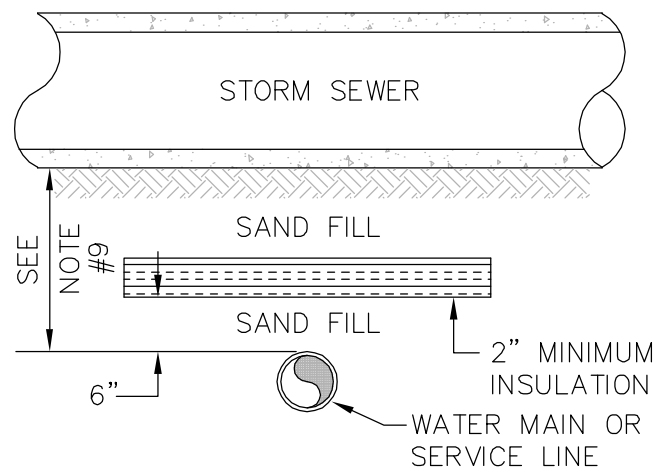
SHALLOW BURY CONDITIONS  
NO SCALE

WIDTH OF INSULATION BETWEEN WATER MAIN AND STORM SEWER

STORM SEWER	WATER LINE	
	1" TO 4"	6" TO 12"
12" TO 48"	2'	4'
54" & LARGER	4'	8'



STORM SEWER CROSSING BELOW  
NO SCALE



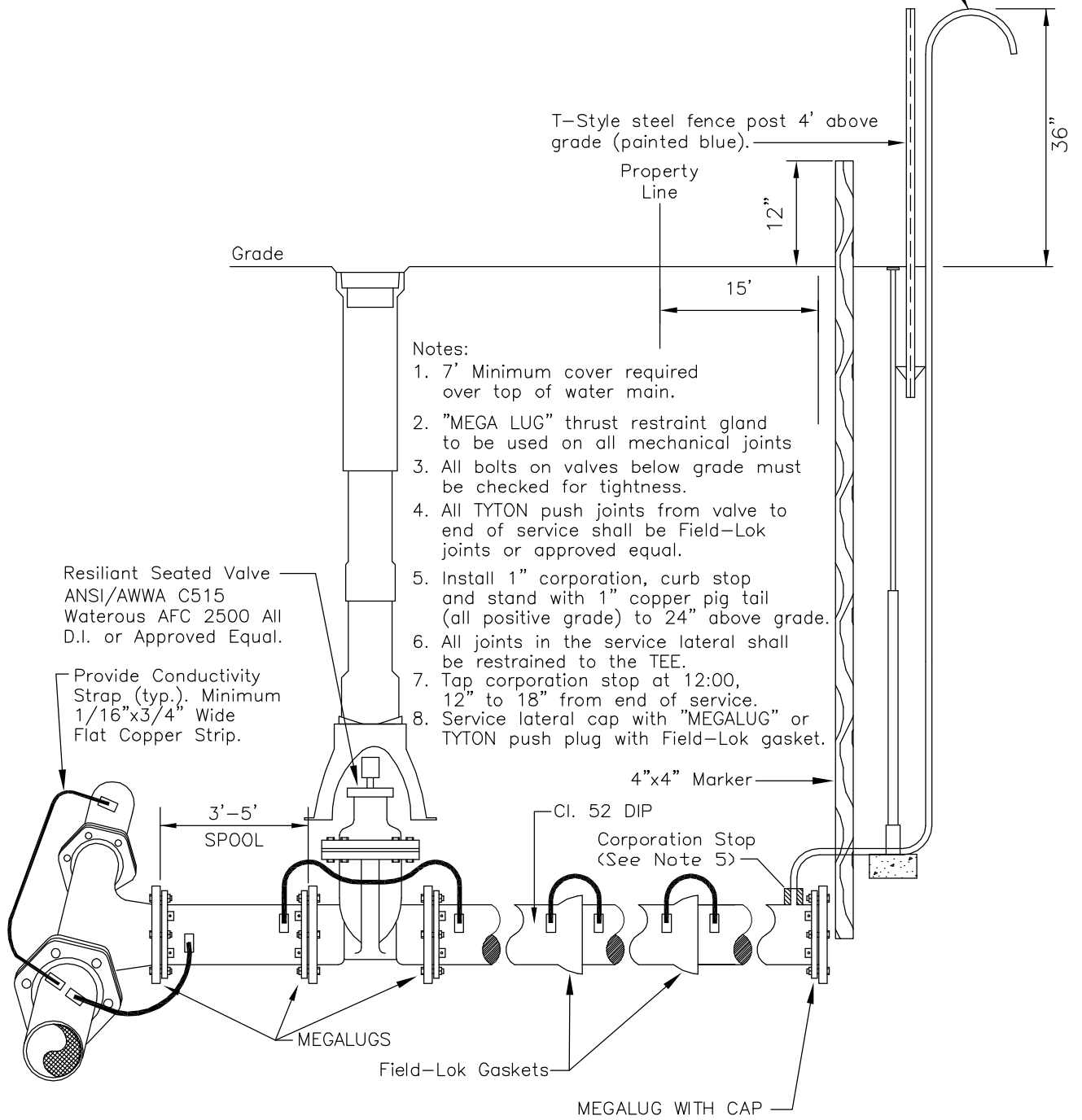
STORM SEWER CROSSING ABOVE  
NO SCALE

NOTES:

1. INSULATION SHALL BE CENTERED ON THE PIPE.
2. RIGID, EXTRUDED POLYSTYRENE BOARD INSULATION, CLOSED CELL (DOW CHEMICAL) OR APPROVED EQUAL.
3. THERMAL RESISTANCE (R): 5.0.
4. MINIMUM THICKNESS: 2 INCHES.
5. BOARD SIZE: 48"x96".
6. COMPRESSIVE STRENGTH: MINIMUM 25 psi.
7. WATER ABSORPTION IN ACCORDANCE WITH ANSI/ASTM D2842: 0.1 PERCENT BY VOLUME, MAXIMUM.
8. EDGES: SQUARE.
9. ALL STORM SEWER CONFLICTS OR INTERSECTIONS SHALL BE INSULATED AS APPROVED BY FIELD ENGINEER TO EQUATE TO 7 FEET OF MINIMUM COVER (1 INCH CLOSED CELL INSULATION = 1 FOOT OF SOIL).
10. INSULATION LENGTH ALONG WATER LINE SHALL BE A MINIMUM OF 4 FEET GREATER THAN THE OUTSIDE DIAMETER OF THE STORM SEWER PIPE.

INSULATION DETAIL

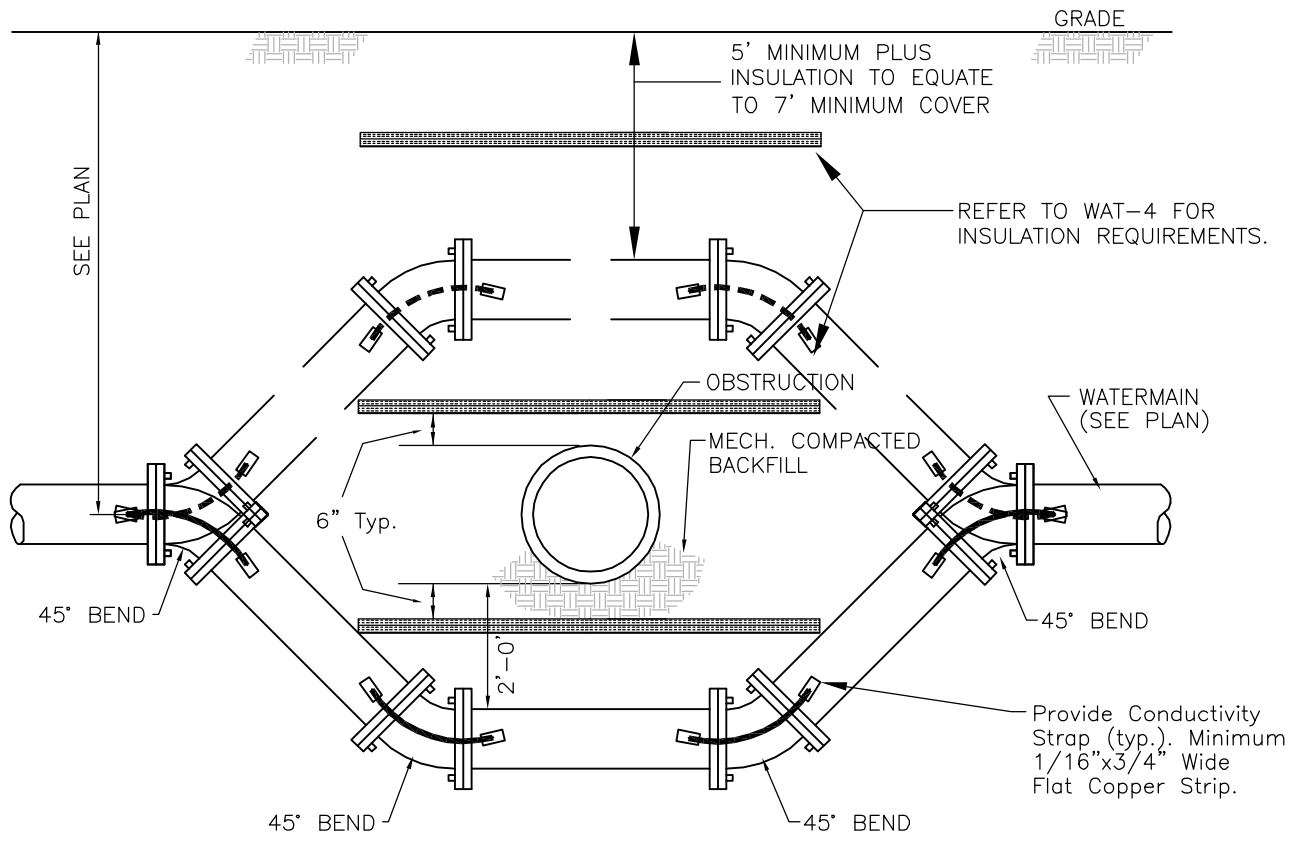
Copper end flared and installed with flare nut and flare plug



## GATE VALVE ON DIP SERVICE OR DEAD-END LINE

HUDSON, WISCONSIN

PLATE NO. WAT-5



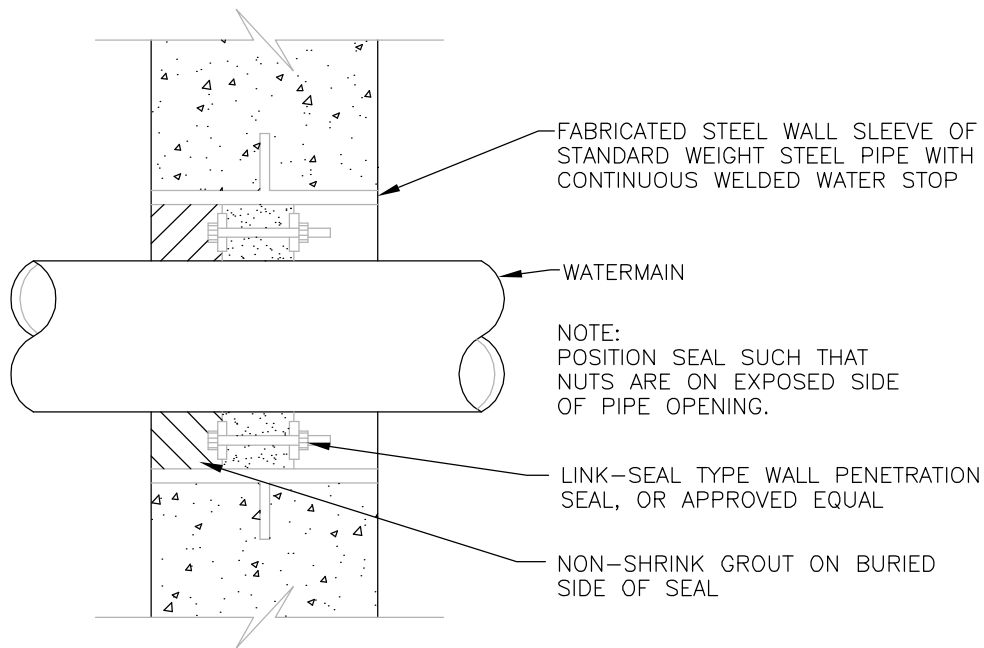
TIE ALL JOINTS WITH  
MEGALUGS (8 REQ.)

- NOTE:
1. WATERMAIN OFFSET SHALL BE OVER OBSTRUCTION IF 5' MINIMUM COVER PLUS INSULATION TO EQUATE 7' COVER CAN BE ACHIEVED.
  2. ADDITIONAL INSULATION BETWEEN WATERMAIN AND OBSTRUCTED PIPE MAY BE REQUIRED AS PER DETAIL PLATE WAT-4

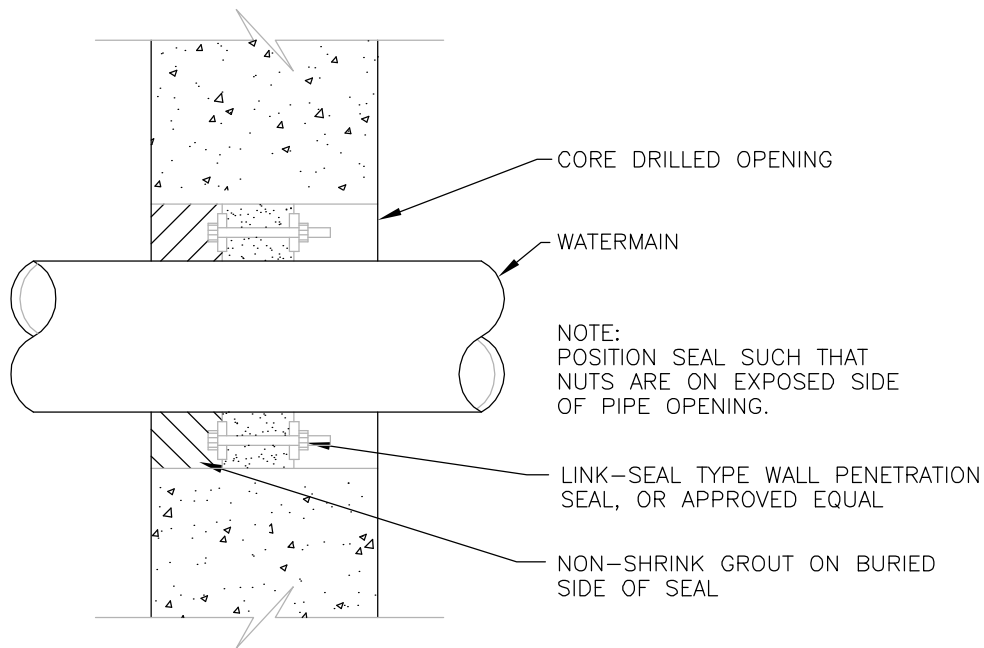
## WATERMAIN OFFSET WITH MEGALUGS

HUDSON, WISCONSIN

PLATE NO. WAT-6

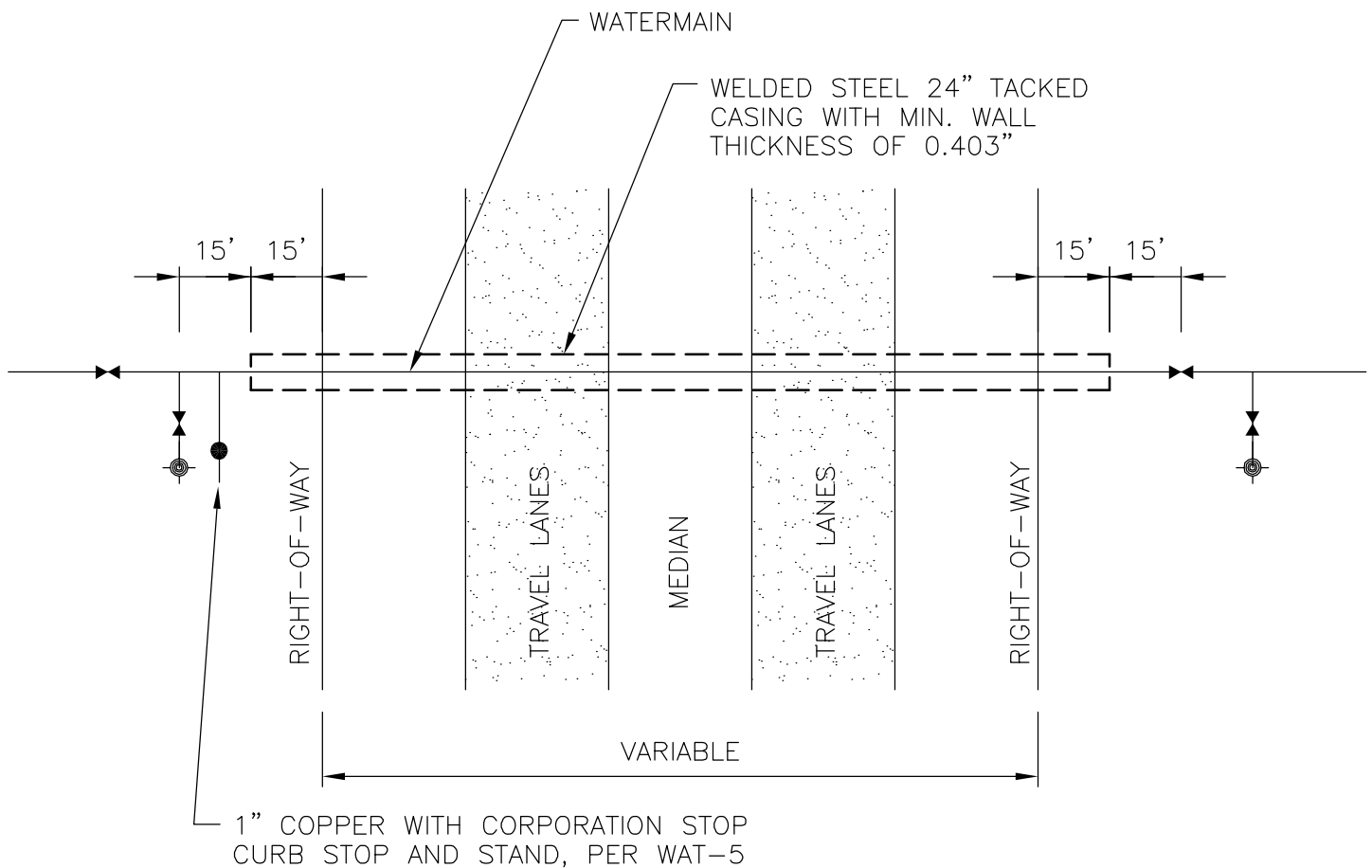


NEWLY POURED CONCRETE WALL, FOUNDATION OR BULKHEAD



EXISTING CONCRETE WALL, FOUNDATION OR BULKHEAD

WATERMAIN PENETRATION  
OF WALL, FOUNDATION OR BULK HEAD



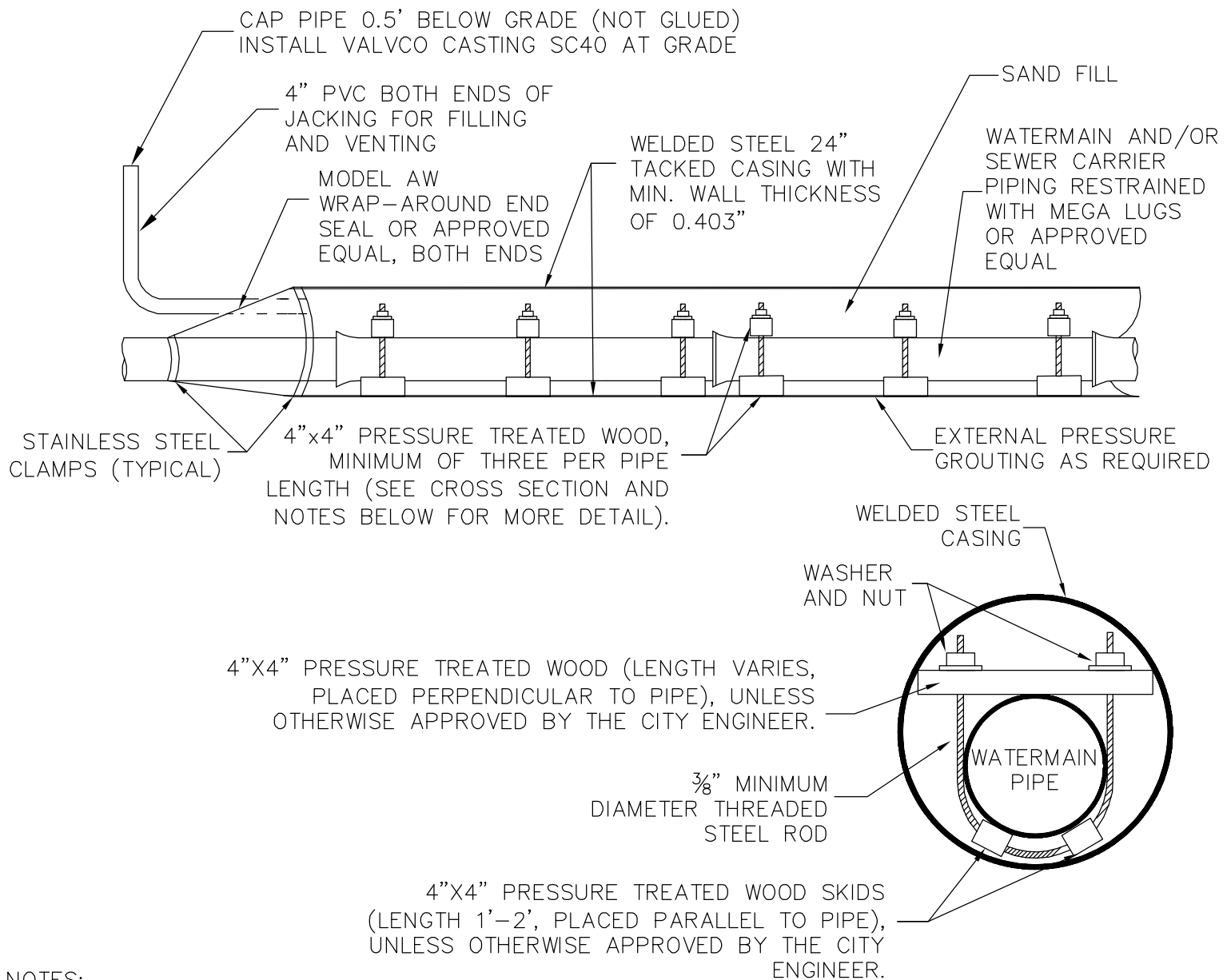
NOTES:

1. ALL JOINTS SHALL BE RESTRAINED WITH MEGA LUGS, OR APPROVED EQUAL, AND UTILIZE FULL PIPE LENGTHS.
2. PIPE SHALL BE SUPPORTED BY 4"X4" PRESSURE TREATED WOOD AND  $\frac{3}{8}$ " MINIMUM DIAMETER THREADED STEEL ROD, UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER, MINIMUM OF THREE SUPPORTS PER PIPE LENGTH (SEE DETAIL PLATE WAT-10 FOR MORE DETAIL).
3. SILICA SAND SHALL FILL VOID IN CASING.
4. A MODEL AW WRAP-AROUND END SEAL, OR APPROVED EQUAL, SHALL BE UTILIZED ON ENDS OF CASING AND REDUCED TO CARRIER PIPE.
5. VERTICAL ALIGNMENT SHALL MAINTAIN 7-FOOT MINIMUM COVER OVER WATERMAIN BELOW LOWEST DITCH ELEVATION OF ROADWAY CROSS SECTION OR AS APPROVED BY THE CITY ENGINEER.
6. MARK END WITH POST AND MARKER, PER DETAIL PLATE WAT-12.
7. VENTS SHALL BE INSTALLED UTILIZING VALVCO CASTING SC40 AT GRADE (WITH WATER OR SEWER LID), OR APPROVED EQUAL.
8. FOR CROSSINGS INVOLVING STATE RIGHT-OF-WAYS, DIMENSIONS SHOWN ABOVE SHALL APPLY TO THE BUFFER SETBACK ZONES (NOT THE RIGHT-OF-WAY LINES).

ENCASED WATERMAIN CROSSING

HUDSON, WISCONSIN

PLATE NO. WAT-8

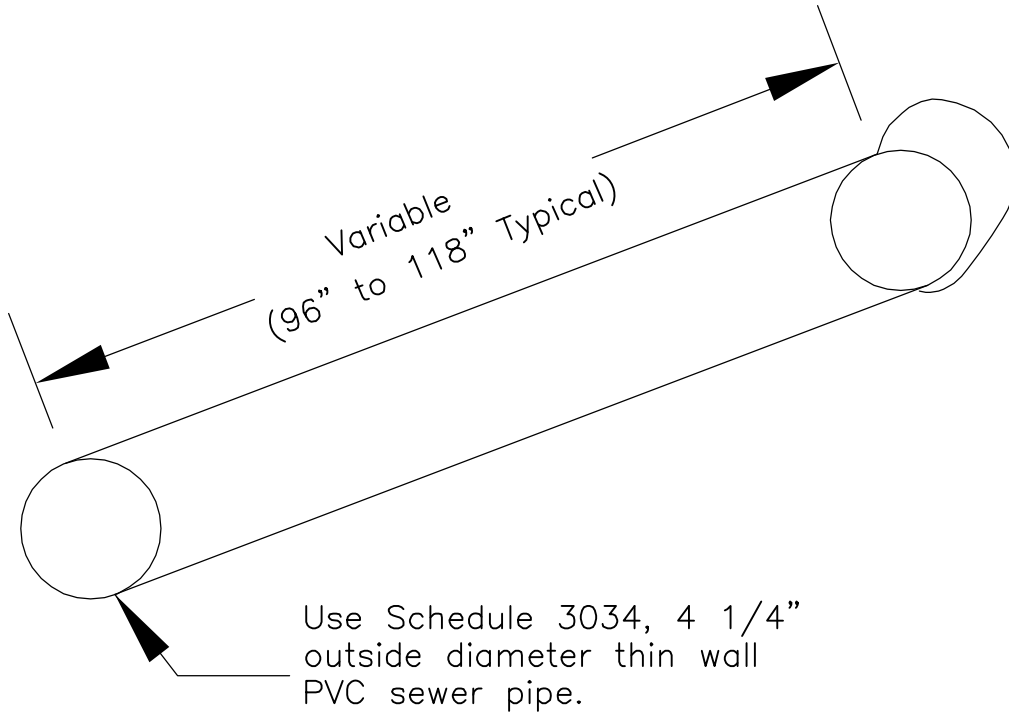


NOTES:

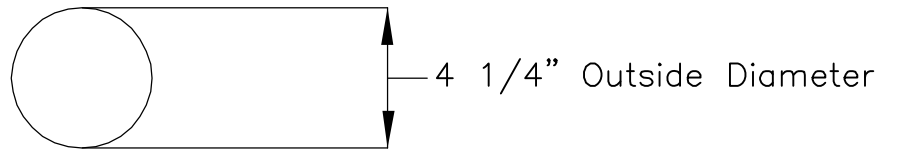
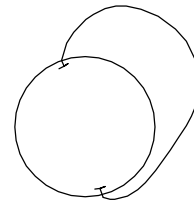
1. ALL JOINTS SHALL BE RESTRAINED WITH MEGA LUGS, OR APPROVED EQUAL, AND UTILIZE FULL PIPE LENGTHS.
2. PIPE SHALL BE SUPPORTED BY 4"x4" PRESSURE TREATED WOOD AND 3/8" MINIMUM DIAMETER THREADED STEEL ROD, UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER, MINIMUM OF THREE SUPPORTS PER PIPE LENGTH (SEE ABOVE DIAGRAM FOR MORE DETAIL).
3. SILICA SAND SHALL FILL VOID IN CASING.
4. A MODEL AW WRAP-AROUND END SEAL, OR APPROVED EQUAL, SHALL BE UTILIZED ON ENDS OF CASING AND REDUCED TO CARRIER PIPE.
5. VERTICAL ALIGNMENT SHALL MAINTAIN 7- FEET MINIMUM COVER OVER WATERMAIN BELOW LOWEST DITCH ELEVATION OF ROADWAY CROSS SECTION OR AS APPROVED BY THE CITY ENGINEER.
6. MARK END WITH POST AND MARKER, PER DETAIL PLATE WAT-12.
7. VENTS SHALL BE INSTALLED UTILIZING VALVCO CASTING SC40 AT GRADE (WITH WATER OR SEWER LID), OR APPROVED EQUAL.
8. INSTALL APPURTENANCES IN THE LOCATIONS SHOWN PER DETAIL PLATE WAT-9.

JACKING DETAIL





Rope end to be left open to inspect gate valve operating nut. Loop rope inside of PVC and tie off with knots.

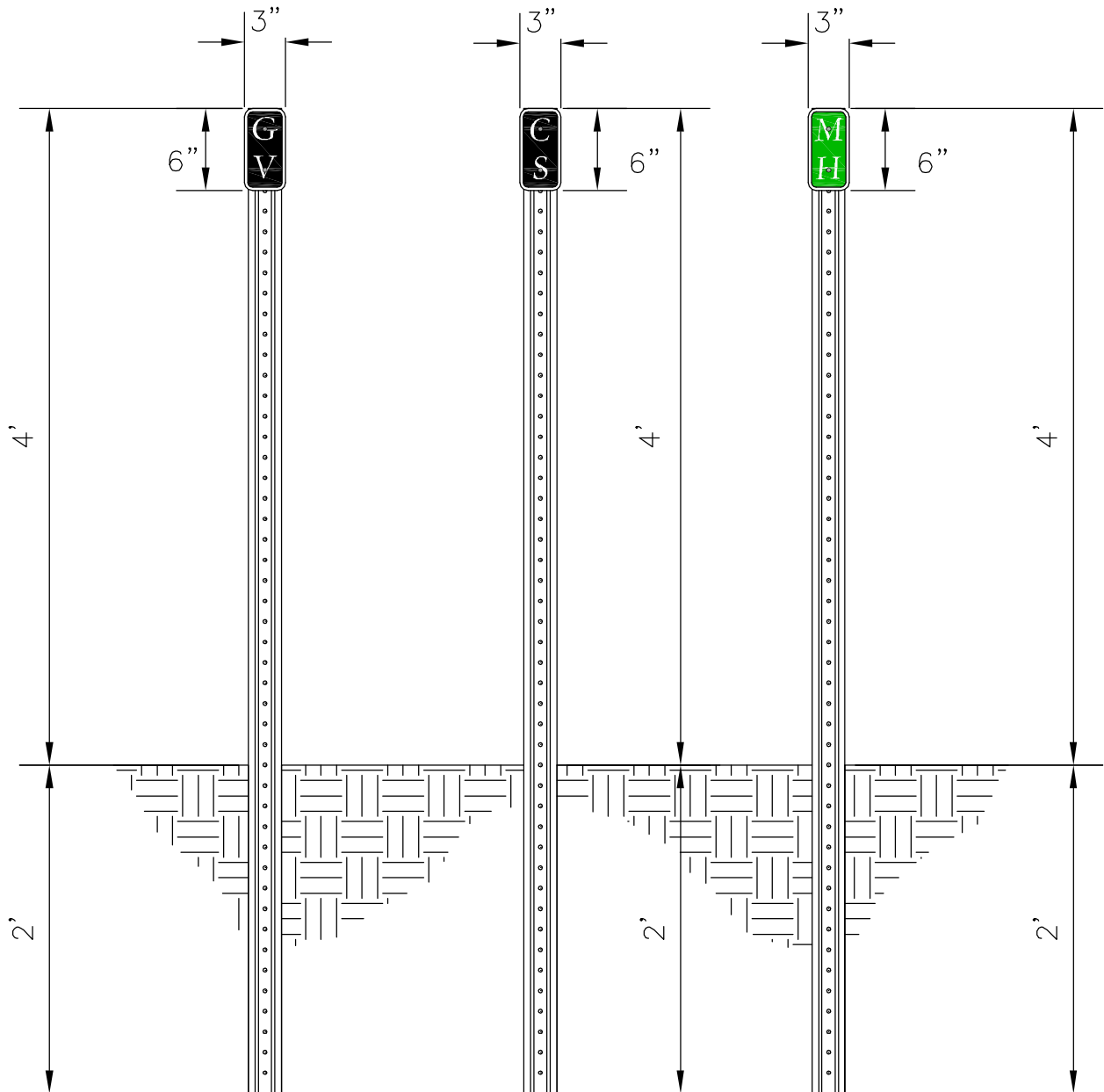


## GATE VALVE ALIGNMENT TOOL

HUDSON, WISCONSIN

PLATE NO. WAT-10

NOTE: All manholes installed outside the roadway (such as right-of-ways and easements) shall be marked with a green metal sign labeled "MH" in white letters. All gate valves installed outside the roadway (such as right-of-ways and easements) shall be marked with a blue metal sign labeled "GV" in white letters. All curb boxes located in unimproved right-of-ways and easements shall be marked with a blue metal sign labeled "CS" in white letters. Signs shall be mounted to a U-style steel post 4' above grade with two sets of stainless steel bolts, washers and nuts. All metal sign shall be a minimum of 0.063" thick. All steel posts shall be a minimum of 1.2 LB/FT.



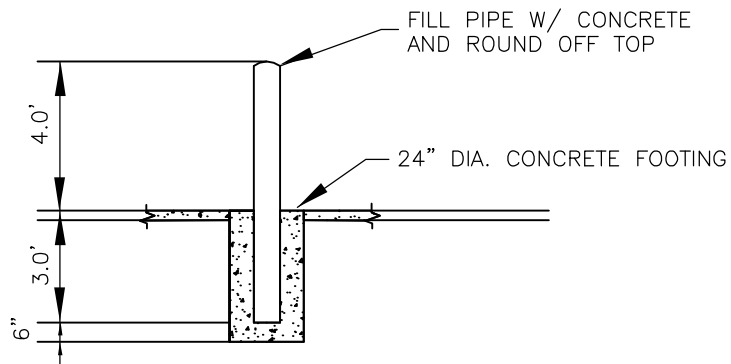
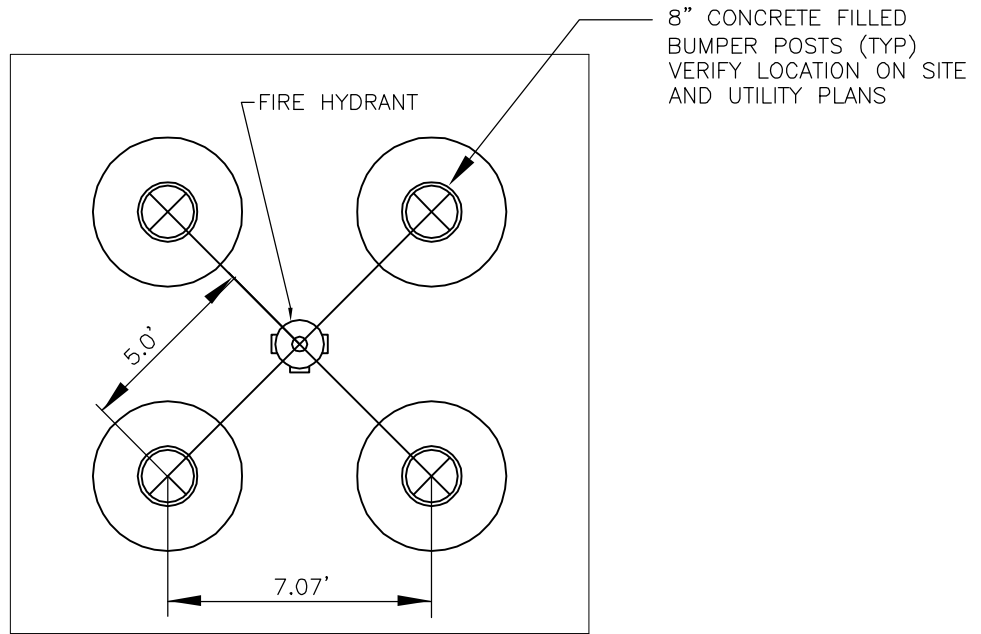
NOTE: Posts to be embedded 2' and located 18" behind gate valves and curb boxes. All markers shall face the structure.

GATE VALVE, CURB STAND, AND MANHOLE MARKERS WITH STEEL POSTS

HUDSON, WISCONSIN

PLATE NO. WAT-11

FEBRUARY 2012



NOT TO SCALE

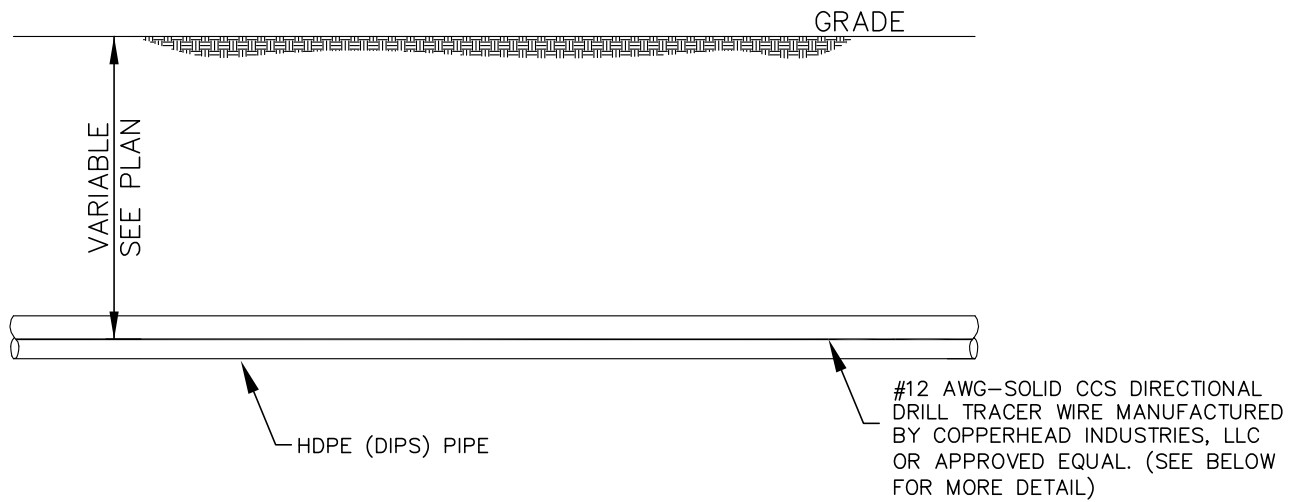
NOTE:  
8" DIA. CLASS 52 D.I. PIPE (1) COAT OF PRIMER, FOLLOWED BY (3) COATS OF SAFETY YELLOW PAINT.

NOTE:  
BOLLARDS SUPPLIED BY CONTRACTOR.

PIPE GUARD POST PLAN VIEW

HUDSON, WISCONSIN

PLATE NO. WAT-12



NOTES:

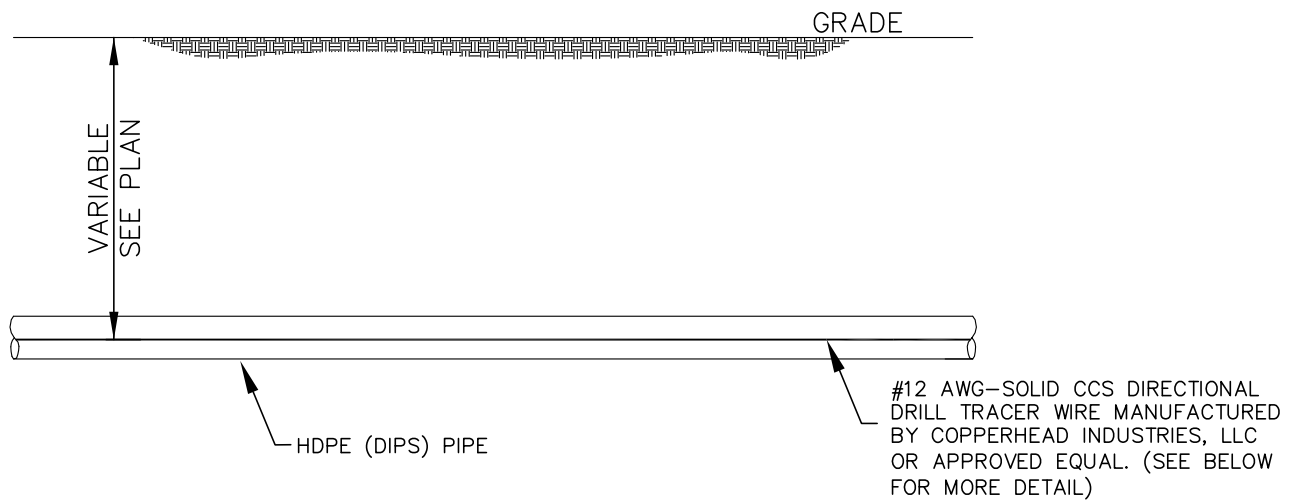
1. HDPE WATERMAIN SHALL BE DUCTILE IRON PIPE SIZE (DIPS).
2. CONTRACTOR SHALL PROVIDE AND INSTALL #12 AWG SOLID (0.0808" DIAMETER) CCS EXTRA HIGH STRENGTH HARD DRAWN HORIZONTAL DIRECTIONAL DRILL TRACER WIRE MANUFACTURED BY COPPERHEAD INDUSTRIES, LLC OR APPROVED EQUAL.
3. TRACER WIRE SHALL BE BLUE WITH A MINIMUM 45 MIL HDPE, 30 VOLT MINIMUM RATING, AND 1150 POUND MINIMUM AVERAGE BREAK STRENGTH.
4. ATTACH TRACER WIRE TO PIPE IN A MANNER THAT ENSURES IT REMAINS INTACT THROUGHOUT THE ENTIRE INSTALLATION PROCESS.
5. TRACER WIRE TO BE BROUGHT TO SURFACE AT TRACER WIRE TEST STATIONS.
6. TRACER WIRE BROUGHT TO THE SURFACE SHALL BE MARKED AND IDENTIFIED WITH A TRI-VIEW FLEX TEST STATION CONTAINING TWO INTERNAL TERMINALS MANUFACTURED BY RHINO MARKING & PROTECTION SYSTEMS OR APPROVED EQUAL. TEST STATIONS FOR WATER SHALL BE BLUE WITH RHINO PART #TVTI72BB2 OR APPROVED EQUAL AND SHALL CONTAIN ONE DECAL ON EACH SIDE OF TEST STATION WITH RHINO PART #GD8-1332K OR APPROVED EQUAL.
7. TRANSITION FROM HDPE TO DIP SHALL BE MADE AT THE EXTREMITIES OF HYDRANT CONNECTIONS, WATERMAIN CROSSINGS, AND SERVICES.
8. HDPE TO DUCTILE IRON FITTING CONNECTIONS SHALL BE MADE WITH ONE OF THE FOLLOWING, UNLESS APPROVED BY THE CITY ENGINEER:
  - MJ ADAPTORS (FUSED TO HDPE PIPE) APPROVED BY THE CITY.
  - MEGALUGS AND STAINLESS STEEL PIPE STIFFENERS. PIPE STIFFENERS SHALL BE MODEL CPS AS MANUFACTURED BY CASCADE WATERWORKS MFG. OR APPROVED EQUAL.
9. MAINLINE BENDS SHALL BE EITHER HDPE OR DIP AS APPROVED BY THE CITY ENGINEER.

## HDPE (DIPS) WATERMAIN

HUDSON, WISCONSIN

PLATE NO. WAT-13

FEBRUARY 2012



NOTES:

1. HDPE WATERMAIN SHALL BE DUCTILE IRON PIPE SIZE (DIPS).
2. CONTRACTOR SHALL PROVIDE AND INSTALL #12 AWG SOLID (0.0808" DIAMETER) CCS EXTRA HIGH STRENGTH HARD DRAWN HORIZONTAL DIRECTIONAL DRILL TRACER WIRE MANUFACTURED BY COPPERHEAD INDUSTRIES, LLC OR APPROVED EQUAL.
3. TRACER WIRE SHALL BE BLUE WITH A MINIMUM 45 MIL HDPE, 30 VOLT MINIMUM RATING, AND 1150 POUND MINIMUM AVERAGE BREAK STRENGTH.
4. ATTACH TRACER WIRE TO PIPE IN A MANNER THAT ENSURES IT REMAINS INTACT THROUGHOUT THE ENTIRE INSTALLATION PROCESS.
5. TRACER WIRE TO BE BROUGHT TO SURFACE AT GATE VALVE AND/OR HYDRANT LOCATIONS.
6. TRACER WIRE BROUGHT TO THE SURFACE SHALL BE MARKED AND IDENTIFIED WITH A TRI-VIEW FLEX TEST STATION CONTAINING TWO INTERNAL TERMINALS MANUFACTURED BY RHINO MARKING & PROTECTION SYSTEMS OR APPROVED EQUAL. TEST STATIONS FOR WATER SHALL BE BLUE WITH RHINO PART #TVTI72BB2 OR APPROVED EQUAL AND SHALL CONTAIN ONE DECAL ON EACH SIDE OF TEST STATION WITH RHINO PART #GD8-1332K OR APPROVED EQUAL.
7. TRANSITION FROM HDPE TO DIP SHALL BE MADE AT THE EXTREMITIES OF HYDRANT CONNECTIONS, WATERMAIN CROSSINGS, AND SERVICES.
8. HDPE TO DUCTILE IRON FITTING CONNECTIONS SHALL BE MADE WITH ONE OF THE FOLLOWING, UNLESS APPROVED BY THE CITY ENGINEER:
  - MJ ADAPTORS (FUSED TO HDPE PIPE) APPROVED BY THE CITY.
  - MEGALUGS AND STAINLESS STEEL PIPE STIFFENERS. PIPE STIFFENERS SHALL BE MODEL CPS AS MANUFACTURED BY CASCADE WATERWORKS MFG. OR APPROVED EQUAL.
9. MAINLINE BENDS SHALL BE EITHER HDPE OR DIP AS APPROVED BY THE CITY ENGINEER.

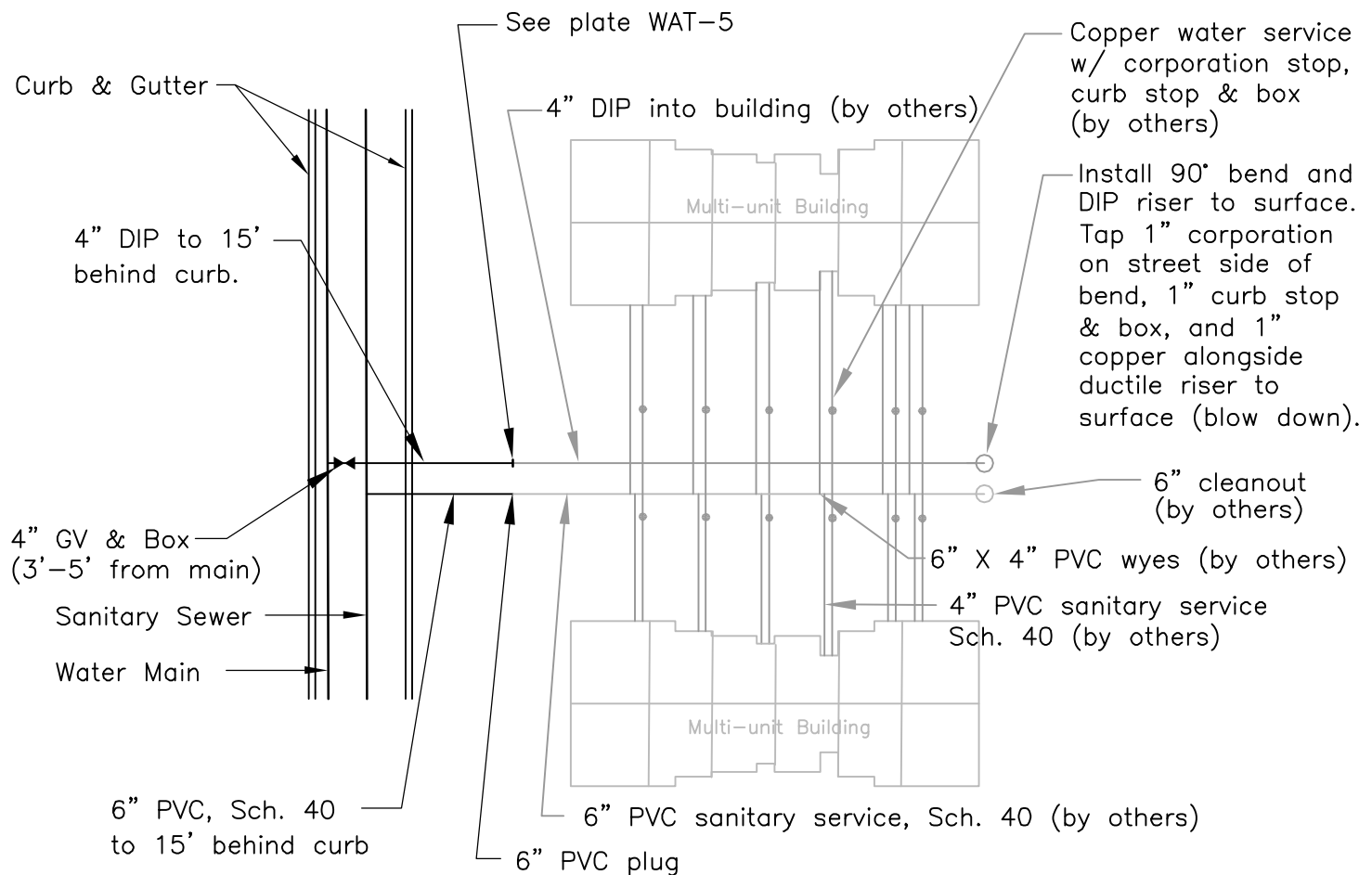
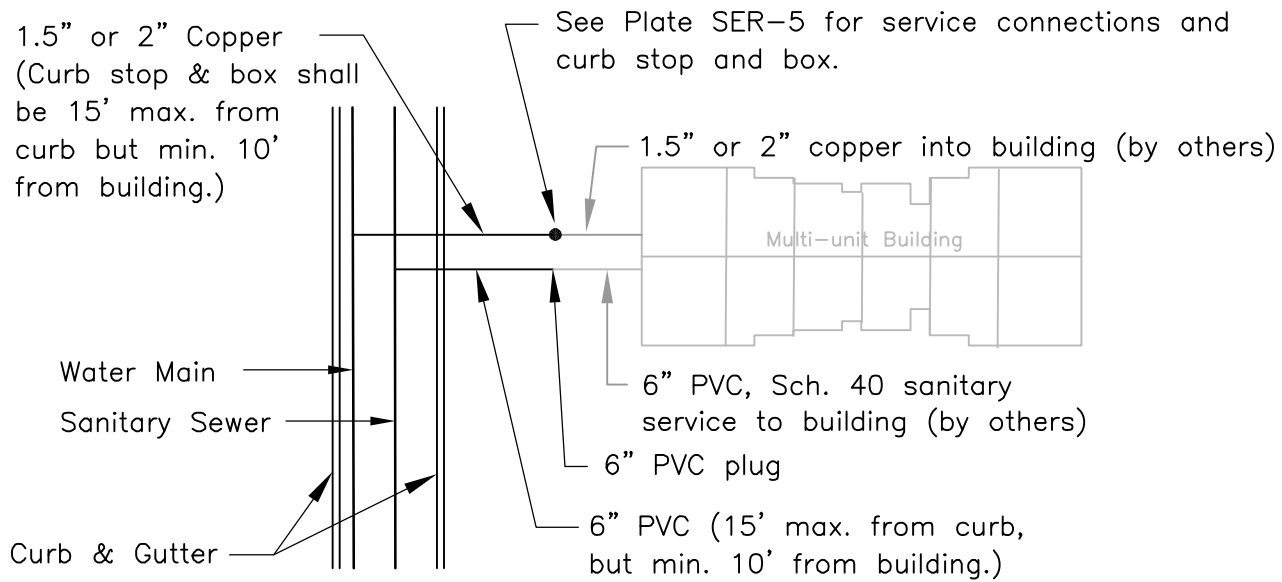
## HDPE (DIPS) WATERMAIN

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HUDSON, WISCONSIN

PLATE NO. WAT-14

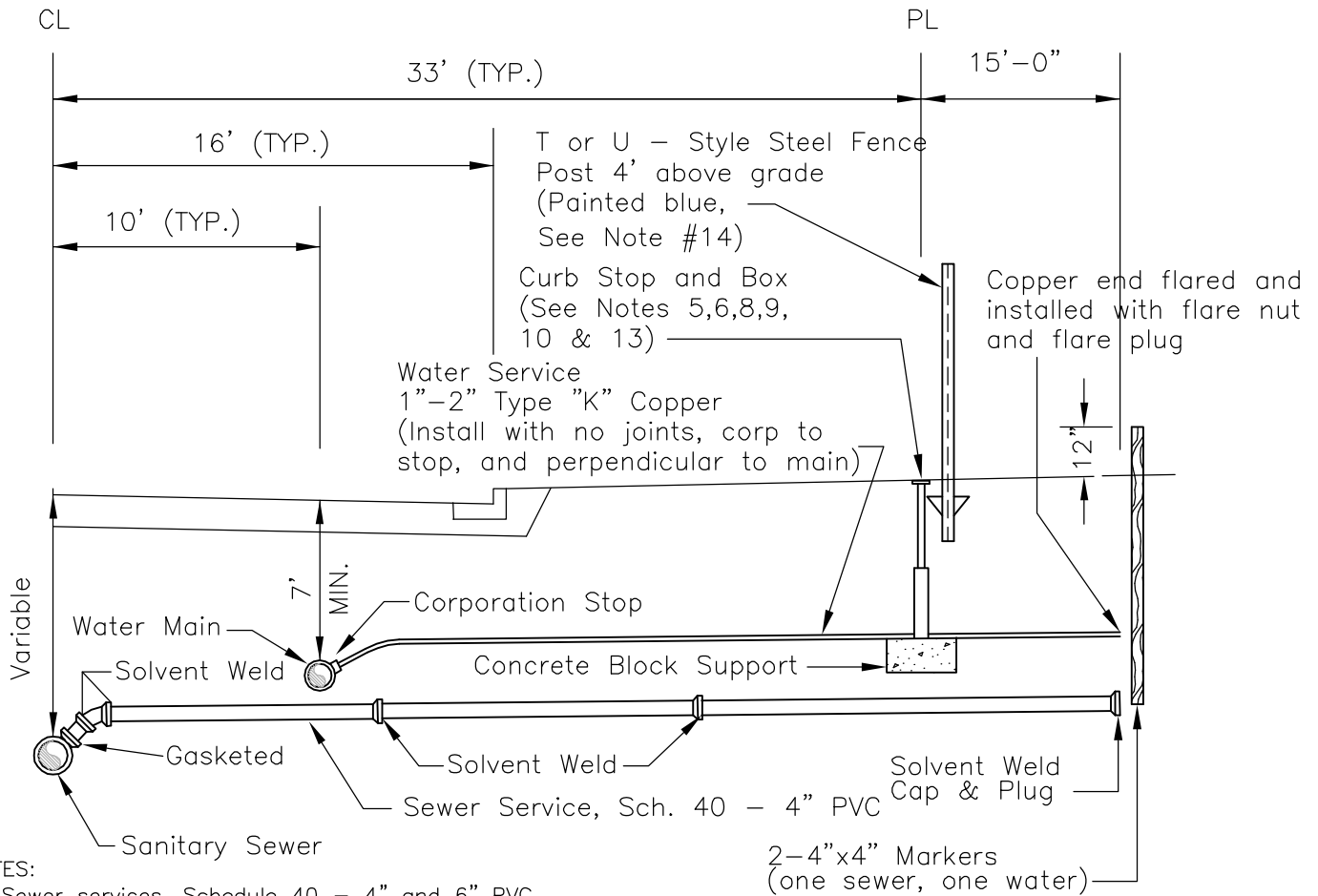
JANUARY 2009



## MULTI FAMILY SEWER AND WATER SERVICE

HUDSON, WISCONSIN

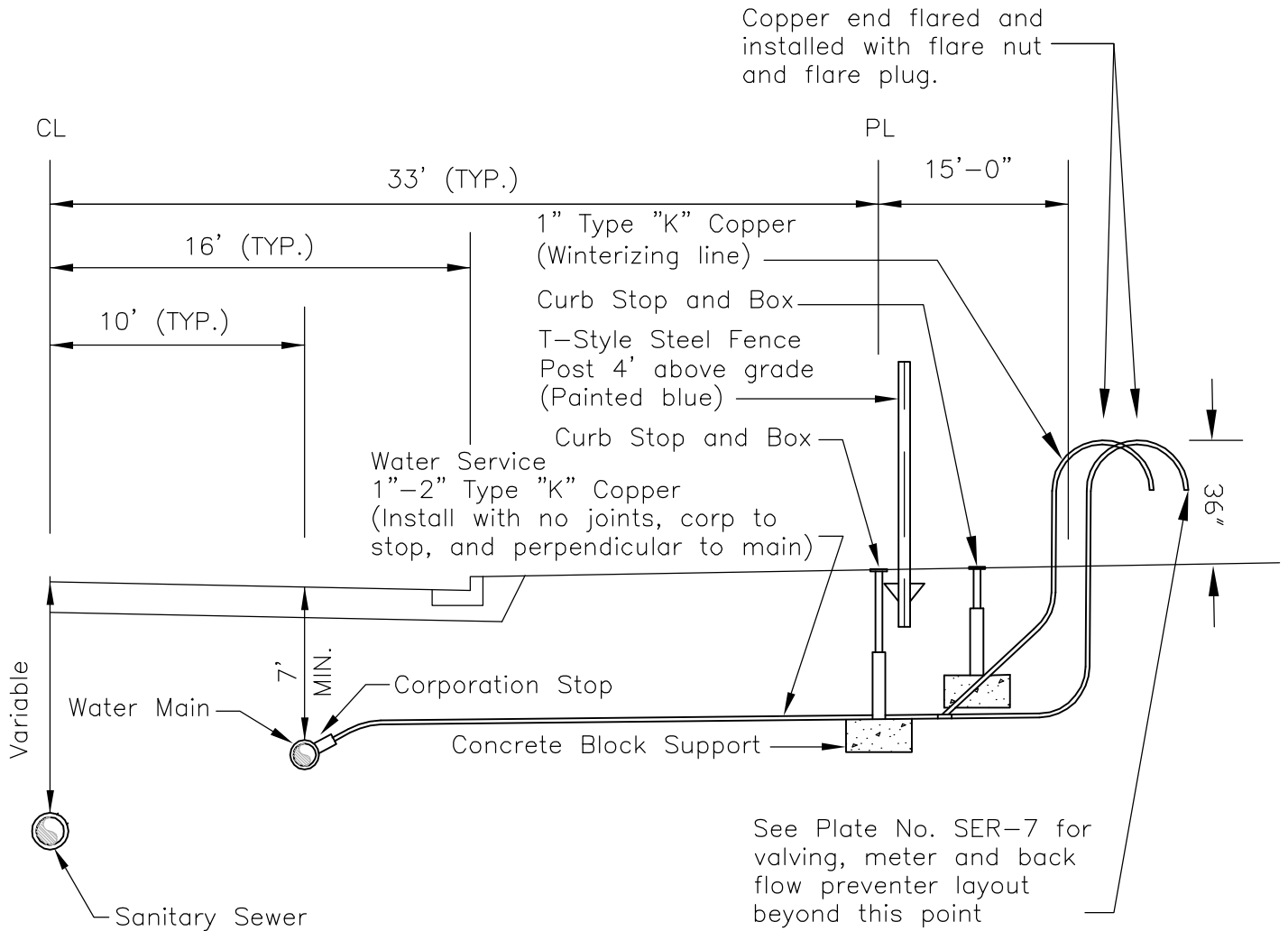
PLATE NO. SER-4



NOTES:

1. Sewer services, Schedule 40 - 4" and 6" PVC.
2. Slope - 1/4" per foot minimum (reference to proposed house pad assuring gravity flow to proposed building or house) Contractor to supply exact end of service elevation & location.
3. Pipe joints and fittings after wye branch shall be non gasketed, solvent weld type.
4. All pipe shall be bedded in granular borrow 209.2.2 Grade 1 or course filter aggregate (501.3.6.4.5 Size No. 1 crushed)
5. Curb box shall extend from 78" to 90" and installed to be adjustable 6" up and down from finished grade.
6. Adjust Curb Box to 1" below finish grade.
7. 1-1/2" and 2" taps (and any size taps in 4" D.I.P.) shall be installed with double strap tapping service saddle, FORD style F202 (with AWWA CC threads) or approved equal.
8. All curb stops and corporation stops shall be in the **open** position during the pressure test.
9. Corporation Stop (AWWA CC Threads):  
Mueller 300 Ball B25000, B25028 or approved equal.  
Curb Stop:  
Mueller 300 Ball B25154, B25155 or approved equal.  
Curb Box (Minneapolis Pattern):  
1" Service - Mueller H10300 (1-1/4" upper section) or approved equal.  
1-1/2" & 2" Services - Mueller H10302 (1-1/2" upper section) or approved equal.
10. Curb boxes in bituminous or concrete shall be installed utilizing Valco Casting SC40(with WATER lid), or approved equal.
11. Service fitting couplings utilized from curb stop to building shall be Mueller H-15400, H-15430, or approved equal.
12. Water service shall be tapped with water main under pressure, and located in upper quadrant of main (2:00 o'clock or 10:00 o'clock), or location approved by the City Engineer. Threads shall be double wrapped with teflon tape prior to installation. Tapping bit shall be inspected and approved by the City Engineer.
13. Curb box shall be located at property line. For private street/drives, curb box location shall be a maximum of 15' behind curb or edge of pavement, and no closer than 10' from edge of building. No curb box shall be located in curb and gutter or closer than 12" to lip of gutter.
14. Curb boxes located in unimproved right-of-ways and easements shall be marked with U-style steel post 4' above grade with blue metal sign labeled "CS" in white letters per detail WAT-12.

SEWER AND WATER SERVICE CONNECTIONS

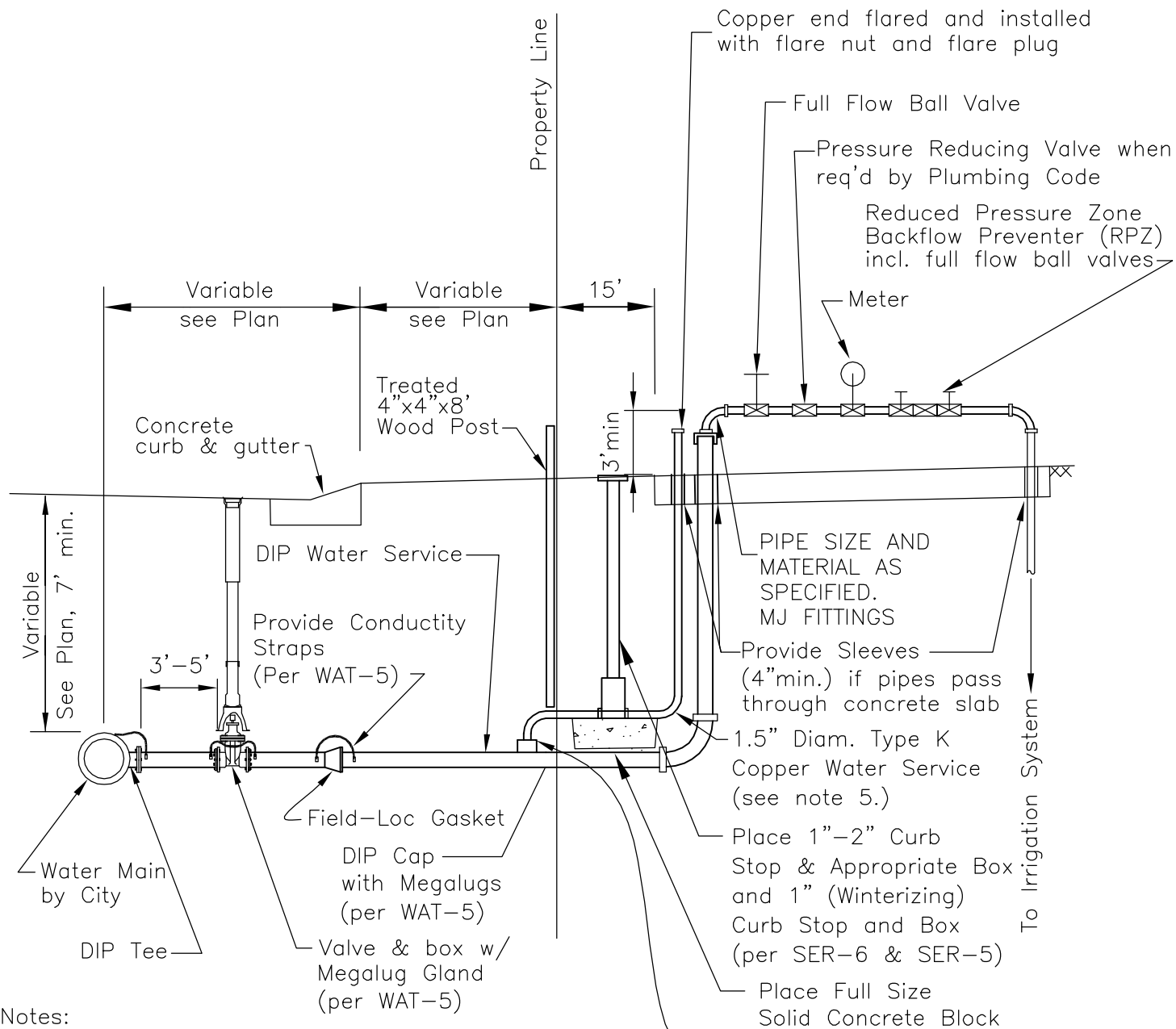


NOTES:

1. All pipe shall be bedded in granular borrow 209.2.2 Grade 1 or course filter aggregate (501.3.6.4.5 Size No. 1 crushed). If pipe is terminated 36" above grade, it shall be protected from any contaminations.
  2. Curb box shall extend from 78" to 90".
  3. Adjust Curb Box to 1" below finish grade.
  4. 1 1/2" and 2" taps (and any size taps in 4" D.I.P.) shall be installed with double strap tapping service saddle, FORD style F202 (with AWWA CC threads) or approved equal.
  5. Curb box installed is to be adjustable to 6" up or down from finished grade.
- Corporation Stop (AWWA CC Threads): Mueller 300 Ball B25000, B25028 or approved equal. Curb Stop: Mueller 300 Ball B25154, B25155 or approved equal. Curb Box (Minneapolis Pattern): 1" Service - Mueller H10300 (1-1/4" upper section) or approved equal. 1-1/2" & 2" Services - Mueller H10302 (1-1/2" upper section) or approved equal.

1" - 2" IRRIGATION SERVICE REQUIREMENTS

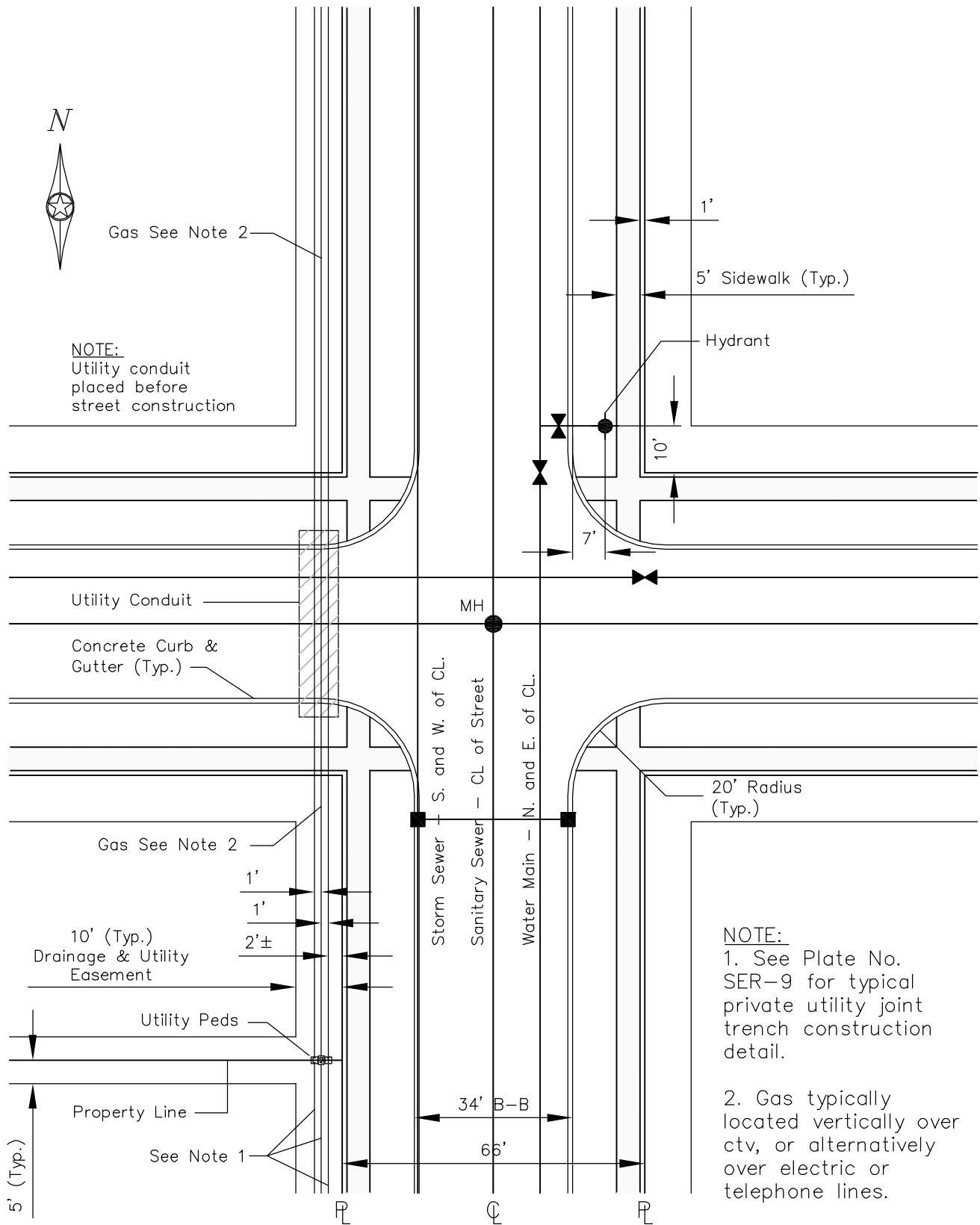




Notes:

1. City Water Service & Plumbing Permits Required for service line installation.
2. Annual Testing of RPZ Required
3. Required Equipment must be Enclosed and Supported.
4. Sleeves for pipes in concrete slabs shall be PVC or approved equal, and a minimum of one nominal size larger in diameter than the pipe (4" min.).
5. Any complete D.I.P. services of any size shall bend to 36" min. above ground and continue with valves, meter, RPZ backflow preventer, etc. of the proper size. All joints shall be restrained.

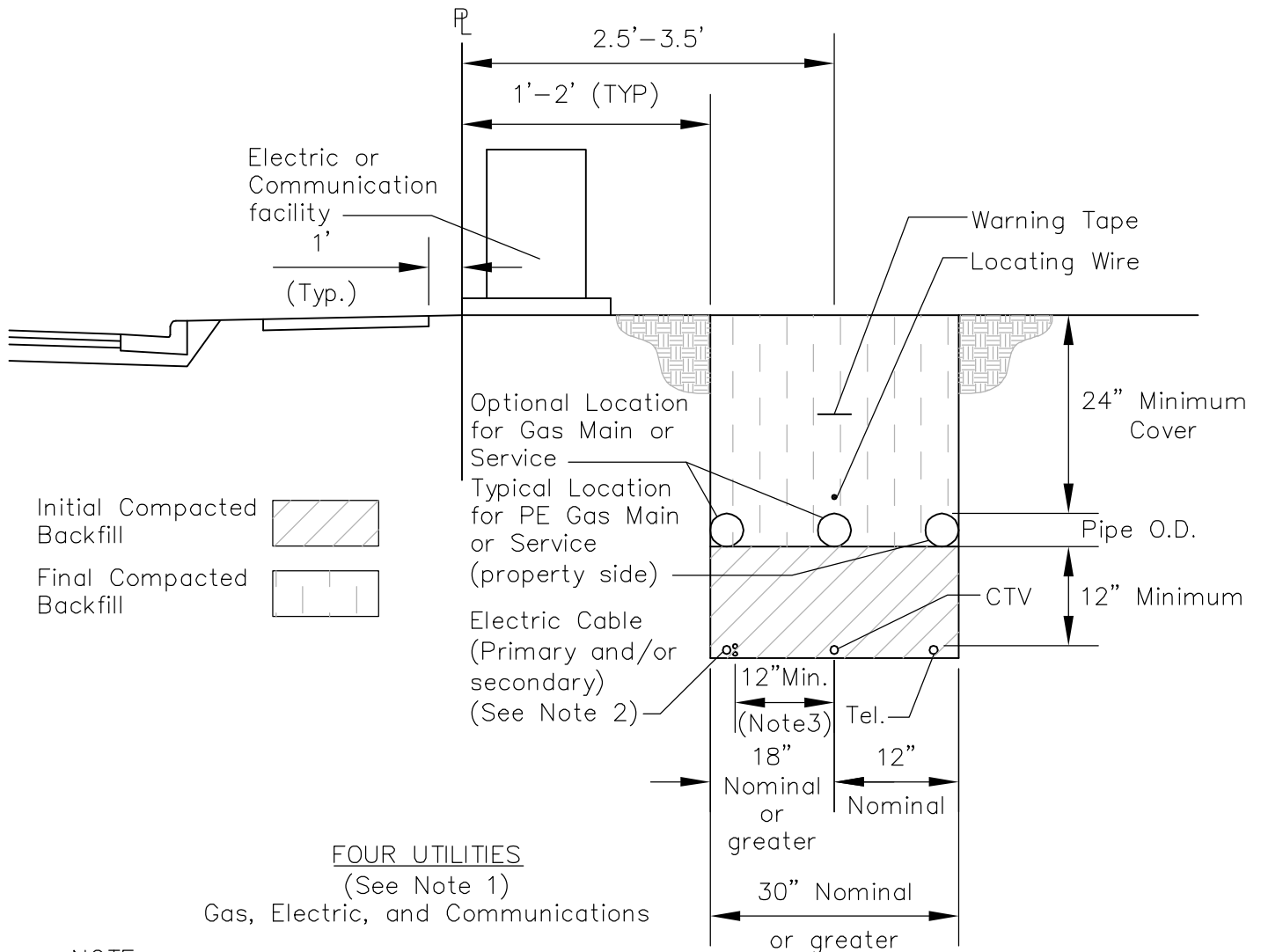
## LARGE OUTDOOR IRRIGATION SERVICE



## TYPICAL UTILITY LOCATIONS

HUDSON, WISCONSIN

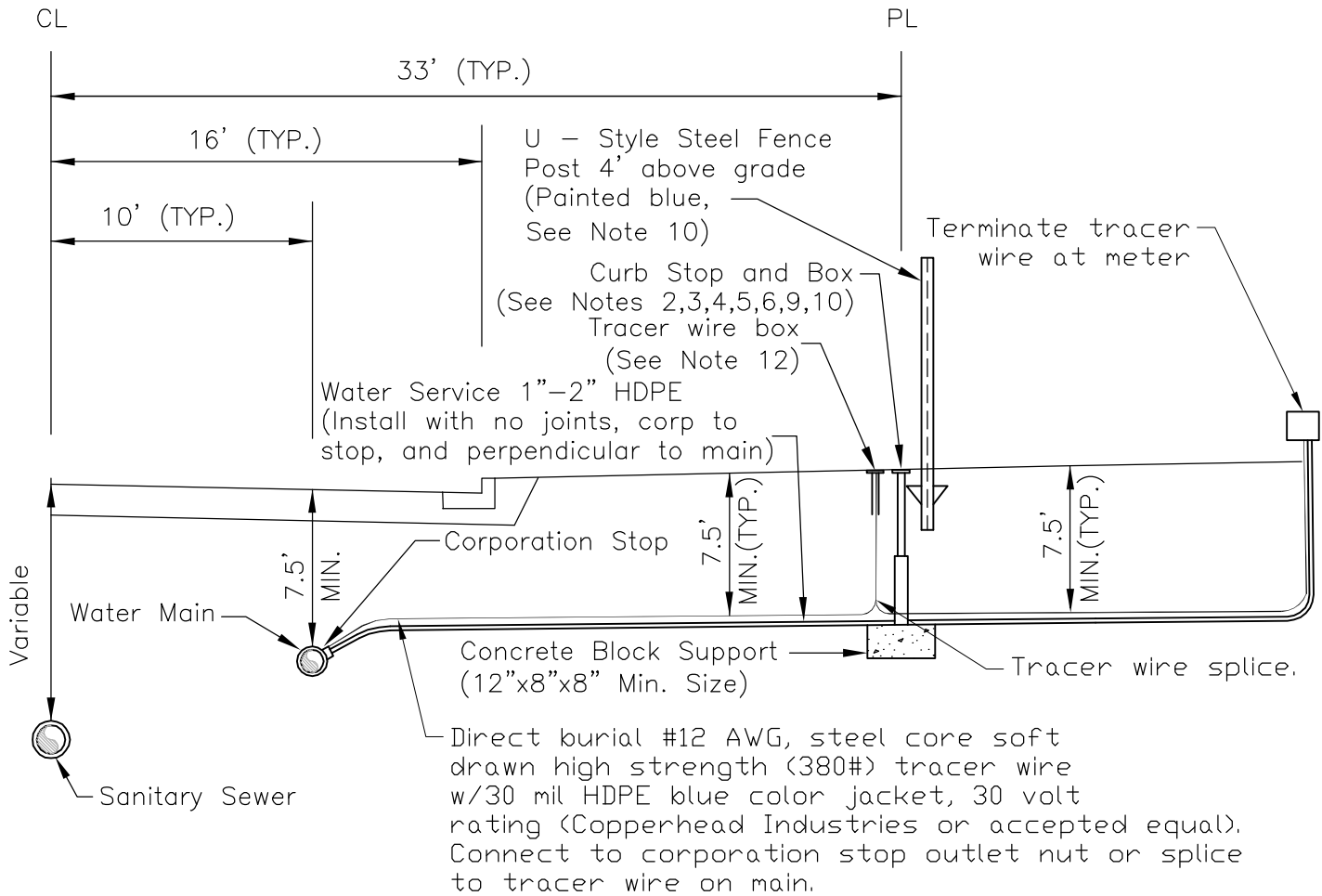
PLATE NO. SER-8



**NOTE:**

1. Communication cables may be buried with random separation provided all parties are in agreement.
2. Electric cables may be buried with random separation provided all parties involved are in agreement, however, 3 phase and 1 phase cables should be separated (1" or more apart) preferably on opposite sides of trench.
3. Horizontal or vertical separation between electric cables and communication cables should be 12" minimum.
4. Vertical clearance between gas pipe and cables should be 12" minimum.
5. Horizontal separation between gas pipes and cables at the same level should be a minimum 12" to 24".
6. Warning tape if used shall be installed using methods agreed upon by each of the utility companies involved.
7. Locating wire shall be installed with gas pipe using standard installation methods.
8. Detail derived from Xcel Energy's Gas Standards Manual, Figure 7.12.1-Joint Trench Construction, dated 10-01-02. Refer to figure 7.12.1 for joint trench construction when less than four utilities involved.

**TYPICAL UTILITIES  
JOINT TRENCH CONSTRUCTION**



NOTES:

1. All pipe shall be bedded in granular borrow 209.2.2 Grade 1 or course filter aggregate (501.3.6.4.5 Size No. 1 crushed)
2. Curb box shall extend from 78" to 90" and installed to be adjustable 6" up and down from finished grade.
3. Adjust Curb Box and tracer wire box to finished grade.
4. All curb stops and corporation stops shall be in the **open** position during the pressure test.
5. Corporation Stop (AWWA CC Threads):  
Mueller 300 Ball B25000, B25028 or approved equal.  
Curb Stop:  
Mueller 300 Ball B25154, B25155 or approved equal.  
Curb Box (Minneapolis Pattern):  
1" Service - Mueller H10300 (1-1/4" upper section) or approved equal.  
1-1/2" & 2" Services - Mueller H10302 (1-1/2" upper section) or approved equal.
6. Curb boxes in bituminous or concrete shall be installed utilizing Valco Casting SC40(with WATER lid), or approved equal.
7. Service fitting couplings utilized from curb stop to building shall be Mueller H-15400, H-15430, or approved equal.
8. Water service shall be tapped with water main under pressure, and located in upper quadrant of main (2:00 o'clock or 10:00 o'clock), or location approved by the City Engineer. Threads shall be double wrapped with teflon tape prior to installation. Tapping bit shall be inspected and approved by the City Engineer.
9. Curb box shall be located at property line. For private street/drives, curb box location shall be a maximum of 15' behind curb or edge of pavement, and no closer than 10' from edge of building. No curb box shall be located in curb and gutter or closer than 12" to lip of gutter.
10. Curb boxes located in unimproved right-of-ways and easements shall be marked with U-style steel post 4' above grade with blue metal sign labeled "CS" in white letters per detail WAT-12.
11. All exposed ends of tracer wire at splice and connection points shall be coated with anticorrosive protective coating.
12. Tracer wire box shall be Copperhead Industries - Snake Pit Model RB14\*TP, color blue.

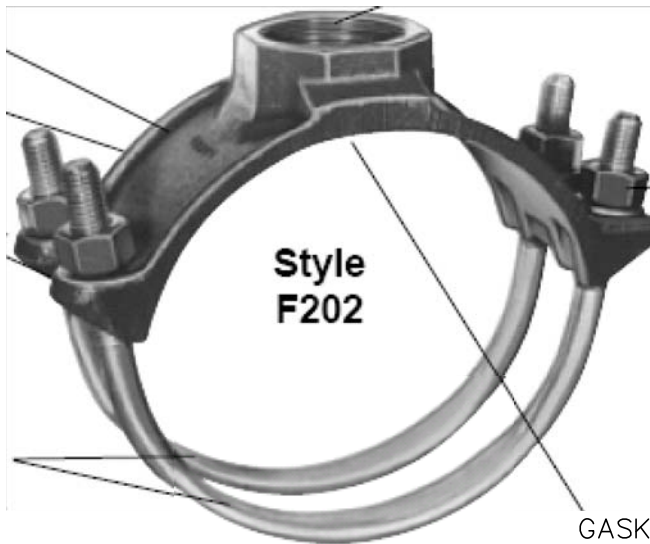
HDPE WATER SERVICE CONNECTION

THREADS: CC PER AWWA C800.

BODY: HIGH STRENGTH DUCTILE  
IRON PER ASTM A 536  
FINISH: BLACK E-COAT

ONE SIDE OF THE SADDLE BODY  
HAS CLOSED BOLT LUGS FOR  
EASY INSTALLATION.

STRAPS:  $\frac{5}{8}$ " ASI C1010 STEEL,  
ZINC PLATED WITH DICHROMATE  
SEAL. EACH STRAP HAS  $\frac{5}{8}$ "  
FLAT BEARING SURFACE.  $\frac{1}{2}$ "  
STRAPS ARE FURNISHED ON  
SADDLES 3' OR SMALLER.



HEAVY HEX NUTS AND  
WASHERS:  $\frac{1}{2}$ " OR  $\frac{5}{8}$ "  
AISI STEEL ALLOY, ZINC  
PLATED, WITH  
TRIVALENT SEAL.

GASKET: EPDM RUBBER.  
ASTM-D2000

NOTES:

1. WATER SERVICE TAPPING SADDLE FOR DIP SHALL BE A DOUBLE STRAP FORD F202 OR APPROVED EQUAL. CITY ENGINEER SHALL PRE-APPROVE ALL TAPPING SADDLES PRIOR TO INSTALLATION.
2. THE CITY ENGINEER MUST APPROVE ALL SADDLE INSTALLATIONS. SADDLES MAY ONLY BE USED ON  $\frac{3}{4}$ " TO 2" SERVICES. ANY LARGER SERVICES MUST BE CUT-INS OR WET TAPPED TO WATERMAIN.
3. DOUBLE STRAP TAPPING SADDLES MUST BE USED ON SERVICE TAPS LARGER THAN 1", UNLESS APPROVED BY THE CITY ENGINEER.
4. DOUBLE STRAP TAPPING SADDLES SHALL BE USED ON ALL SERVICE TAPS INTO WATERMAIN 4 INCHES IN DIAMETER OR SMALLER, UNLESS APPROVED BY THE CITY ENGINEER.

DOUBLE STRAP TAPPING SADDLE FOR WATER SERVICE (DIP WATERMAIN)

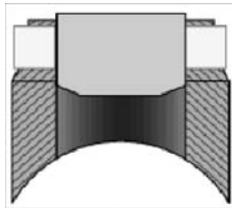
HUDSON, WISCONSIN

PLATE NO. SER-11

NOTES:

1. THE CITY ENGINEER MUST APPROVE ALL SADDLE INSTALLATIONS. SADDLES MAY ONLY BE USED ON ¾" TO 2" SERVICES. ANY LARGER SERVICES MUST BE CUT-INS OR WET TAPPED TO WATERMAIN.
2. ONE OF THE FOLLOWING SADDLES SHALL BE USED FOR TAPPING INTO HDPE WATERMAIN UNLESS APPROVED BY HUDSON WATER UTILITY:
  - A. SIDE FUSING TAPPING SADDLE AS MANUFACTURED BY POLY-CAM, INC. OR APPROVED EQUAL.
  - B. ELECTROFUSION CORP. SADDLE AS MANUFACTURED BY CENTRAL PLASTICS COMPANY OR APPROVED EQUAL.

- A. SIDE FUSING TAPPING SADDLE AS MANUFACTURED BY POLY-CAM, INC. OR APPROVED EQUAL.



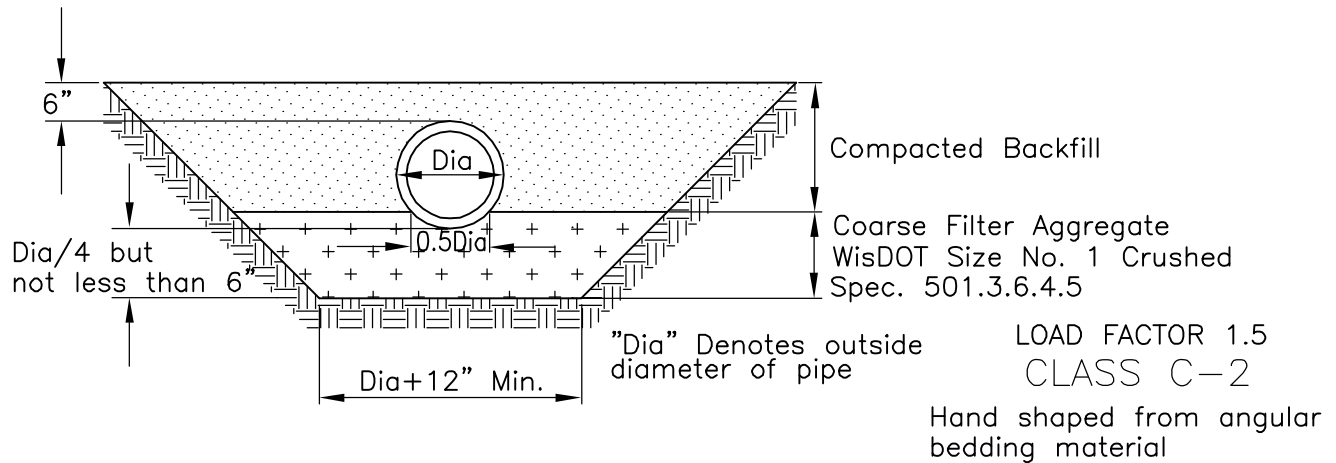
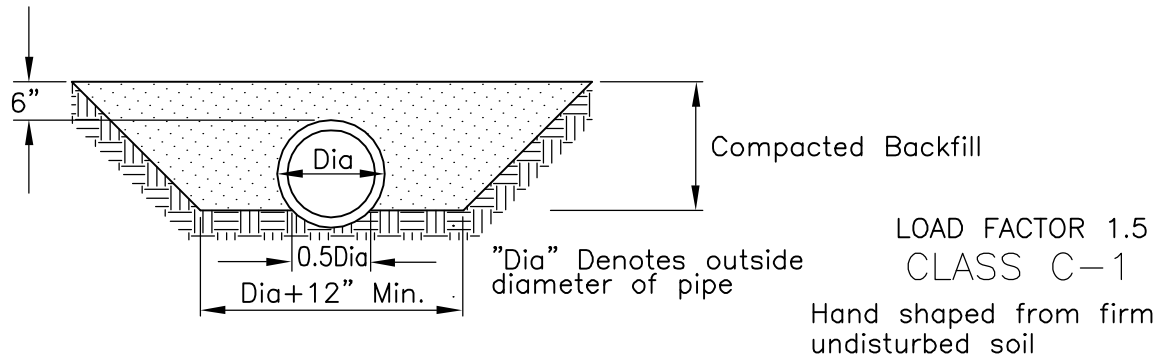
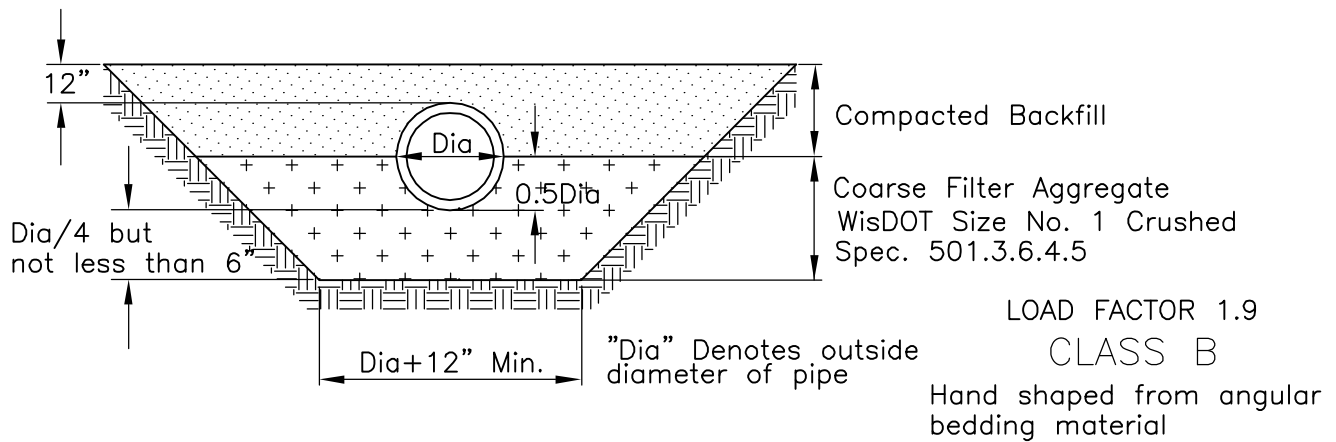
- B. ELECTROFUSION CORP. SADDLE AS MANUFACTURED BY CENTRAL PLASTICS COMPANY OR APPROVED EQUAL.



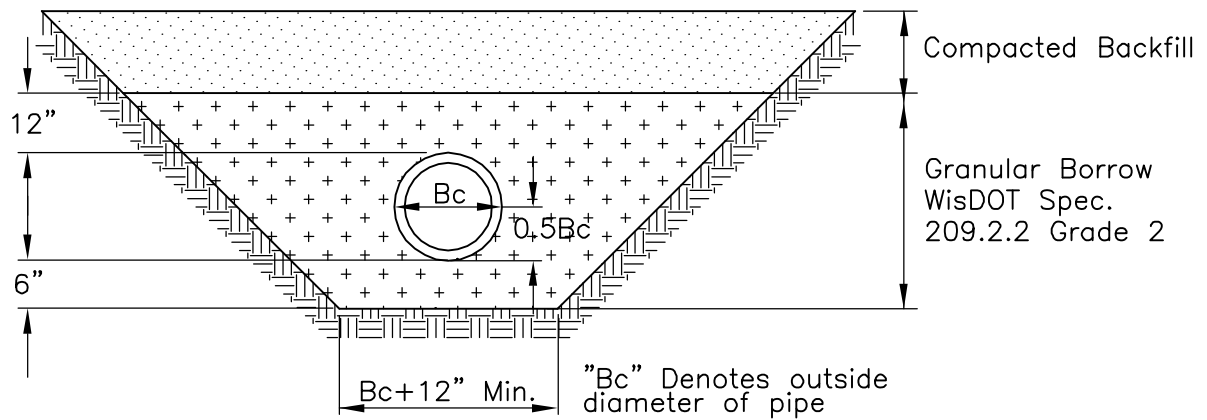
TAPPING SADDLE FOR WATER SERVICE HDPE (DIPS) WATERMAIN

HUDSON, WISCONSIN

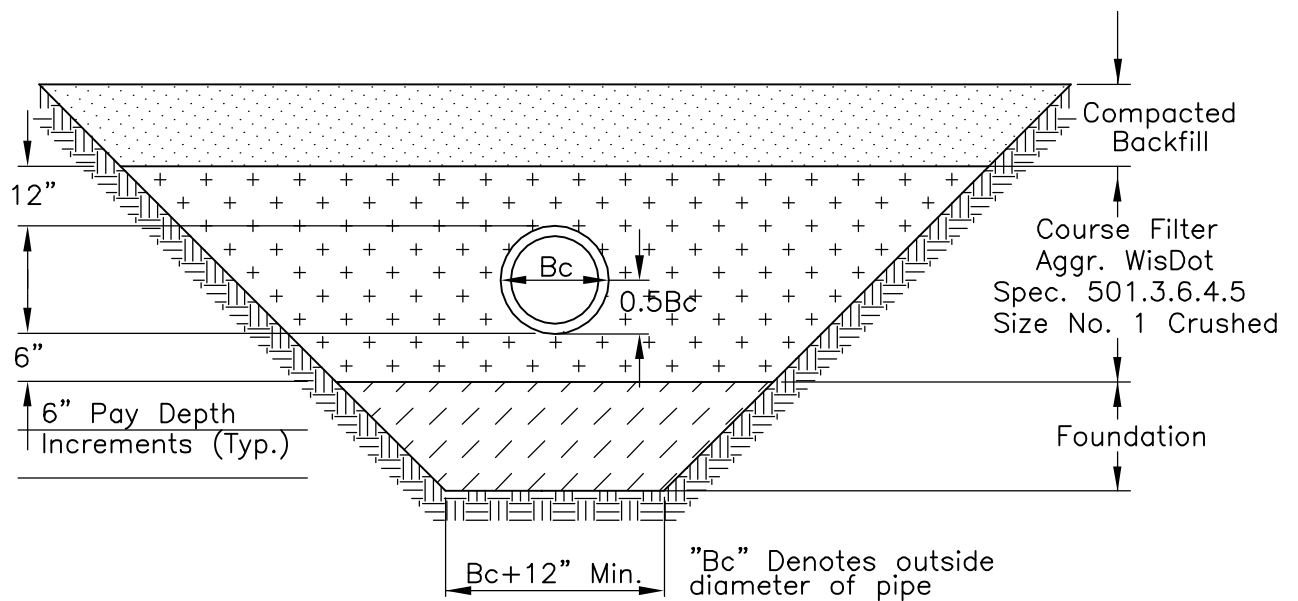
PLATE NO. SER-12



## BEDDING METHODS FOR RCP, VCP AND DIP



PIPE FOUNDATION & BEDDING IN GOOD SOILS



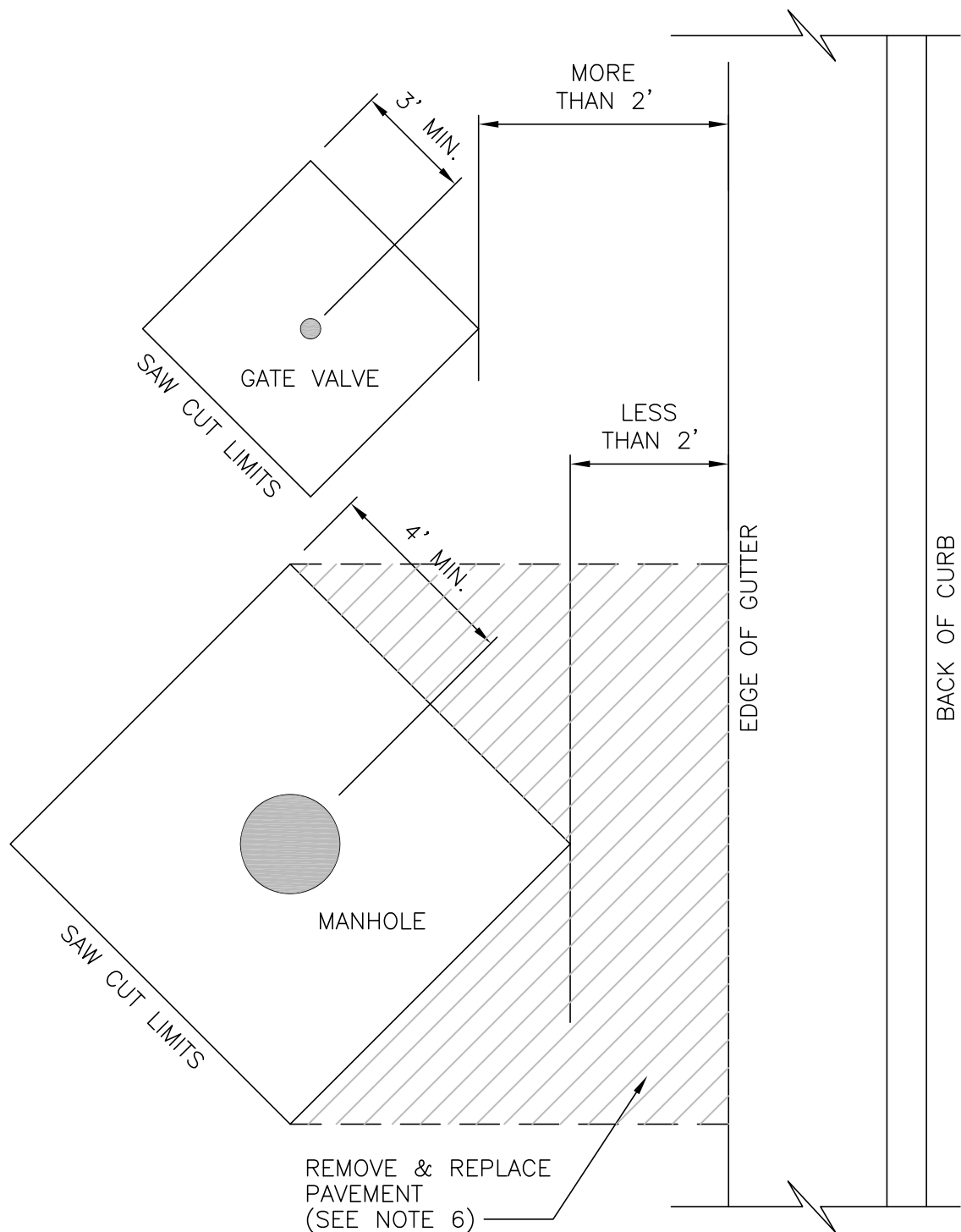
PIPE FOUNDATION & BEDDING IN POOR SOILS

## BEDDING METHODS FOR PVC

HUDSON, WISCONSIN

PLATE NO. BED-2





**NOTES:**

1. Saw cut full depth through bituminous and concrete pavement square (diamond-shaped relative to the roadway) a minimum of 4' from center for manholes and a minimum of 3' from center for gate valves.
2. These removal dimensions shall minimally allow for vibratory plate compaction to operate properly.
3. Adjust all sides of structures 1/2" lower than adjacent final grade, matching street grades and cross-slopes.
4. Utilize 1/2"-thick pucks on gate valves and 1/2"-thick circular plates on manholes for all paving of streets, driveways, paths and parking areas.
5. Clean all lids of all gravel, bituminous or concrete during paving operations while bituminous is hot and/or concrete is plastic.
6. Any saw cut closer than 2' to the edge of the gutter shall be extended to the edge of the gutter and that additional pavement removed and replaced, as directed by the city.

**STRUCTURE ADJUSTMENT (BITUMINOUS OR CONCRETE)**