

DESIGN AND CONSTRUCTION STANDARDS

# **WATER & WASTEWATER UTILITY SYSTEMS**

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# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### TABLE OF CONTENTS

|                                                       |    |
|-------------------------------------------------------|----|
| INTRODUCTION .....                                    | 1  |
| 1.0 GENERAL REQUIREMENTS .....                        | 2  |
| 1.1 DESIGN REQUIREMENTS .....                         | 4  |
| A. Plan Submittal .....                               | 4  |
| B. Engineer's Report.....                             | 5  |
| C. Engineer's Responsibility .....                    | 5  |
| D. Inspection of Work by the Utility.....             | 5  |
| E. Record Drawings .....                              | 6  |
| F. Separation Distance .....                          | 6  |
| 1.2 GENERAL CONSTRUCTION REQUIREMENTS .....           | 7  |
| A. Execution of Work.....                             | 7  |
| B. Handling .....                                     | 7  |
| C. Excavations.....                                   | 7  |
| D. Dewatering.....                                    | 10 |
| E. Insulation .....                                   | 10 |
| F. Casings .....                                      | 11 |
| G. Connections to Existing System .....               | 11 |
| H. Traffic Control .....                              | 11 |
| I. Construction Surveying.....                        | 13 |
| 2.0 DESIGN AND CONSTRUCTION OF WATER FACILITIES ..... | 14 |
| 2.1 General.....                                      | 14 |
| 2.2 Water System Hydraulics .....                     | 14 |
| 2.3 Design Capacity .....                             | 14 |
| 2.4 System Pressure .....                             | 15 |
| 2.5 Size and Type of Pipe .....                       | 15 |
| 2.6 Depth of Cover .....                              | 15 |
| 2.7 Water Main Placement .....                        | 15 |
| 2.8 Pipe Joints .....                                 | 15 |
| 2.9 Restrained Joints.....                            | 15 |
| 2.10 Pipe Fittings.....                               | 16 |
| 2.11 Valves .....                                     | 16 |
| 2.12 Valve Boxes .....                                | 17 |
| 2.13 Fire Hydrants.....                               | 17 |
| 2.14 Disinfection and Flushing.....                   | 18 |
| 2.15 Pressure Testing.....                            | 18 |
| 2.16 Material and/ Equipment Specification .....      | 19 |

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### TABLE OF CONTENTS

|      |                                                       |    |
|------|-------------------------------------------------------|----|
| 3.0  | DESIGN AND CONSTRUCTION OF WASTEWATER FACILITIES..... | 23 |
| 3.1  | General.....                                          | 23 |
| 3.2  | Sizing .....                                          | 23 |
| 3.3  | Storm Water.....                                      | 23 |
| 3.4  | Design Flow .....                                     | 23 |
| 3.5  | Peaking Factors .....                                 | 24 |
| 3.6  | Slope.....                                            | 24 |
| 3.7  | Size and Type of Pipe .....                           | 25 |
| 3.8  | Depth of Cover .....                                  | 25 |
| 3.9  | Final Accuracy .....                                  | 25 |
| 3.10 | Manholes .....                                        | 25 |
| 3.11 | Flushwells.....                                       | 27 |
| 3.12 | Lift Stations .....                                   | 27 |
| A.   | General.....                                          | 27 |
| B.   | Pumps.....                                            | 27 |
| C.   | Safety .....                                          | 27 |
| D.   | Capacity.....                                         | 28 |
| E.   | Control Panel.....                                    | 28 |
| F.   | Additional Lift Station Equipment Requirements .....  | 29 |
| 3.13 | Acceptance Testing .....                              | 29 |
| A.   | Pressure Testing.....                                 | 29 |
| B.   | Cleaning.....                                         | 30 |
| C.   | Video Inspection .....                                | 30 |
| 3.14 | Force Mains.....                                      | 30 |
| A.   | Design.....                                           | 30 |
| B.   | Size AND Type of Pipe .....                           | 30 |
| C.   | HDPE.....                                             | 30 |
| D.   | Clean-Outs.....                                       | 31 |
| E.   | Pressure Test.....                                    | 31 |
| 4.0  | BUILDING SERVICES - GENERAL REQUIREMENTS .....        | 32 |
| 4.1  | Standards .....                                       | 32 |
| 4.2  | Scope of Utility Personnel Work .....                 | 32 |
| 4.3  | Required Inspections .....                            | 32 |
| 4.4  | Connection of Service Lines to Utility Main .....     | 32 |
| 4.5  | Excavation .....                                      | 33 |
| 4.6  | Backfill .....                                        | 33 |
| 4.7  | Compaction Requirements .....                         | 33 |
| 4.8  | Insulation .....                                      | 33 |
| 4.9  | Service Line Placement .....                          | 34 |

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### TABLE OF CONTENTS

|      |                                                            |    |
|------|------------------------------------------------------------|----|
| 5.0  | WATER SERVICE REQUIREMENTS .....                           | 35 |
| 5.1  | Corporation Stop Saddle Connection.....                    | 35 |
| 5.2  | Tee Connections.....                                       | 37 |
| 5.3  | Material Standards.....                                    | 39 |
| 5.4  | Pipe Fittings.....                                         | 39 |
| 5.5  | Circulating Loop and Water Meter .....                     | 40 |
| 5.6  | Shut-Off Valve .....                                       | 40 |
| 5.7  | Circulating Pump .....                                     | 40 |
| 5.8  | Fire Sprinkler Systems .....                               | 41 |
| 5.9  | Fire Hydrants (If Required on a Sprinkler Fire Main) ..... | 43 |
| 5.10 | Commissioning .....                                        | 43 |
| 5.11 | Cross Connections.....                                     | 44 |
| 5.12 | Inspection.....                                            | 44 |
| 6.0  | WASTEWATER SERVICE REQUIREMENTS .....                      | 45 |
| 6.1  | Connection .....                                           | 45 |
| 6.2  | Material Standards.....                                    | 46 |
| 6.3  | Service Requirements .....                                 | 47 |
| 6.4  | Cleanouts .....                                            | 48 |
| 6.5  | Backwater Valves .....                                     | 48 |
| 6.6  | Lift Stations .....                                        | 49 |
| 6.7  | Pre-Treatment.....                                         | 50 |
| A.   | Grease Traps/Interceptors.....                             | 50 |
| B.   | Sand Traps and Oil/Water Separators .....                  | 51 |
| C.   | Disposal.....                                              | 51 |

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### TABLE OF CONTENTS

#### Index of Drawings

| <u>Drawing No.</u>                                | <u>Title</u>                                           | <u>Date</u> |
|---------------------------------------------------|--------------------------------------------------------|-------------|
| <b>Direct-Buried Water Distribution System</b>    |                                                        |             |
| WDS-101                                           | Piping Joints and Offsets .....                        | 30 Apr 2010 |
| WDS-102                                           | Temporary Domestic Water Service .....                 | 30 Apr 2010 |
| WDS-103                                           | Valve Details and Sections .....                       | 30 Apr 2010 |
| WDS-104                                           | Fire Hydrant Plan and Details .....                    | 30 Apr 2010 |
| WDS-105                                           | Thrust Block Details .....                             | 30 Apr 2010 |
| WDS-106                                           | Circulating Pump Manhole .....                         | 30 Apr 2010 |
| WDS-107                                           | Water Piping Tie-in, 4" and Larger .....               | 30 Apr 2010 |
| WDS-108                                           | Circulating Loop, 2" and Larger Water Service .....    | 30 Apr 2010 |
| WDS-109                                           | Circulating Water Service with Fire Suppression .....  | 30 Apr 2010 |
| WDS-110                                           | Circulating Loop, 1-½" and Smaller Water Service ..... | 30 Apr 2010 |
| WDS-111                                           | Trace Wire Detail .....                                | 30 Apr 2010 |
| WDS-112                                           | Service Lateral Tie-in .....                           | 30 Apr 2010 |
| WDS-113                                           | Water Piping Repair Details .....                      | 30 Apr 2010 |
| WDS-114                                           | Water Piping Trench Detail .....                       | 30 Apr 2010 |
| <b>Utilidor Water Distribution System</b>         |                                                        |             |
| WDS-201                                           | Piping Joints and Offsets .....                        | 30 Apr 2010 |
| WDS-202                                           | Pipe Repairs .....                                     | 30 Apr 2010 |
| WDS-203                                           | Fire Hydrant Off Utilidor .....                        | 30 Apr 2010 |
| WDS-204                                           | Lateral Off Utilidor .....                             | 30 Apr 2010 |
| WDS-205                                           | Fire Hydrant Manhole Lid .....                         | 30 Apr 2010 |
| WDS-206                                           | Pipe Guide Detail .....                                | 30 Apr 2010 |
| WDS-207                                           | Pipe Anchor and Alternate Support Details .....        | 30 Apr 2010 |
| <b>Direct-Buried Wastewater Collection System</b> |                                                        |             |
| WWC-101                                           | Gravity Sewer Manhole Sections .....                   | 30 Apr 2010 |
| WWC-102                                           | Gravity Sewer Manhole Details .....                    | 30 Apr 2010 |
| WWC-103                                           | Gravity Sewer Manhole Details .....                    | 30 Apr 2010 |
| WWC-104                                           | Service Lateral Connection Details .....               | 30 Apr 2010 |
| WWC-105                                           | Gravity Sewer Piping Details .....                     | 30 Apr 2010 |
| WWC-106                                           | Main and Lateral Cleanout Details .....                | 30 Apr 2010 |
| WWC-107                                           | Forced Main at Road Crossing Details .....             | 30 Apr 2010 |
| WWC-108                                           | Gravity Sewer Trench Detail .....                      | 30 Apr 2010 |
| WWC-109                                           | Lift Station and Valve Box Plan .....                  | 30 Apr 2010 |
| WWC-110                                           | Lift Station and Valve Box Sections .....              | 30 Apr 2010 |
| WWC-111                                           | Lift Station Control Panel Details, Sheet 1 of 2 ..... | 30 Apr 2010 |
| WWC-112                                           | Lift Station Control Panel Details, Sheet 2 of 2 ..... | 30 Apr 2010 |
| <b>Utilidor Wastewater Collection System</b>      |                                                        |             |
| WWC-201                                           | Typical Pipe Connections and Repairs .....             | 30 Apr 2010 |
| WWC-202                                           | Pipe Support and Anchor in Utilidor .....              | 30 Apr 2010 |

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### INTRODUCTION

We have prepared the following information to guide designers and constructors through the required steps in the utility line installation process; to serve as the inspection guideline prior to connection; and as information for the Army. This booklet was designed as a guideline to supplement the Utilities' rates, charges, and rules and regulations as filed with the Regulatory Commission of Alaska (RCA).

These standards are modified from time to time, generally on an annual basis during the first quarter of the year. When substantive revisions occur, the Utilities will publicly notice the Army. These standards will be enforced. It is the responsibility of the user of these standards to ensure they have the most recent version. To confirm that you have the most recent version, please check our website at [www.doyonutilities.com](http://www.doyonutilities.com) or contact Doyon Utilities (DU).

If you have any questions after reading this booklet, please contact our office for further information. DU standards of construction shall be utilized for all facilities to be owned, operated and maintained by the utility, to include hookups from the utility facility to the demarcation point.

DU will be responsible for planning, designing and constructing utility water, wastewater, gas and heat mains and electrical distribution system improvements for new government facilities. This will require close cooperation and utility involvement in the government facility planning process. Without this coordination, facilities constructed will have no utility service.

Doyon Utilities will be responsible for construction of the hookup for the utility from the building to the utility main/electrical distributions system facility as described below:

- Water: The water hookup from the main to the shutoff valve inside the facility on the customer side of the meter. The utility or its designee will provide and install the meter.
- Wastewater: The wastewater hookup will be from the collection main to the cleanout, normally located about 5 feet outside the building foundation.
- Gas: The gas hookup will be from the gas main to the shutoff valve on the customer side of the meter. The utility or its designee will provide and install the meter.
- Heat: The heat hookup will be from the heat main, either steam or hot water to the shutoff valve on the customer side of the meter. The utility or its designee will provide and install the meter.
- Electric: The electric hookup will be from the transformer to the meter socket. The utility or its designee will provide and install the meter and the overhead service drop from the transformer to the service entrance mast.

Hookups will be inspected during construction by utility personnel and constructed according to these standards.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### 1.0 GENERAL REQUIREMENTS

The design of a water distribution or wastewater collection system within the Doyon Utilities, LLC (hereinafter referred to as the Utility) service area shall be submitted to and approved by the Alaska Department of Environmental Conservation (ADEC) prior to construction. The design shall be in accordance with: State Regulations (specifically 18 AAC 72 for wastewater and 18 AAC 80 for water), the current Uniform Plumbing Code, International Fire Code, the standards of American National Standards Institute (ANSI), American Water Works Association (AWWA), American Society for Testing and Materials (ASTM), Utility master plans and these *Standards of Design and Construction*.

Final design shall be sealed by a professional engineer registered in the State of Alaska. When non-utility personnel are involved in design a preliminary concept design shall be submitted to the Utility prior to the preparation of the final design. The purpose of the submittal is to present the preliminary lay-out, controlling assumptions and considerations used for the planning of the proposed system with emphasis on impacts to the existing system. The proposed final plat or site drawing of the improvement area shall be submitted with each design.

Any addition to the Utility water or wastewater system shall be consistent with the Utility's standards of design and quality of materials and construction. Emphasis shall be given to reduce future operation and maintenance costs. Design details shall be conducive to minimizing potential freezing problems. Special consideration shall be given to cold temperatures, permafrost and high water tables; conditions common in Alaska. Allowances for future extensions will be made in the design of all additions.

This document is designed to aid in meeting the requirements of the Utility. It must be emphasized that no single document can possibly present guidelines for all situations that will be encountered. The Utility shall have the ultimate authority to interpret this document and may direct modifications for specific situations.

DU assumes no responsibility or liability concerning the suitability or applicability of this standard to the requirements of the Army.

It is not the intent of this standard to supersede tariff regulations, but rather to provide designers and contractors, a basic guide for design and installation of underground piping systems to ensure compatibility with the Utilities' system.

The extent of ownership by the Utility is limited to water or wastewater mains, corporation stop and/or service valve and tee, wastewater saddle, water meter, and Automatic Meter Reading (AMR) equipment, and the water service line to the shutoff valve on the customer side of the meter, along with the sewer service line to the building line, and for all construction after August 15, 2008, to the sewer cleanout.

The following definitions apply to this Standard:

Utility: Doyon Utilities, LLC (DU) or its designee.

Customer: The Army or its facility contractor making contact with the Utility for the purpose of obtaining water and/or wastewater service. The customer has certain responsibilities and liabilities detailed in this Standard.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

Designer/Engineer: Any person licensed by the State of Alaska who designs the system governed by this specification.

Installer/Contractor: Any person who will perform installation, excavation, insulation, or any other work relating to complete or partial accomplishment of connection to the Utility system. The installer is responsible to the utility to provide a system which conforms to the requirements of this Standard.

The installer is responsible for obtaining verification from the designer that all design and installation work is in conformance with this Standard.

The installer is responsible for meeting the requirements of this standard. The installer will be held accountable for damage to Utility facilities resulting from failure to comply with the requirements of this Standard.

The installer is responsible for meeting the applicable requirements of this Standard, and all other applicable codes or standards.

Call or visit DU's office at 714 Fourth Avenue, Suite 100, 907-455-1500 for information on obtaining new service:

- a) The availability of utility services.
- b) The location of mains.

The customer is responsible for making application for service with DU prior to requesting field location of, or connection to the mains.

Application: Apply for service at DU's office located at 714 Fourth Avenue, Suite 201, Fairbanks, AK 99701. You may also contact one of our depot buildings at each Fort.

Work must be performed by competent plumbers holding valid Alaska Department of Labor Journeymen Plumber Cards (required by Alaska State Law).

Responsibility to Locate Underground Utilities: The installer shall be responsible for determining the location of all underground utilities and shall be responsible for any damages to underground utilities caused by the work. Possible underground utilities to be located are: telephone lines, cable TV lines, electrical lines, street lights, water and wastewater mains, gas mains, storm drains, etc. If a line location is needed for water or wastewater mains, an appointment must be made in advance.



# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### 1.1 DESIGN REQUIREMENTS

#### A. PLAN SUBMITTAL

##### STANDARD SHEETS AND SCALES

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The standard plan sheet size shall be 11" x 17". Standard scale shall be one (1) inch equals forty (40) feet (1" = 40') horizontal and one (1) inch equals four (4) feet (1" = 4') vertical. Plan sheet sizes up to 24" x 36" will be acceptable with a maximum horizontal scale of one (1) inch equals fifty (50) feet (1" = 50'), when plotted on 24" x 36".

##### ELEVATION DATUM

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Elevation datum shall be based on NAD 83 and NAVD 88 and so noted on the plans.

##### PLAN AND PROFILE INFORMATION

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Standard plan and profile sheets shall be used and shall depict all existing and proposed utilities. The plans shall show the exact location of proposed improvements from designated survey control points. Include the following on all sets of plans:

- A graphic scale bar and north arrow.
- R.O.W. lines, edge of roadways, culverts, fences, street names, existing and proposed utilities, property lines, existing and proposed building footprints.
- Highlight new facilities with thick, bold, continuous line types. Show existing topography and utilities as dashed or grayscale background.
- Label all existing and proposed utilities and include pipe sizes. Sequentially number all new manholes and fire hydrants in plan and profile.
- Show lot/block/address for each lot or parcel.
- Specify station and offset of all water main angle points, fire hydrants, valves and connection points.
- Specify station and offset of all wastewater manholes, flushwells and connection points.
- Specify station and offset of all water and wastewater service connections.
- In profile view, show invert elevations and slope of sanitary sewer pipe along with top of pipe elevations for water mains. Also note ground water elevations.
- Stationing shall read from left to right and shall follow the pipe centerline where practical. Arrange plans so that the north arrow is pointed toward the top or to the right edge of the sheet.
- Provide a sheet index and vicinity map.
- Specify basis of horizontal and vertical control.
- Plans shall be drawn in AutoCAD.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### B. ENGINEER'S REPORT

A design report, as required by ADEC, shall be included with the plan submittal. The report shall include all assumptions used in the design, expected population density, demand, design criteria, calculations, flow analysis, main sizing, pump sizing and other information as required to confirm the design is adequate. The report shall verify the existing facilities have sufficient capacity to support the additional load from the proposed development.

Subsurface soil information may be required in areas of questionable material. Test hole information shall include, but not be limited to: classification of soils, moisture content, gradation, depth of frost, depth of water table and depth of soil classifications. The design engineer shall identify all known permafrost areas within the project area on the drawing.

### C. ENGINEER'S RESPONSIBILITY

The design engineer shall be registered in the State of Alaska and retained by the party responsible to design and coordinate the installation of the Utility system. The design engineer shall be responsible for submitting all checklists and information as required by ADEC to obtain the Approval to Construct certificate, prior to construction.

The design engineer shall furnish drawings and specifications which, as far as practical, completely represent the requirements of the work to be performed under the contract.

The design engineer shall be responsible for the design of any construction changes required during the course of construction and shall be responsible for submission of stamped Record Drawings to the Utility upon completion of the project.

The design engineer will provide the Utility with advance notice of the work schedule and report to the Utility as to the progress of the work and manner in which it is being performed.

The design engineer is not authorized to revoke, alter, enlarge, relax, or release any requirements of the plans and specifications, or to approve or accept any portion of the work or to issue instructions contrary to this document.

### D. INSPECTION OF WORK BY THE UTILITY

The Utility will perform periodic inspections of the work and material to ensure compliance with the plans, specifications and the these Standards of Design and Construction. Such inspections may extend to any part of the work including the preparation, fabrication, or manufacture of the materials used. The Utility shall have the authority to reject any work or materials that do not meet Utility standards.

The contractor will notify the Utility 24 hours in advance of required inspections to be witnessed by the Utility or its designee. The Utility will decide all questions which may arise as to the quality and acceptability of materials furnished and work performed; all questions as to the degree of completion of the work; all questions which may arise as to interpretation of the plans and specifications; and all questions as to the acceptable fulfillment of the contract on the part of the contractor.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

The presence or absence of the Utility does not relieve the contractor from his obligation to fully perform all requirements of the construction documents, the Standards of Construction, nor does it give rise to any right of action or suit by the Contractor, or third persons against the Utility.

### E. RECORD DRAWINGS

Upon completion of the project and before final acceptance by the Utility; the Contractor shall be responsible for providing as-built Record Drawings so the design engineer may secure ADEC Approval to Operate for the Utility. The Record Drawings shall be stamped and signed by the design engineer and shall certify that the drawings show a true and accurate representation of the project as actually constructed. Record Drawings shall include a minimum of three (3) swing ties to all manholes, flushwells, water valves and service connections.

The Contractor shall maintain a mark-up 'red-line' set of plans which shall be revised during construction as work progresses to reflect current conditions. The red-line drawings along with survey notes and/or grade books shall be submitted to the design engineer for as-built preparation. The revisions are to be indicated in a neat, well organized manner and are to include the elevation and plan location of any utilities, structures, etc. encountered or installed.

Two (2) paper copies and one (1) electronic AutoCAD copy of the Record Drawings shall be submitted to the Utility. The Utility will stamp one (1) set (as the inspecting engineer of record) and submit to ADEC for the Approval to Operate certificate.

Time Limit for Record Drawing Submittal - Final acceptance of the project will not occur until the Record Drawings have been approved by the Utility. The system improvements shall not be available for customer use until Record Drawings have been approved and meet the requirements of ADEC Regulations 18 AAC 72 and 18 AAC 80.

### F. SEPARATION DISTANCE

Placement of utilities shall be consistent with State or local R.O.W. guidelines. Water and wastewater mains (including manholes) shall be separated by a minimum of ten (10) feet horizontally measured edge to edge. Where it is not possible to maintain a ten (10) foot separation, a waiver request must be submitted to ADEC. For purposes of separation, storm drain sewers are considered equivalent to sanitary sewers.

Where water/wastewater mains must cross, the water main shall be above the wastewater main, and a minimum of eighteen (18) inches vertical separation shall be provided. The crossing shall be arranged so that a full length of pipe will be centered on the crossing and the water line joints are at least nine (9) feet from the wastewater line. Where this is not possible; a waiver request must be submitted to ADEC.

All other existing and proposed utilities, (electric, phone, gas, cable, etc.), shall be separated by a minimum of five (5) feet horizontally from Utility water or wastewater facilities.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### 1.2 GENERAL CONSTRUCTION REQUIREMENTS

#### A. EXECUTION OF WORK

This section covers the installation of Utility pipe and appurtenances. Unless otherwise noted; the Contractor shall provide all the necessary labor, equipment, materials, supervision and incidentals necessary to complete the system as shown on the plans. The Contractor shall comply with all pertinent codes and regulations and shall be responsible for obtaining all necessary permits. Where provisions of pertinent codes and standards conflict with this document, the more stringent provisions shall apply. All materials shall be new, of current manufacture, and conform to the specifications contained herein.

#### B. HANDLING

Use all means necessary to protect materials before, during, and after installation. In the event of damage, immediately make all repairs and replacements necessary to keep materials in a "like new" condition. Repairs or replacements must be approved by the Utility and made at no cost to the Utility. If, in the judgment of the Utility, materials or installed work are not being protected or handled as specified, or in accordance with manufacturer's recommendations, they shall be rejected and removed from the job site and shall not be used on any other work, either present or future for the Utility.

#### C. EXCAVATIONS

##### LOCATES

Prior to the commencement of any excavation activity, the Contractor shall be responsible for obtaining all necessary locates for buried utilities and structures. The Contractor shall be responsible for all costs incurred in locating, protecting and repair to damages of all existing utilities or structures, whether shown on the plans or not.

##### SAFETY AND SHORING

All excavations shall be made in accordance with the rules, regulations, requirements and guidelines set forth in Occupational Safety and Health Administration (OSHA) and the State of Alaska Department of Labor standards. Contractor shall be aware of the potential dangers of trenching or other excavation operations and be knowledgeable about proper techniques of sloping and shoring. Contractor shall be aware of the increased potential for excavation collapse due to adverse environmental factors, such as elevated levels of ground water. Contractor shall be knowledgeable about job safety and always conduct a general hazard assessment prior to any excavation. A competent person shall be placed in charge of all excavations.

Trench configuration shall be adequate for proper laying and joining of the pipe, manholes etc. and for compaction of backfill. Excavations deeper than four (4) feet shall have sidewall slopes of one point five (1.5) to one (1), meeting Alaska Department of Labor/Occupational Safety and Health Standards

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

Construction Code. Care shall be taken to pile excavation material a sufficient distance from the trench wall to avoid slides or cave-ins.

When side sloping is impractical, or protection of adjacent structures or safety of workers is an issue, the Contractor shall provide adequate shoring protection. Any shoring system, other than pre-manufactured trench boxes or shielding shall be designed and certified by a registered professional engineer. Under no circumstances will any worker enter any excavation which is deemed unsafe.

#### IMPACT TO SURROUNDING AREA

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No more than one thousand (1,000) lineal feet of trench shall be open at one time without prior approval from the Utility or governing right-of-way authority.

Excavations shall not undermine permanent structures, require removal of substantial trees or unduly block vehicle or pedestrian access.

Every attempt shall be made by the Contractor to provide reasonable access to adjacent property during the course of construction. Business access, mail delivery, garbage pick-up and emergency vehicle access will take special priority.

Various obstructions or improvements such as asphalt pavement, power poles, light poles, signs, survey monuments, lawns, landscaping, trees, culverts, driveways, telephone pedestals, mailboxes, fences, buried utilities, etc. will be encountered during construction. The plans shall generally attempt to show these improvements, based on the best information available, but are by no means comprehensive. The Contractor shall restore all surrounding areas and improvements to their original or better condition and all related work shall be considered incidental to the cost of facility installation; and at no additional cost to the Utility.

Roadway excavations and backfill shall comply with project specifications and drawings prepared by the engineer. The Contractor shall be responsible for obtaining all necessary permits.

#### LAYING PIPE

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The pipe and fittings shall be inspected for defects before installation. All defective or damaged pipes shall be replaced with new pipe at no cost to the Utility. All pipes shall be laid and maintained to the required alignment and grades as shown on the plans. Pipe interiors shall be kept clean of debris. All open ends of pipe and fittings shall be secured so that no water, earth, rodents, or other substances may enter.

Trenches shall be kept dry. No pipe will be laid in water. Any pipe or structure having its alignment or grade changed by floating in a flooded trench shall be re-laid. Trench bottoms shall be compacted to ninety-five (90) percent optimum density prior to placement of pipe or other Utility structures. If frozen or otherwise unacceptable material is encountered at the planned bottom of trench elevation; the ditch shall be over excavated an additional eighteen (18) inches in depth (minimum) and backfilled with select gravel to the satisfaction of the Utility.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

Standard lengths of pipe shall be used. Minimum pipe length shall be nine (9) feet. Cutting of pipe shall be done by methods which will not damage the pipe and which will ensure tight joints.

Pipe bedding shall be placed so as to ensure the pipe is given a uniform bearing for its full length. Deflections from a straight line or grade shall not exceed the limits specified by the manufacturer. If the desired alignment requires deflections in excess of such limits, the Contractor shall provide fittings to provide the necessary deflection.

### BACKFILL AND COMPACTION

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Under normal circumstances, backfill material will be the native material obtained during excavation. The material shall be thawed and have a reasonably low moisture content. Backfill material shall be free from organic material, debris, broken pieces of concrete or asphalt, large stones or stumps or any other material that in the opinion of the Utility is unsuitable for backfill. Rejected material shall be removed from the site and replaced with acceptable material. All backfill material shall be compacted to ninety-five (95) percent optimum density.

Special bedding material will not normally be required provided the native material is acceptable and can be compacted. Pipe bedding shall be placed so as to ensure the pipe is given a uniform bearing for its full length. If native material is unacceptable, the pipe shall be bedded in select gravel (see table 4.1 grading requirements).

The first backfill lift shall not exceed the spring line of the pipe. The second lift shall be to the top of pipe. Each lift shall be compacted to ninety-five (95) percent optimum density prior to placement of subsequent lifts. Backfill above the pipe may proceed with any method provided excessive loads are not transmitted to the pipe. Backfill shall be placed in uniform layers not exceeding eighteen (18) inches.

The Utility will require field density compaction testing during backfill operations. Tests shall be paid for by the Contractor. The minimum frequency of density tests for backfill in linear trenches will be one test per 200 lineal feet of trench for each type of backfill material. The test depth locations will be from various lifts, approximately half the burial depth, but no more than two tests in a row from the same backfill lift.

Table 1.1 Grading Requirements for Select Gravel  
(Percent passing by weight)

| Sieve Designation | Grading (% Passing) |
|-------------------|---------------------|
| 4 in.             | 100                 |
| 2 in.             | 85-100              |
| No. 4             | 30-70               |
| No. 60            | 35 Max.             |
| No. 200           | 6 Max.              |

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

#### D. DEWATERING

Excavations shall be free from standing water. Pipes shall not be laid in water. The Contractor shall be responsible for taking whatever action is necessary to provide a dry ditch.

Any dewatering activity shall be done in accordance with ADEC dewatering regulations. The Contractor shall be responsible for obtaining and complying with any required dewatering permit.

Dewatering must be conducted without damage to adjacent property, inconvenience to property owners or impairment of traffic. The Contractor shall assume all liability for flooding or related water damage to property as a result of dewatering.

#### E. INSULATION

To help prevent freezing, all Utility lines, valves, fittings, fire hydrants, manholes and other appurtenances shall be completely insulated with a minimum of two (2) inches of urethane foam. Waterproof protective coating shall be used over the foam insulation where pipes are within close proximity to the natural groundwater table.

Water/wastewater services shall be insulated with a minimum of three (3) inches of urethane foam. Any water/wastewater mains or services within seven (7) feet of storm drain lines will require two (2) inches of additional insulation. Storm drains shall also be insulated where crossing Utility lines.

Urethane spray foam insulation shall be rigid closed cell, two (2) component urethane foam, Resin Technology 2045, with the following properties:

K Factor: 0.14 (Btu - in/FT<sup>2</sup> - Hr - °F)  
Compressive Strength: 25 psi  
Density: 2.0 pcf

Protective Coatings shall be a two (2) component, one hundred (100) percent solids, sprayable polyurethane coating, Permex 700 by Resin Technology with the following properties:

Tensile Strength: 1800 PSI  
Elongation (percent): 120  
Water Vapor Transmission: 0.413 Perms

Applicator shall demonstrate prior experience of at least two (2) years. The Utility shall be the sole judge of the qualifications of system, application method, and applicator.

The Contractor shall furnish labor, materials, equipment and services necessary for, and incidental to, application of spray urethane foam.

Insulation shall be applied to Utility mains above ground in a local yard. Mains shall not be insulated in the ditch except under special circumstances, which must be approved by the Utility.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

Hydrants, valves and manholes shall be insulated as shown on the standard drawings. Care shall be taken not to cover hydrant drain holes.

Pre-insulated pipe that has damaged insulation due to transportation shall be reinsulated to the satisfaction of the Utility. Backfill shall not take place until all insulation has been inspected. Backfill shall be placed so that pipe insulation will not be damaged.

#### F. CASINGS

Utility mains which must cross the Alaska Railroad, Alaska Department of Transportation (ADOT) Highways and/or other selected roadways shall be placed in bored casing sleeves. Casings shall be placed according to the specific utility permit requirement. Joints inside casings shall be fully restrained. Ends of casings shall be sealed with urethane foam. The design engineer will notify the Utility of the general requirement for a permit. The Utility will obtain the permit and the contractor will comply with the terms of the permit.

#### G. CONNECTIONS TO EXISTING SYSTEM

Connections to the existing Utility system shall be made by Utility personnel or its designated contractor. The Contractor shall provide a safe excavation with sufficient room to make the connection. At least forty-eight (48) hours of advanced notice is required when requesting a connection. The Utility reserves the right to schedule connections so as to not inconvenience existing customers and minimize potential problems.

Connections to the Utility's water transmission mains or wastewater interceptor lines are not allowed without special consideration and approval by the Utility.

#### H. TRAFFIC CONTROL

#### GENERAL

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The Contractor shall perform actions necessary to protect and maintain traffic during the life of the contract, including the furnishing of such personnel, equipment and devices as may be required to insure the safety of the traveling public. The Contractor shall be responsible for obtaining and complying with all required street excavation or traffic control permits, as issued by controlling agency.

#### PUBLIC NOTIFICATION

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In the event that the planned construction will affect the public, the Contractor shall post a notice to the public in a local daily newspaper advising the public of the project boundaries including a scale map showing the project area and suggested detour routes, the project time limits, the general contractor's name, and the need to be alert for construction signs and traffic control. The notice, dimensioned 3" x



# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

5" minimum, shall appear once fourteen (14) days prior to the start of work and continuously for seven (7) days beginning five (5) days before the start of work.

### TRAFFIC CONTROL SIGNAGE

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All traffic control devices used by the Contractor shall be placed and maintained in accordance with the requirements as specified in the Manual on Uniform Traffic Control Devices (UTCM) with Alaska Supplement. No construction operation will be allowed to commence until the Contractor has obtained the proper signs and placed them as required by UTCM. Hastily made hand painted signs and barricades will not be permitted.

### ACCESS

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The Contractor will be required to: maintain pedestrian access to all residences and businesses in the construction zone; maintain vehicle access for emergency vehicles, fire trucks, ambulances and police vehicles; provide barricades and flagging personnel as necessary while working in all areas and in particular busy intersections on the project. Ditch openings which isolate businesses and other areas as specified by the engineer shall be provided with an approved bridge system capable of withstanding traffic loads to those areas. No road or business driveway may be closed without the approval of the Utility Engineer unless the Contractor has received written authorization from the owner affected.

### OPEN WORK

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At no time will the Contractor have more than one thousand (1,000) feet of trench open, nor more than two (2) existing intersections closed to vehicular traffic. Pedestrian access crossings suitably equipped with handrails shall be provided. The cost of such crossings, if required, shall be the responsibility of the Contractor.

### BARRICADE WARNING LIGHTS

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Barricade warning lights shall be provided and maintained at all barricades and at all other points where directed by the engineer and shall be kept continuously functioning from one (1) hour before sunset until one (1) hour after sunrise.

### AGENCY NOTIFICATION

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The Contractor is required to notify the appropriate agencies at least twenty-four (24) hours prior to starting any work which might inconvenience or impact vehicular traffic. Information on project area, duration and detour routes should be provided.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### I. CONSTRUCTION SURVEYING

The Contractor shall perform all surveying and staking essential for the completion of the project in conformance with the plans and specifications and shall perform all necessary calculations required to accomplish this work. Monumentation shall be in accordance with State of Alaska Standard Drawings.

The Contractor shall use competent personnel and suitable equipment for the layout work required, and shall furnish all equipment necessary for checking and maintaining lines and grades. Upon the Utility's request, the Contractor shall provide evidence acceptable to the Utility that the individual who is proposed to perform the construction staking has a minimum of three (3) years experience in similar construction staking work, is knowledgeable in the operation of required staking instruments and is capable of reading, understanding and accomplishing the construction survey work described herein.

All lot corners adjacent to, or within the area of the construction project that are destroyed or disturbed by the Contractor, shall be replaced at the expense of the Contractor.

All surveying work requiring the setting/resetting of monuments, property corners and all permanent survey monuments shall be accomplished under the direct supervision of a Registered Land Surveyor, licensed in the State of Alaska.

All control, alignment, or grades necessary for construction shall be the responsibility of the Contractor. All alignment and grades shall be set in such a manner that they can be checked by the Utility.

The Contractor shall be responsible for the supervision of the construction surveying personnel. Any errors resulting from the preparations of said personnel shall be corrected at the expense of the Contractor, at no cost to the Utility.

If field measurements or construction work is necessary to determine quantities or verify proper installation, that work shall be performed by the Contractor's survey crew under the supervision of the Utility.

At any point during construction, including prior to backfilling, the Utility may require the Contractor to provide verification that the pipes or other Utility structures are set to the proper plan grade. Any pipes or structures placed outside of the specified tolerances shall be re-worked at the Contractor's expense.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

## 2.0 DESIGN AND CONSTRUCTION OF WATER FACILITIES

### 2.1 GENERAL

Designing additions or modifications to the Utility water distribution system can present problems not normally encountered in typical water system design. Permafrost and deep seasonal frost result in conditions where the distribution system must be circulated to prevent freezing. Special attention must be given to any addition or modification and its effect on existing flow patterns. Service connections, fire hydrant installation and valve operations all require special consideration in the Alaskan environment.

### 2.2 WATER SYSTEM HYDRAULICS

Any addition or change to the Utility water distribution system shall be designed to minimize the risk of freezing. Water lines shall be insulated with urethane foam to prevent freezing. New additions must supply sufficient flow and pressure to provide for both consumption and fire protection.

While the existing water distribution network may not be a fully circulating water system, all additions to the water network, whether single distribution mains or networks, shall to the extent possible incorporate circulating loop characteristics. This circulation may be partial or full circulation which can utilize pitorifices for circulating water hookups. Every effort will be made to effectuate a fully circulating water system.

In order to evaluate the hydraulics of the proposed addition or modification and to examine the impact it has on the existing system, the responsible party shall submit a preliminary layout of the proposed water system to the Utility. The Utility will then analyze the system using its water modeling software. The results will be used to confirm adequate flow and pressure in the new and existing system and to determine if a pumping station will be required. If a problem exists, the Utility will suggest possible solutions such as changing pipe sizes or piping layouts. The responsible shall then resubmit preliminary designs until a workable solution is achieved. A copy of the final water model will be included in the report to ADEC.

### 2.3 DESIGN CAPACITY

Basic design capacity shall provide for peak demand or fire protection requirement, whichever is larger. Design water consumption for the Utility shall be one hundred (100) gallons per day per capita. Peak hourly demand for residential areas shall generally be at least four and one-half (4½) times the average daily demand. Capacity for commercial and industrial use will usually be based on the fire protection requirement. Actual fire protection requirements are based on ISO requirements and will be determined in conjunction with ISO to optimize fire flows for the entire system.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### 2.4 SYSTEM PRESSURE

Normal operating pressure of the DU water system is approximately 75 psi with pressures from fire pumps creating pressures of 100 psi. Design pressure shall be two hundred (200) psi. The connection of a fire booster pump to the Utility water system is prohibited without advance written approval.

### 2.5 SIZE AND TYPE OF PIPE

Water mains will be sized to accommodate fire protection and domestic water demands. Minimum water main size shall be six (6) inch diameter. Water mains shall be ductile iron pipe, cement mortar lined, push on Tyton® joint. Pipe shall conform to AWWA C151. Cement lining shall conform to AWWA C104. Reference Paragraph 2.16 for specific pipe materials. All pipe and materials in direct contact with potable water shall meet the requirements of the National Sanitation Foundation (NSF) 61.

Water service piping shall be ductile iron, type K copper or standard wall steel. Copper tubing shall conform to ASTM B-88. Service sizes shall be three-quarters (3/4) through two (2) inches for copper. Services two and one-half (2-1/2) inches and larger shall be ductile iron or steel.

### 2.6 DEPTH OF COVER

Generally, water mains shall have a minimum depth of cover of four (4) feet. When cover on existing pipe is less than four (4) feet due to road excavation, ditches, etc., the existing water main shall be lowered or insulated, as directed by the Utility.

At FRA the standard depth of bury will be ten (10) feet, without prior approval of DU.

### 2.7 WATER MAIN PLACEMENT

Water mains shall be typically located parallel to roadways and other utilities and a minimum of five (5) feet from any other existing or proposed buried utility.

### 2.8 PIPE JOINTS

Ductile iron joints shall be push-on Tyton®; conforming to AWWA C111. Joining plain end sections shall be with Romac® couplings or approved equal. For services, copper tubing joints shall be flare type and steel pipe shall be plain end suitable for Romac couplings or welding. No threaded joints shall be used below ground.

### 2.9 RESTRAINED JOINTS

In a straight section of a pipeline, the hydrostatic forces are balanced. Wherever the pipeline changes direction or diameter, such as at a bend or a reducer, the hydrostatic forces create an unbalanced thrust

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

force in the line. This unbalanced thrust force can cause the line to move or its joints to separate unless the thrust is counterbalanced. Conventional ductile iron push-on or mechanical joints do not offer any significant resistance to joint separation. Unbalanced thrust forces are commonly counter balanced with thrust blocks, restrained pipe joints or a combination of the two.

In lieu of concrete thrust blocks, restrained joint products such as Field Lok® gaskets and Megalug® restraining glands may be used provided all joints within the specified distance from the angle point are also restrained.

Table 2.1 Restrained Length Requirements

|               |     | HORIZONTAL ANGLE |       |     |     |          |
|---------------|-----|------------------|-------|-----|-----|----------|
|               |     | 11.25°           | 22.5° | 45° | 90° | Dead End |
| PIPE DIAMETER | 4"  | -                | 3'    | 6'  | 18' | 32'      |
|               | 6"  | -                | 4'    | 9'  | 22' | 46'      |
|               | 8"  | 3'               | 6'    | 12' | 28' | 59'      |
|               | 10" | 3'               | 7'    | 18' | 36' | 72'      |
|               | 12" | 4'               | 8'    | 19' | 40' | 84'      |
|               | 14" | 4'               | 9'    | 20' | 46' | 96'      |
|               | 16" | 5'               | 10'   | 21' | 54' | 108'     |
|               | 18" | 5'               | 11'   | 23' | 60' | 120'     |

Example: For a ten (10) inch – ninety (90) degree elbow; all joints within thirty-six (36) feet of the elbow (either side) must be restrained, (in addition to the elbow itself) when using mega-lugs and field lock gaskets.

This table applies only to horizontal bends with a minimum of four (4) feet backfilled cover. Restrained lengths for tee's, reducers, vertical bends or any other situation shall be as directed by the Utility Engineer.

## 2.10 PIPE FITTINGS

Ductile iron pipe fittings shall conform to AWWA C153 standard for compact fittings. Fitting shall be mechanical joint and shall be pressure class three hundred fifty 350. Fitting interiors shall be cement mortar lined.

## 2.11 VALVES

Main line valves shall be spaced at maximum intervals of seven hundred (700) feet and shall be placed at intersections and adjacent to fire hydrants where possible. Resilient wedge gate valves, conforming to AWWA C515, shall be used for pipe sizes six (6) inch through twelve (12) inch. Rubber-seated butterfly valves, conforming to AWWA C504, shall be used for pipe sizes fourteen (14) inches and larger. Butterfly valves shall be Henry Pratt Groundhog.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

Valve end connections shall be mechanical joint. Valves shall be non-rising stem with a two (2) inch square operating nut and open in the counter-clockwise direction.

#### 2.12 VALVE BOXES

All valves shall be furnished with cast iron valve boxes. Valve boxes shall be two piece extension types with a cast iron cover. Valve boxes shall be East Jordan Iron Works 3669 or approved equal.

Valve box top sections shall be installed a minimum of five (5) inches above the last extension piece to allow room for a plastic insert to be installed by the Utility. Top section interiors shall be smooth and straight with no protrusions.

Valve boxes shall be installed to minimize the amount of runoff water that will enter the box. Drain tubes and drain fields shall be installed on each valve to allow accumulated water to drain. Avoid placing valve boxes in ditch bottoms or low spots in streets.

Valve box lids shall be depressed three-eighths (3/8) inch below asphalt or concrete surfaces to avoid damage from snow plows. Valve boxes shall extend four (4) inches above finish grade in un-traveled areas for ease of locating.

#### 2.13 FIRE HYDRANTS

Fire hydrants shall typically be required at all street intersections and at spacing not to exceed three hundred fifty (350) feet. Hydrants shall be placed at common lot lines. The governing fire authority shall approve the location, number and performance requirements of all hydrants in commercial or industrial locations. Special attention shall be given to hydrant access.

Fire Hydrants shall conform to the standards of AWWA C502. Fire hydrants shall be Waterous Pacer WB-67-250. Mueller Super Centurion 250 hydrants may be allowed on a case by case basis with prior approval from the Utility. Hydrants shall be configured with two (2) – two and one-half (2½) inch side nozzles and one (1) – four and one-half (4½) inch front pumper connection. Pacer upper standpipe length shall measure sixteen (16) inches.

Hydrant inlet connections shall be flanged and shall connect to a six (6) inch flange x mechanical joint gate valve. The gate valve shall connect to a hydrant “swivel” tee, as manufactured by Tyler or approved equal. Flange connection shall use a US Pipe flange-type gasket.

The hydrant ground line bury mark shall be no more than six (6) inches above finish grade elevation. Hydrants shall be insulated with two (2) inches of urethane foam to within one (1) foot of the bury mark. Care shall be taken not to cover the hydrant drain ports. Hydrants shall be wrapped in three (3) layers of polyethylene sheeting prior to backfill.

Guard posts shall be installed at designated hydrants vulnerable to traffic damage as directed by the Utility.

Each hydrant shall be set on a concrete base over a drain field as shown on the standard drawings.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

Hydrants and guard posts shall be painted with two (2) coats of federal safety yellow (M 4182) paint color after installation.

#### 2.14 DISINFECTION AND FLUSHING

Mains shall be disinfected in accordance with the latest revisions of AWWA C651. The Contractor shall furnish all material, labor, equipment, and services required for disinfection of the pipeline. Mains shall be chlorinated using calcium hypochlorite granules or tablets. The basic procedure will be as follows:

Contractor shall place chlorine powder or tablets in the main as the pipe is being laid.

When pipe laying is complete, the Utility will slowly begin filling the main. Long runs of pipe will take a considerable amount of time to fill. The main shall be filled slowly so as not to wash the chlorine to the end of the test section. Air shall be purged by opening hydrants and if necessary by placing a temporary tap in the high spot of the main.

Once the pipe is full, the Utility shall re-isolate the system. The chlorinated water will have a minimum contact time of twenty-four (24) hours. A minimum chlorine residual of twenty-five (25) mg/L is required at the end of the twenty-four (24) hour period; which will be verified by the Utility. The Contractor shall re-chlorinate any section failing to meet minimum standards.

Upon successful chlorine residuals; the main shall be full bore flushed. The Contractor shall make all necessary arrangements for disposal of the flushing water, and to ensure the flush does not cause property damage, flood the ditch or inhibit traffic in the area. The Utility will energize the system and flush until the water in the pipe has been replaced at least once.

After the lines have been flushed, the system will be isolated so that all air has been removed and the isolated section is at system pressure. At that point the Contractor may connect test pump apparatus and perform pressure testing.

After the lines have been flushed and pressure tested, two (2) series of samples, twenty-four hours apart, will be taken for biological purity. The biological purity tests shall be performed by a State certified laboratory and shall provide a drinking water analysis report for total coliform bacteria for each sample taken. The new mains shall remain isolated and absolutely no service connections will be made until the test results report negative for E. coli and total coliform.

#### 2.15 PRESSURE TESTING

The Contractor shall perform a pressure test on the installed pipeline; in accordance with the latest revision of AWWA C600. All mechanical joints shall be left exposed until completion of the pressure test. All portions of the pipeline shall be adequately restrained or backfilled to counterbalance thrust forces introduced by the pressure test. All pit orifice assemblies, service tees and hydrants shall be installed prior to the pressure test. All air shall be properly vented from the pipe during charging. Water for pressure testing and flushing will be provided by the Utility. Once the line has been filled and all air removed, the utility main connection shall be isolated from the new section of piping under test. The Contractor shall provide chlorinated make-up water and test pump to pressurize the line to one hundred fifty (150) psig. The make-up water and pump shall be disconnected during the test period.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

Only approved pressure gauges with five (5) psi increments shall be used, provided by the Contractor. While under this pressure, all joints shall be visually examined. Any evidence of leakage shall be repaired and the line retested until meeting these requirements.

After there is no evidence of leakage, the pipe section shall be held under pressure for four (4) hours, with an initial pressure of one hundred (150) psig. At the end of the four (4) hours, the make-up water and pump shall be reconnected and the line re-pressurized to one hundred fifty (150) psig. The make-up water shall then be bled off into a graduated container until the pressure equals the pressure indicated at the end of the four hour test. The allowable leakage shall be determined by the following formula:

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

L = allowable leakage (make-up water), in gallons per hour

S = length of pipeline tested (feet)

D = nominal diameter of the pipe (inch)

P = average test pressure during the test (psi)

No pipe section will be accepted if the leakage is greater than allowable. Service reconnections and final connections to the existing main shall be visually inspected at main line pressure.

## 2.16 MATERIAL AND/ EQUIPMENT SPECIFICATION

All materials and equipment specified in this standard apply to Water Distribution System (WDS) piping installed in utilidors, vaults, manholes and building mechanical rooms. An attempt has been made to name at least two (2), and in most cases three (3) manufacturers wherever products are specified. Where only one (1) name is listed, it has been done for a specific reason. Pipe, fittings, valves, and specialties manufacturers are subject to approval by Doyon Utilities, LLC (DU) and the Engineer of Record.

All materials and equipment shall:

- Conform to all applicable standards, codes and ordinances;
- Be in accordance with the specifications and performance characteristics listed herein;
- Be standard products of one of the approved manufacturers;
- Be new and in perfect condition.



# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

| Domestic Water / 0-to-250 PSIG / 35-to-150°F |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item                                         | Size (IN.)     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Pipe                                         | ½ thru 2       | Copper, Type L, hard drawn, ASTM B75, ASTM B88, ASTM B251, ASTM B447                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                              | 3 thru 24      | Ductile iron pipe, AWWA C151, Special Thickness<br>Class 50 for 3" thru 16" (Forts Wainwright and Greely)<br>Class 52 for 3" thru 16 " (Fort Richardson Only)<br>Class 54 for 18"<br>Class 55 for 20"<br>Class 56 for 24" thru 36<br>Pipe shall be supplied in minimum Pressure Class 350 for 3" thru 12"; Pressure Class 250 for 14" thru 16"; Pressure Class 200 for 24", and Pressure Class 150 for 30" and larger<br>Cut groove ends, AWWA C606<br>Cement-mortar lined, AWWA C104<br>Approved Mfg <u>American Pipe</u> ; <u>Atlantic States Pipe</u> ; <u>Canada Pipe</u> ; <u>CLOW Water Systems</u> ; <u>Griffin Pipe Products</u> ; <u>McWane</u> ; <u>Pacific States</u> ; <u>US Pipe and Foundry</u> |
| Type of Joint                                | ½ thru 2       | Rolled Groove, AWWA C606                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                              | 3 thru 24      | Cut Groove, AWWA C606                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Fittings                                     | ½ thru 2       | Standard wrought copper – ASME B16.15, ASME B16.18, ASME B16.22, ASME B16.23, ASME B16.26, ASME B16.29, ASME B16.32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                              | 3 thru 24      | Ductile iron, ASTM A 536.<br>Fittings and specials shall have a pressure rating no less than that of adjoining pipe.<br>Fittings and specials for cut grooved, and shouldered end pipe shall conform to AWWA C606 without field preparation.<br>Fittings and specials for flanged joint pipe shall conform to AWWA C110.<br>Fittings required which are not covered in AWWA C110 shall have AWWA flanges and be based on AWWA C110 design principles.                                                                                                                                                                                                                                                         |
| Unions                                       | ½ thru 2       | Copper ASTM B 75 solder joint ends integral seats ANSI B16.22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Couplings                                    | 3 thru 24      | Victaulic Style 606 couplings, ASTM A536<br>Coupling shall provide for full circumferential bearing against face of pipe groove with positive locking action when components being joined are in line.<br>Rubber gaskets and lubricant shall conform to the applicable requirements of AWWA C111.                                                                                                                                                                                                                                                                                                                                                                                                             |
| Flanges                                      | ½ thru 2       | Wrought Copper, soldered end, full face, ANSI/AWWA C115/A21.15.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                              | 3 thru 24      | Forged carbon steel, standard bore, flat face, AWWA C115 / AWWA C110                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Flange Bolts                                 | Stud Bolts     | Alloy steel, ASTM A193, Grade B7<br>Thread ANSI B1. / B18.2.1, Class 2A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                              | Heavy Hex Nuts | Alloy Steel, ASTM A 194, Grade 2H<br>Thread ANSI B1.1 / B18.2.2, Class 2B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Flange Gaskets                               | ½ thru 24      | EPDM; full face; ⅛" thickness; high performance type satisfying requirements of ANSI/AWWA C111/A21.11 Appendix C, Sec. C.2; and have at least three (3) bulb-type rings molded into both faces of gasket; UL classified in accordance with ANSI/NSF 61 for potable water service.<br>Approved Gaskets: US Pipe Flange-Tyte                                                                                                                                                                                                                                                                                                                                                                                    |
| Thread Sealant                               | ½ thru 4       | Teflon Ribbon, ½ inch wide, 4 mils thick                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

| Domestic Water / 0-to-250 PSIG / 35-to-150°F                                                                     |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item                                                                                                             | Size (IN.) | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Ball Valves                                                                                                      | ½ thru 2   | <p>Full port, ANSI Class 600, PSI non-shock cold water, ASTM B124</p> <p>Body Forged carbon steel</p> <p>Ball &amp; Trim Brass ball, chrome plated, free floating, brass alloy stem</p> <p>Seats &amp; Seals TFE (TFM-1600; PTFE)</p> <p>Ends Soldered</p> <p>Handle Stainless steel tee handle with vinyl insulator</p> <p>Features Blow-out proof stem, 2-¼ in. stem extension</p> <p>Approved Mfg Apollo; Jamesbury; Marwin; Velan; Watts</p>                                                                                                                                                                                                                                                                                                   |
| Butterfly Valves                                                                                                 | 3 thru 24  | <p>ANSI Class 150</p> <p>Body Cast carbon steel, threaded lug pattern, extended neck</p> <p>Disc Stainless steel, ASTM A182-F316L with PTFE woven fabric liner over 317 stainless steel frame</p> <p>Bearings RFTE lined stainless steel</p> <p>Stem Stainless steel, ASTM A182-F316L</p> <p>Seat EPDM, field replaceable</p> <p>Features Manual worm gear-operator, bi-directional for dead end service</p> <p>Approved Mfg Centerline; DeZurik; Jamesbury; Velan; Walworth</p>                                                                                                                                                                                                                                                                   |
| Gate Valves                                                                                                      | 3 thru 24  | <p>AWWA C500</p> <p>Body Cast iron, ASTM A126</p> <p>Trim Hard faced with 13 percent chrome</p> <p>Ends Flanged, AWWA C115</p> <p>Features Resilient seat type with non-rising stem, bolted bonnet with Teflon impregnated packing, solid wedge disc</p> <p>Gate valves serving fire hydrants shall be flange x mechanical joint type and must be FM approved. Gate valve shall connect to a hydrant "swivel" tee, as manufactured by Tyler.</p> <p>Approved Mfg Hammond; Jenkins; Milwaukee; Powell; Stockham; Velan; Walworth; Watts</p>                                                                                                                                                                                                         |
| Check Valves                                                                                                     | ½ thru 2   | <p>Full port, swing type, Class 600, PSI non-shock cold water, ANSI B 16.34</p> <p>Body Bronze with renewable bronze disc</p> <p>Trim Hard faced with 13 percent chrome</p> <p>Ends Socket weld, ANSI B16.11</p> <p>Features Horizontal installation, bolted bonnet with spiral-wound gasket</p> <p>Approved Mfg Bonney Forge; RP&amp;C; Velan; Vogt; Walworth; Hammond; Milwaukee; Watts</p>                                                                                                                                                                                                                                                                                                                                                      |
| Fire Hydrants                                                                                                    |            | <p>Fire hydrants shall be "Dry Barrel" type conforming to AWWA Specification C502. Hydrants shall open counterclockwise.</p> <p>Working parts shall be bronze or non-corrodible metal.</p> <p>Upper standpipe length shall be 16 inches. Furnish each hydrant with 10' stem with drain outlets at base of barrel.</p> <p>Hydrants shall have two (2) each 2-½" hose connections and one (1) each 4-½" pumper connection. Hose threads shall be National Standard threads.</p> <p>Hydrant inlet connection shall be flanged.</p> <p>Painting and coating shall be in accordance with AWWA C502. Color of paint shall be Federal Safety Yellow, two coats after installation.</p> <p>Approved Mfg American Flow Control Waterous Pacer WB-67-250</p> |
| Air release valves shall be cast iron body and cover, stainless float with brass seats conforming to AWWA C-512. |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

| Domestic Water / 0-to-250 PSIG / 35-to-150°F |            |                                                                                                                                                                                                                                                                            |
|----------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item                                         | Size (IN.) | Description                                                                                                                                                                                                                                                                |
| Permanent Strainers                          | ½ thru 2   | Bronze body “Y” pattern threaded end connections strainer ASTM B 62 (Alt. B-61) 400 lb WOG at 150 deg F rating; 0.033 perforated stainless steel screen (Alt: Monel)<br>Approved Mfg Apollo; Armstrong; Keckley; Mueller; Self Cleaning Strainer Co.(Paget); Watts         |
|                                              | 3 thru 24  | Stainless steel conical strainer with 0.125 in. perforations, long pattern, 200% open area relative to flow area of same size standard weight pipe, 14 gage, flange class 300<br>Approved Mfg Mueller; Keckley; Watts; Mack Iron Works; Self Cleaning Strainer Co. (Paget) |
| Temporary Strainers (Start-up)               | 3 thru 24  | Stainless steel conical strainer with 0.045 in. perforations, long pattern, 200% open area relative to flow area of same size standard weight pipe, 14 gage, flange class 150<br>Approved Mfg Mack Iron Works; Self Cleaning Strainer Co. (Paget); Mueller; Watts          |

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

## 3.0 DESIGN AND CONSTRUCTION OF WASTEWATER FACILITIES

### 3.1 GENERAL

Sewage must be transported in a sanitary manner through the Utility wastewater collection system with an absolute minimum of infiltration of groundwater and in-flow of storm run off. Attention shall be given to design details which will minimize potential freezing problems within the wastewater collection system. Wastewater mains shall generally be located in the street R.O.W. to facilitate maintenance. Special consideration should be given to cold temperatures, permafrost, and high water tables. Gravity flow is usually most desirable, but in some cases pumping may be required.

### 3.2 SIZING

Sanitary sewer mains shall be sized for the ultimate population and/or land use that can reasonably be expected to develop in the tributary area within a period of fifty (50) years.

The following factors shall be considered when determining sanitary sewer sizing:

- Maximum hourly domestic sewage flow
- Additional maximum flow from industrial or commercial sources
- Inflow and ground water infiltration
- Topography of area
- Location of nearest existing sewer main which can accept the flow
- Depth of excavation
- Pumping requirements

### 3.3 STORM WATER

Under no conditions shall storm drain or roof drain connections be allowed to connect to the Utility wastewater collection system.

### 3.4 DESIGN FLOW

Basic design capacity shall be based on the peak hourly flow. For typical domestic situations, an average daily per capita flow of one hundred (100) gallons per day shall be used along with an assumption of three point five (3.5) persons per residential dwelling unit.

Various sources are available to estimate commercial, industrial, and inflow/infiltration flows; which will be examined on a case by case basis.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

#### 3.5 PEAKING FACTORS

Peaking factors are inversely proportional to the average daily flow in a pipe. Peaking factors for very small flows can be substantially higher than for larger flows. The following table is provided as a guide to calculate peak flow conditions:

| AVERAGE DAILY FLOW<br>(GALLONS) | PEAKING FACTOR |
|---------------------------------|----------------|
| 1,000 or less                   | 150            |
| 3,000                           | 55             |
| 30,000                          | 8              |
| 100,000                         | 3.4            |
| 300,000                         | 2.5            |
| 1,000,000 and more              | 2.0            |

Factors for flow other than these may be extrapolated. A minimum peak design flow of one hundred (100) gallons per minute shall be used for any new sanitary sewer.

#### 3.6 SLOPE

The slope of a gravity sanitary sewer is important to maintain a self-cleansing velocity, generally recommended at two (2) feet per second (fps), when flowing full. It is usual practice to design for this velocity at peak design flows, recognizing that prior to ultimate development some deposits will occur and more frequent cleaning will be required. Slopes shall be uniform between manholes. The following table lists the minimum slopes for various pipe sizes and full flow capacity:

| SIZE<br>(inch) | SLOPE<br>(ft/ft) | CAPACITY<br>(gpm) |
|----------------|------------------|-------------------|
| 8              | 0.0033           | 370               |
| 10             | 0.0028           | 560               |
| 12             | 0.0022           | 800               |
| 14             | 0.0017           | 1,075             |
| 16             | 0.0014           | 1,390             |
| 18             | 0.0012           | 1,755             |
| 20             | 0.0011           | 2,125             |
| 24             | 0.0008           | 3,090             |
| 30             | 0.00058          | 4,850             |
| 36             | 0.00046          | 7,200             |

Wastewater Utility mains shall be laid at minimum slope. Grades may be set slightly higher in locations where no further development is expected and lack of cover is not an issue. The Utility will review each case individually.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

#### 3.7 SIZE AND TYPE OF PIPE

Gravity wastewater mains shall not be less than eight (8) inch diameter. Force main (pumped) sewer mains shall not be less than four (4) inch diameter.

Gravity wastewater and force main sewer pipe shall be cement mortar lined ductile iron pipe (min. 150 pressure class); conforming to AWWA C151 and C104. Joints shall be rubber gasketed push on Tyton<sup>®</sup>.

The Utility may consider the use of HDPE (SDR 17) for force main sewers on an individual basis.

Service piping shall be ductile iron or HDPE and shall not be less than four (4) inch diameter.

#### 3.8 DEPTH OF COVER

Wastewater mains shall be sufficiently deep to receive sewage from basements and to prevent freezing. Wastewater mains shall have a minimum depth of cover of five (5) feet.

#### 3.9 FINAL ACCURACY

At any point during construction, including prior to backfilling, the Utility may require the Contractor to provide verification that the pipes or other Utility structures are set to the proper grade. Final accuracy of all gravity sanitary sewer main installations shall be within one-hundredths (1/100) of a foot vertically and one-half (1/2) of a foot horizontally of the exact location taken from the project plans. In addition, no single section of pipe shall vary by more than ten (10) percent from the grade shown on the project plans. In no case will a reverse or flat grade be allowed. Pipe which exceeds the above limits of variation shall be adjusted immediately and no further pipe shall be laid until so authorized by the Utility. All costs incurred for adjusting grades of lines shall be the responsibility of the Contractor.

#### 3.10 MANHOLES

All intersections or changes in direction of gravity flow shall be in manholes which shall be designed to minimize deposition and aid in maintenance and inspection. Inflow pipes shall have smooth transitional grading in flow channels to minimize the effects of drops. Match crown elevations when joining pipes of different sizes. On a straight section, the grade of the manhole channel shall be the same as the pipes entering and exiting. A section of pipe (with the top half cut out) will pass completely through the manhole. Where there is a change of horizontal direction, the drop through the manhole shall be a minimum of one-tenth (1/10) of a foot. Service connections to manholes will be allowed only with Utility permission.

Manhole placement shall typically be within the street intersections. Avoid placing manhole lids in vehicle tire paths. Distances between manholes shall not exceed three hundred (300) feet. The manhole inside diameter shall be forty-eight (48) inches. Two (2) manholes shall be placed adjacent to lift stations; one upstream, one downstream, to facilitate bypassing operations. All dead end mains shall terminate with a manhole or an eight (8) inch diameter flushwell.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### Manhole Specifications

Manholes shall be completely watertight. Materials used in construction shall conform to the requirements of ASTM Specification Designation C-478 and approved details.

Manhole bases and cones shall be formed of two thousand five hundred (2500) psi concrete. They shall be reinforced with wire mesh, rebar and provided with steps as shown on the standard drawings.

Each precast concrete manhole section shall be set and sealed by use of a gasket type seal such as Ram-Nek or equal.

All portions of precast manholes must be approved by the Utility prior to installation. This approval does not relieve the Contractor of the responsibility for protection of manholes against damage during handling and installation.

Outside surface of the manhole shall be sprayed with two (2) inches of urethane foam. Waterproof coating shall be applied wherein close proximity to the water table as directed by the Utility Engineer. Manholes shall be completely wrapped in three (3) layers of six (6) mil polyethylene sheeting prior to backfill.

Manhole covers and rings shall be fabricated from cast iron per ASTM A48, Class 24 (H-20 loading). The traffic cover shall have a diameter of twenty-five (25) inches with a clear inside diameter of twenty-three (23) inches. Overall depth shall be six (6) inches. The word "SEWER" shall be cast into the manhole cover. Manhole cover shall be solid except for one (1) one (1) inch lifting hole. Manhole rings and covers shall be machine ground on seating surfaces so as to assure a non-rocking fit in any position and interchangeability. Manhole rings and covers shall be East Jordan Iron Works IFCO 740 or approved equal.

Manholes shall be brought to the grades shown on the plans. Covers shall be depressed three- eighths (3/8) of an inch below finish grade elevation.

The base section shall be set plumb on a minimum of eighteen (18) inches of select gravel, compacted to ninety-five (95) percent optimum density.

Where indicated on plans, a stub shall be provided for future connections to the manhole. The end of the stub shall be sealed water-tight.

Pipe penetrations to the manhole shall be sealed with non-shrink grout, inside and out. Manholes shall be completely water-tight. In areas of high water table, water-proof coating and Link-Seal shall be required.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

#### 3.11 FLUSHWELLS

Flushwell clean-outs shall be installed at the terminus end of branch wastewater mains where future extension is not anticipated. Maximum distance between flushwell and nearest manhole shall be three hundred (300) feet. Flushwell shall be constructed with a forty-five (45) degree elbow, eight (8) inch ductile iron pipe to surface and East Jordan Iron Works IFCO 221 cleanout cover assembly.

#### 3.12 LIFT STATIONS

##### A. GENERAL

The combination of flat topography, deep frost penetration, high water table and high construction costs for excavation often make wastewater lift stations necessary. Many times wastewater service is not available to an area. In those cases, a central receiving lift station is installed and the discharge is pumped to the nearest gravity collection point. Since lift stations are expensive to construct and to operate, they shall be utilized only as absolutely necessary, and be consistent with Utility planning. Lift stations shall be installed as deep as practically possible in order to serve foreseeable future development and to keep the number of lift stations to a minimum.

The Engineer's design report shall include present and ultimate design information including: pump curves, system curve, estimated operating point (gpm/head), impeller size, area to be served, pump run time, pump cycle time, anticipated power consumption, operations and maintenance information, recommended spare parts, and other appropriate information.

Lift stations shall be supplied with three (3) phase, 480 VAC power.

##### B. PUMPS

Lift stations shall be designed with a reinforced concrete receiving well and furnished with a minimum of two (2) heavy duty, submersible, non-clog wastewater pumps. Each pump shall be capable of handling peak design flow. The system will be completely automatic and electrical controls and accessories shall be completely compatible with the pumps. Pumps shall be Flygt, type NP, 7.5 minimum horsepower. Bases, relay, check valves, guide rail, seal leakage detection and hatches shall all be manufactured by Flygt.

##### C. SAFETY

The lift station site shall be readily accessible but outside of street driving surfaces. Safety shall be a primary concern in designing access within the lift station. All electrical equipment within the lift station shall be Class I, Division 1; explosion proof and intrinsically safe. Each lift station shall be vented. Heavy duty access covers shall be designed for H-20 traffic loads and shall feature Safe-Hatch fall through protection grating.



# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### D. CAPACITY

Capacity of the lift station shall be based on the peak hourly flow (average daily flow times the peaking factor). The controls shall be designed to alternate between pumps, to maximize time between start-ups of each pump and to equalize wear. The minimum size of a lift station receiving well shall be six (6) feet in diameter. The depth of the receiving well sump, which is defined as the distance from the lowest incoming pipe invert to the bottom of the concrete base, shall be a minimum of five (5) feet and shall be designed to minimize the running time and start-ups of the pumps.

### E. CONTROL PANEL

Lift stations shall be equipped with a pump control panel fully integrated with the Utility SCADA system. Panel shall include SCADA radio and antenna (30' x 2" dia. antenna mast, 40' coax cable and connectors or copper/fiber communication), intrinsically safe submersible depth sensor and high level float. PLC programming and integration into the Utility SCADA system shall also be provided.

Standard panel shall be 60" x 36", NEMA 4 rated. Panel shall have controls on an interior swing out panel and pad lockable outer door and will be suitable for up to four (4) 480 VAC, 3 Phase, Flygt submersible pumps. Panel shall feature:

- Pump circuit breakers (pad-lockable in the off position)
- Motor starters with ambient compensated overloads and resets
- Control circuit breaker
- Duplex GFI convenience receptacle
- Condensation heater and thermostat
- Serialized UL 508-14 label relating to hazardous locations with intrinsically safe circuit extensions
- Intrinsically safe float and transducer circuit
- Seal fail relays
- Graphical user interface showing station status, pump status, alarm logs and pump operational data
- Pump alternation control
- 2-hand off-auto selector switches
- 2-overload alarm lamps
- 2-seal fail alarm lights
- External high water alarm light with flasher (red)
- Pump shut-down on circuit breaker trip
- XHHW wire, terminal strip

Electrical wiring and components shall be in compliance with all applicable codes. Conductors of intrinsically safe circuits shall not be placed in any raceway, cable tray or conduit with conductors of any non-intrinsically safe circuit. Panels shall be UL listed and shop tested. Panels shall be provided by DU.

Additional electrical components shall include:

- Meter main and CB disconnect
- Manual transfer switch, 3-pole, double throw, non-fuseable, suitable for use as service equipment, rated 480 V, three (3)-phase, NEMA 12/3R enclosure, Cutler Hammer. Must also disconnect utility neutral.
- Transfer switch be equipped with portable generator plug Crouse Hinds # AR1042-S22

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

NEMA 3-R gutter w/ power terminal blocks, equipment ground bar and control terminal block  
Yard light with photoelectric switch  
Crouse-Hinds EZS6 seals (to be sealed by Utility), eighteen (18) inches above finish grade

All above equipment including SCADA control panel to be mounted on a Unistrut frame set in concrete. Frame shall be located within ten (10) feet of the lift station wet well.

#### F. ADDITIONAL LIFT STATION EQUIPMENT REQUIREMENTS

Flygt heavy duty alum. access cover, H-20 load, safe-hatch w/insulation; model FLED-HD, standard double door clear opening 48" x 60"  
Stainless steel upper guide bar brackets and cable holder  
Standard cast iron Flygt discharge base connection  
2" dia. sch 40 galvanized steel guide bars; fully extended to top of wet well  
Lifting chain/cable  
Heavy duty aluminum ladder  
Flanged ductile iron discharge piping  
Flygt ball check valves  
1" Johnson Vacuum Breakers (Force Main Only)  
One (1) spare pump and motor, identical to installed pumps

### 3.13 ACCEPTANCE TESTING

#### A. PRESSURE TESTING

All gravity wastewater mains shall be air tested in accordance with ASTM C 828 after services are installed. Test sections shall be isolated and initially pressurized to four (4) psi. After stabilization, reduce the pressure to three point five (3.5) psi before starting the test.

If a one (1) psi drop does not occur within the test time, (Table 2.1), the line has passed. If the pressure drop is more than one (1) psi during the test time, the line is presumed to have failed the test. The Contractor shall make all necessary repairs until achieving a successful test.

Table 2.1 Minimum Test Time for Various Pipe Sizes

| Nominal Pipe Size (inch) | T (time) Minutes/100 ft |
|--------------------------|-------------------------|
| 8                        | 1.2                     |
| 10                       | 1.5                     |
| 12                       | 1.8                     |
| 14                       | 2.0                     |
| 16                       | 2.2                     |
| 18                       | 2.4                     |
| 20                       | 3.0                     |
| 24                       | 3.6                     |
| 30                       | 4.8                     |

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

#### B. CLEANING

When all installation work is complete, the Contractor shall remove debris from all pipe, manholes, wet wells etc. The mains and manholes shall be flushed with water to the satisfaction of the Utility.

#### C. VIDEO INSPECTION

After the pipe has been cleaned and tested, the mains shall be video inspected. The video inspection shall be of a format and quality approved by the Utility. Video inspection work by any contractor, other than College Utilities, shall require prior approval. The Contractor shall be responsible for all costs associated with the video inspection. The video inspection shall constitute acceptance for alignment, grade, damaged or defective pipe or any type of faulty installation. The Contractor shall remedy any such defects as directed by the Utility.

### 3.14 FORCE MAINS

In situations where the discharge of a lift station does not have a nearby gravity connection point; the sewage must be pumped under pressure to the nearest location capable of handling the flow.

#### A. DESIGN

Force main design shall clearly show the plan route and profile elevations of the line. The system head curve shall be calculated and plotted against the pump curve to identify the system operating point. The vertical grade of the pipeline shall be as flat as possible. Low and high points are to be avoided. Force main shall be designed with a velocity between two (2) to ten (10) feet per second.

#### B. SIZE AND TYPE OF PIPE

Force mains shall not be less than four (4) inch diameter. Pipe material shall be ductile iron, pressure class 50, cement mortar lined. The Utility may consider the use of HDPE (SDR 17, 100 psi) for force mains on an individual basis. All piping shall be insulated per Utility standards. Ductile iron joints shall be restrained with field lock gaskets and mega-lug fittings. HDPE shall be joined by butt fusion. The Contractor shall be trained and experienced in butt fusion process.

#### C. HDPE

To insure proper and consistent butt weld joints, pipe supports shall be placed on level ground. Non-level, non-perpendicular fused joints will not be accepted. Fuse ANSI 150# HDPE flanges to ends of pipe with flange x mechanical joint adapters to transition to ductile iron pipe.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

#### D. CLEAN-OUTS

Dual force main clean-out assemblies, per standard detail drawing, shall be installed at three hundred (300) foot intervals.

#### E. PRESSURE TEST

Force mains shall be pressure tested at one hundred (100) psi to the satisfaction of the Utility.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

## 4.0 BUILDING SERVICES - GENERAL REQUIREMENTS

### 4.1 STANDARDS

Only work, materials, and tools meeting acceptable standards shall be permitted.

All plumbing shall conform to the standards set forth in the most recent edition of the Uniform Plumbing Code.

All work and materials shall be free of defects and leaks.

All materials used shall be new.

### 4.2 SCOPE OF UTILITY PERSONNEL WORK

Utility personnel or their designee will shut off water main lines, remove insulation from main, install saddles for both water and wastewater services, corporation stops, tees, valves, and thaw bus, reactivate the water main line, and install the water meter. This, together with the inspection of all materials and work, will constitute the scope of Utility personnel work unless specific arrangements have been made in writing for the Utility to do other work for the Installer.

### 4.3 REQUIRED INSPECTIONS

Inspection of the facilities is the responsibility of both the installer and the Utility. Each phase of work must be inspected by the installer and/or Utility personnel before going on to the next phase. Inspection No. 1 inspects the service line for correct installation of materials. Inspection No. 2 inspects the amount of insulation on a service line and re-insulation on the main line. In the event of conflicts between this Standard and other Standards, the following governance shall apply:

1. This specification
2. Uniform Plumbing Code

### 4.4 CONNECTION OF SERVICE LINES TO UTILITY MAIN

Connections to water and wastewater mains will be made during normal Utility working hours. No person, other than Utility personnel, shall cut or bore any holes in a water or wastewater main or attempt to install a connection. The application for service will act as an excavation permit. The Utility will furnish and install the connection to the Utility main.

The Utility requests a 5-day advance notice prior to connection to the main. however, based on workflow, the Utility can normally support a forty-eight (48) hour notice.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

#### 4.5 EXCAVATION

Prior to any digging, the Installer must first obtain a digging permit from the Army Installation.

The Installer shall do all the excavating, including the excavation around the main line necessary to install saddles, corporation stops, tees, and valves.

ANY DAMAGE to the main will be repaired by Utility personnel and billed to the Installer.

The installer is responsible for protection of property and provisions of a safe excavation for connection. All excavations shall meet the requirements of Alaska Department of Labor and Federal OSHA Regulations. The installer shall furnish all necessary construction and safety equipment including shoring, de-watering pumps, excavation equipment, ladders, barricades and signs. The installer shall remove all standing and inflowing water from the excavation. Connections will not be made in cases of improper excavation, excessive groundwater, or other unsafe conditions.

#### 4.6 BACKFILL

Backfill service trench by hand a minimum of twelve (12") inches above the pipe and compact as necessary. Fill remainder by mechanical means and compact as necessary.

#### 4.7 COMPACTION REQUIREMENTS

Compaction in street right of ways must meet the requirements set forth by the designer.

Compaction beneath the Utility main and to a point twelve (12") inches above the main shall be 95% or greater.

#### 4.8 INSULATION

Insulation material shall be sprayed urethane foam; Resin Technology, 2045. Applicator shall demonstrate prior experience of at least two (2) years and the Utility shall be the sole judge of the qualifications of system, application method, and applicator.

For water and wastewater service lines with a four (4') foot or deeper bury, the minimum insulation thickness shall be three (3") inches on the top, sides and bottom.

For water and wastewater service lines shallower than four (4') feet, the minimum insulation thickness shall be four (4") inches on the top, sides, and bottom, including where water services rise vertically near an outside wall. Additional insulation will be required by the Utility for conditions such as shallow service lines installed under driveways and sidewalks, and vertical service lines.

Any hole cut in an outside concrete wall for service must be sprayed full of insulation. Penetrations through foundation walls should be foam filled with foam trimmed to a smooth wall line and coated with an elastomeric sealant.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

The Installer shall be responsible for re-insulating the main at the service connection.

### 4.9 SERVICE LINE PLACEMENT

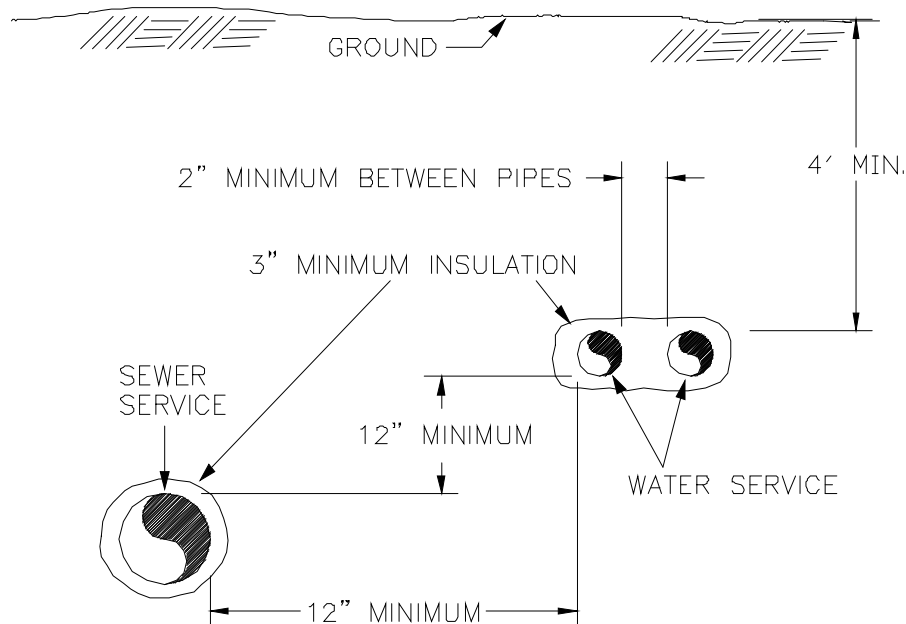
Water service piping shall be installed such that a two (2") inch minimum horizontal separation is provided between supply and return.

Buried piping shall be installed with a minimum four (4') foot soil cover.

The service line depth shall be increased (as per the designer) to provide protection against breakage or damage from heavy vehicles moving on the surface of the ground over or adjacent to such connections.

A minimum one (1') foot horizontal separation from wastewater services shall be provided. In addition, the bottom of the water service piping shall be installed at least twelve (12") inches above the top of the wastewater service piping. These separation distances are required by the Alaska Department of Environmental Conservation. The water service pipe shall be placed on a solid shelf excavated at one side of the common trench.

If the requirements of this section cannot be met, then it is necessary that the service lines be installed in two (2) separate trenches a minimum of ten (10) feet apart.



**FIGURE 1: BURIED SERVICE PIPE SEPARATION**

DESIGN AND CONSTRUCTION STANDARDS  
WATER & WASTEWATER UTILITY SYSTEMS

## 5.0 WATER SERVICE REQUIREMENTS

### 5.1 CORPORATION STOP SADDLE CONNECTION

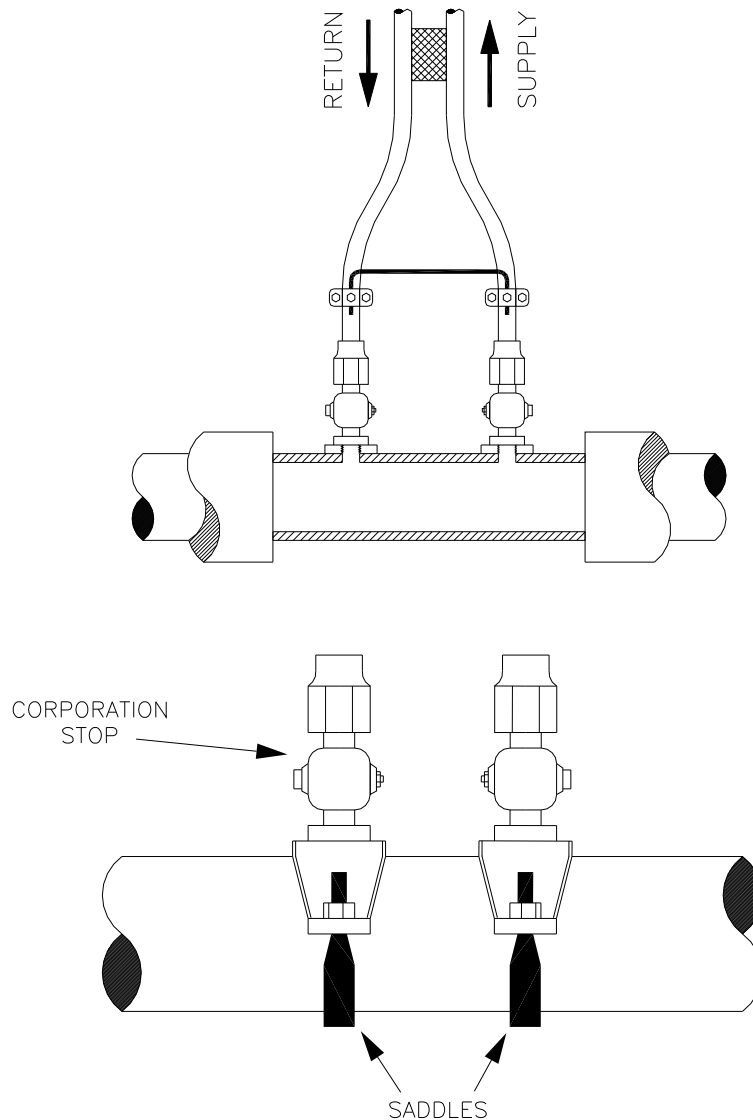


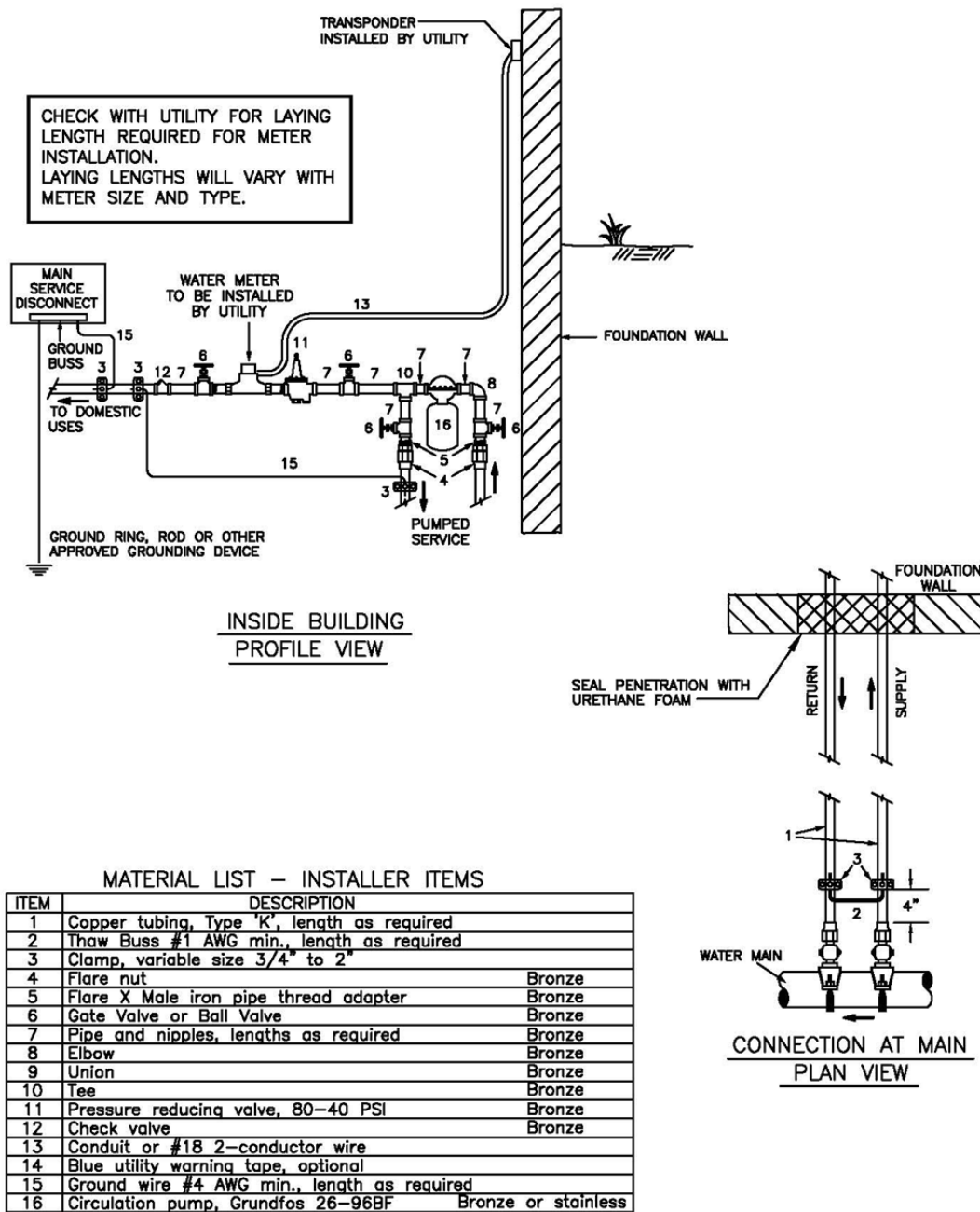
FIGURE 2: CORPORATION STOP CONNECTION

Corporation stops shall be installed for services three quarter (3/4") inch, one (1") inch, one and one-half (1-1/2") inch, and two (2") inch. Saddles and corporation stops are installed by the Utility at the time of connection. Three quarter (3/4") inch saddles are standard for most residential and small commercial services. See Figure 3 for typical water service. Note that in instances where the water main is circulated, pit orifices will be installed in the place of corporation stops.



# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS



### NOTES:

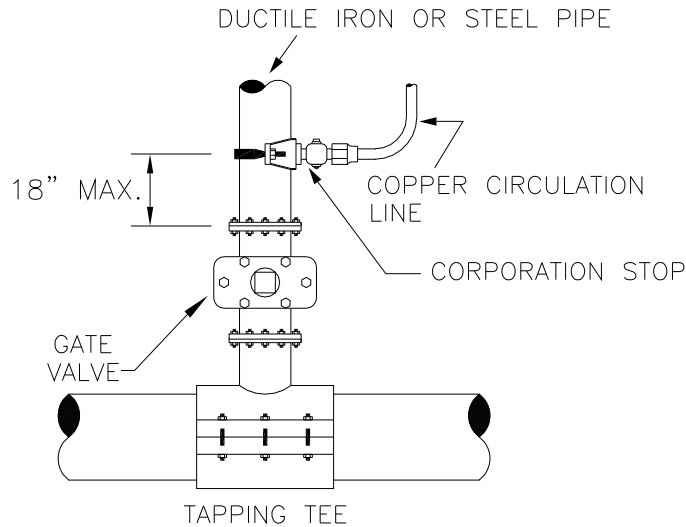
1. All fittings shall be bronze threaded.
2. All tubing shall be type 'K' copper (soft). 3/4", 1", or 1-1/2".
3. Blue utility tape (item 14) may be placed 2' above water service piping for the full length of the service.
4. Water service piping shall be positive grade or level (no humps or dips) from water main to residence.
5. Meter shall be a minimum of 1' and a maximum of 4' above floor level.

FIGURE 3: CIRCULATING LOOP WATER SERVICE

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

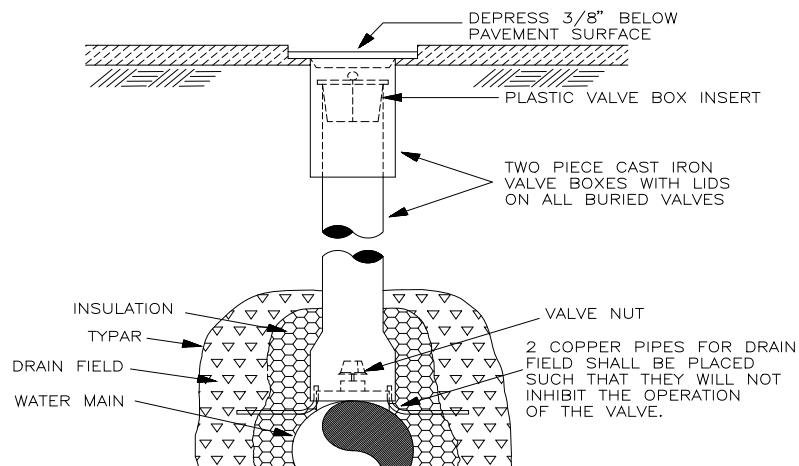
### 5.2 TEE CONNECTIONS



**FIGURE 4:TEE CONNECTION**

Where customer design requires a connection larger than two (2") inches; tees and gate valves are used. Utility personnel will install the tee and gate valve. The gate valve will be a minimum of six (6") inches. Installer will be responsible for providing reducers if the service is to be less than six (6") inches. Gate valve end connection will normally be mechanical joint. Other configurations are available based on customer's requirements. Contact DU for further information. See Figure 6 for typical large service.

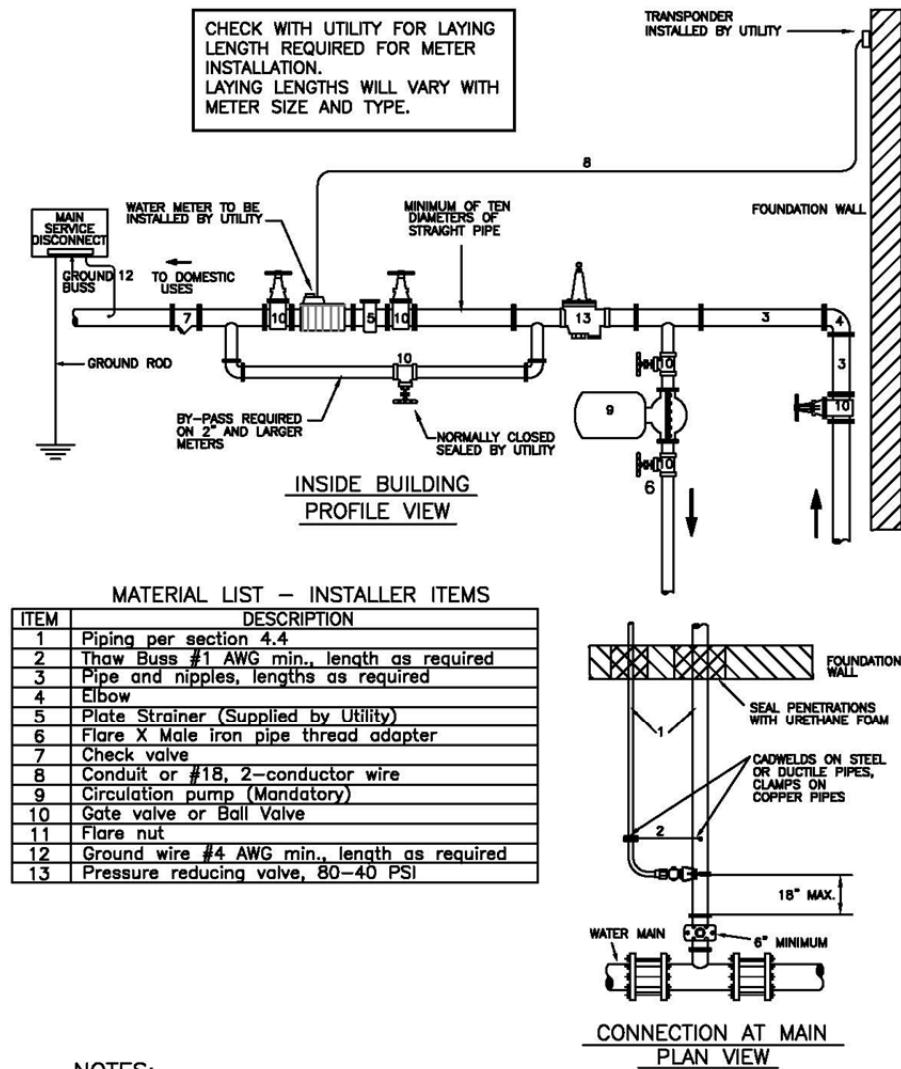
Valve boxes including risers and/or collars provided by the Utility for access to Utility service valves shall be placed on valves by the installer in conjunction with backfill and street repair. Valve boxes shall be plumb, straight, and clean prior to acceptance by the Utility. Assistance with final adjustment of valve box tops will be provided upon 24-hour notification of the Utility.



**FIGURE 5:VALVE BOX/TRENCH ADAPTER**

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS



### NOTES:

1. Water service pipes shall have a level or positive grade from the water main to the building (no humps or dips) to prevent air traps.
2. Sealed by-pass required on 2" and larger meters.
3. Meter shall be a minimum of 1' and a maximum of 4' above floor level.
4. Install circulation pump according to manufacturer's recommendations.

FIGURE 6: CIRCULATING LOOP FOR 2 INCH AND LARGER WATER SERVICE

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

#### 5.3 MATERIAL STANDARDS

Type "K" soft drawn copper for sizes three-quarters (3/4") of an inch, one (1") inch, one and one-half (1-1/2") inch and two (2") inch. Any joints in the service loop below ground shall employ brass flare type connections. **No compression type unions shall be used.**

Ductile iron pipe is preferred for pipe sizes four (4") inch, six (6") inch and eight (8") inch. Ductile iron pipe shall conform to the latest revision of AWWA C151. Joints may be push on (Tyton), or mechanical joint. Joints shall conform to AWWA C111. Ductile iron pipe shall be thickness Class 50, cement mortar lined.

Steel pipe (Schedule 40) is allowed for sizes two (2") inch, three (3") inch, four (4") inch, six (6") inch, and eight (8") inch. **Threaded or galvanized pipe is not permitted.** Pipe shall be butt welded or connected with dresser type couplings with appropriate restraints.

All pipe and fittings shall meet the requirements of the National Sanitation Foundation (NSF) 61.

#### 5.4 PIPE FITTINGS

All fittings on the circulating loop shall be threaded bronze or brass material. Soldered joints are not permitted in the circulation loop. Soldered joints are permitted only in the domestic branch after the check valve. Brass flared fittings shall be used below ground to join copper tubing on long runs.

Ductile iron pipe fittings shall conform to AWWA C153.

Steel pipe systems shall utilize flanged valves and welded or threaded fittings above ground. Threaded joints are not permitted below ground.

Flanged connections for underground piping runs and underground fittings are not acceptable except for valves.

All piping two (2") inch and larger that is not welded shall be restrained by use of anchors, restraining rods and/or thrust blocks wherever necessary.

Non-toxic thread sealant is required for all threaded joints on the service loop. Threaded pipe below ground is not authorized. **Solder joints shall not be used between the Utility water main and the check valve.** Water service lines shall be sloped to the main and installed as straight as possible (except for angle points).

Lead free solder is required in the domestic piping.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

#### 5.5 CIRCULATING LOOP AND WATER METER

Circulating water services are not required at Fort Richardson, provided other means of frost protection such as insulation and burial depth are provided. Elsewhere, the circulating loop and meter shall be located in a warm, accessible area and remain so during the life of the service.

The plumbing must be installed in such a manner that will allow the meter to be installed horizontally with the register upward.

The meter will be installed during the first inspection. The Utility requires that all the components of the water service be present at the time Utility personnel arrive on site to connect the service to the water main and to do the first inspection. If all of the components, such as the PRV, check valve, and service loop are not present and complete, Utility personnel will not install the saddles and will reschedule the appointment for a later time. If all of the components are present and complete, Utility personnel will install the saddles, the water meter, and do the first inspection.

The size of meter is determined prior to installation of the service. Meter size will normally be the same as service size unless otherwise specified. Customer/installer shall leave the correct space (dimension) for Utility personnel to install the meter. Check with the Utility for laying length required for meter installation. Laying length will vary with meter size and type.

Services two (2") and larger shall have a by-pass line around the meter for meter maintenance work.

The meter shall be a minimum of one (1') and a maximum of four (4') above floor level.

#### 5.6 SHUT-OFF VALVE

A gate valve or ball valve must be installed between the meter and the check valve for customer use. The customer shall not use the valves on the circulating loop. These valves are to remain open for proper circulation in the service lines. Closing one of these valves could cause the service to freeze during winter months.

#### 5.7 CIRCULATING PUMP

Circulation pumps are not required at Fort Richardson, provided other means of frost protection, such as insulation and burial depth are provided. Elsewhere, customer is responsible for providing a circulation pump. Pump shall be installed downstream of the supply valve, and upstream of the tee for the domestic branch. Pump shall be sized to provide a minimum flow velocity of 0.1 feet per second in the largest pipe or ten (10) gallons per minute, whichever is larger.

Circulation pumps shall conform to the following requirements:

- a) All services one hundred (100') feet or less in length (one way):
  - Horsepower: 1/12 HP
  - Maximum flow at zero head: 30 GPM
  - Maximum head at zero flow: 20 feet

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

Grundfos UPS 26-64 BF or equal  
Rated for 150 PSI

b) All household services between one hundred (100') feet and five hundred (500') feet in length (one way):

Horsepower: 1/12 HP  
Maximum flow at zero head: 25 GPM  
Maximum head at zero flow: 30 feet  
Grundfos UPS 26-96 BF or equal  
Rated for 150 PSI

c) All commercial services between one hundred (100') feet and five hundred (500') feet in length (one way):

Horsepower: 1/6 HP  
Maximum flow at zero head: 45 GPM  
Maximum head at zero flow: 25 feet  
Grundfos UPS 43-75 BR or equal  
Rated for 150 PSI

d) Any service which services more than one structure and is over five hundred (500') feet in length shall utilize a pumping system that is designed with consideration given to pump load requirements, circulation path, and heat balance. Calculated thermal degradation shall be limited to two (2° F) degrees Fahrenheit over the entire distance through the service piping. A circulation plan is required.

The private circulating pump shall have a bronze or stainless steel body.

## 5.8 FIRE SPRINKLER SYSTEMS

Refer to Figure 7 for specific elements to be included in fire protection system underground piping.

An approved double check valve assembly shall be installed in the sprinkler line, to prevent reintroduction of aged fire-line water into the customer's domestic water branch or into the Utility's system.

The installation of a fire booster pump is prohibited on the DU water systems without advance written approval from the Utility.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

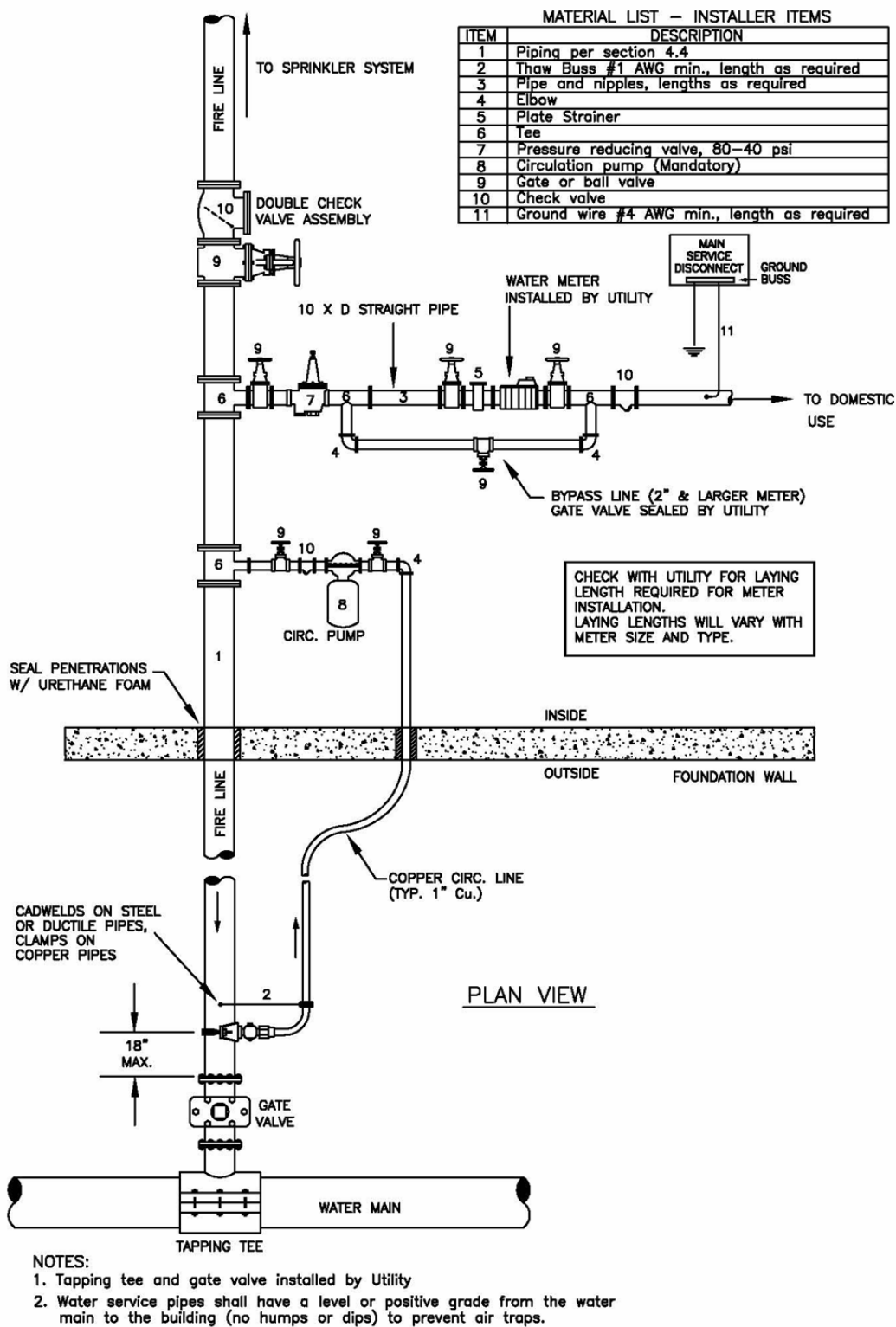


FIGURE 7: CIRCULATING WATER SERVICE WITH FIRE PROTECTION

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

#### 5.9 FIRE HYDRANTS (IF REQUIRED ON A SPRINKLER FIRE MAIN)

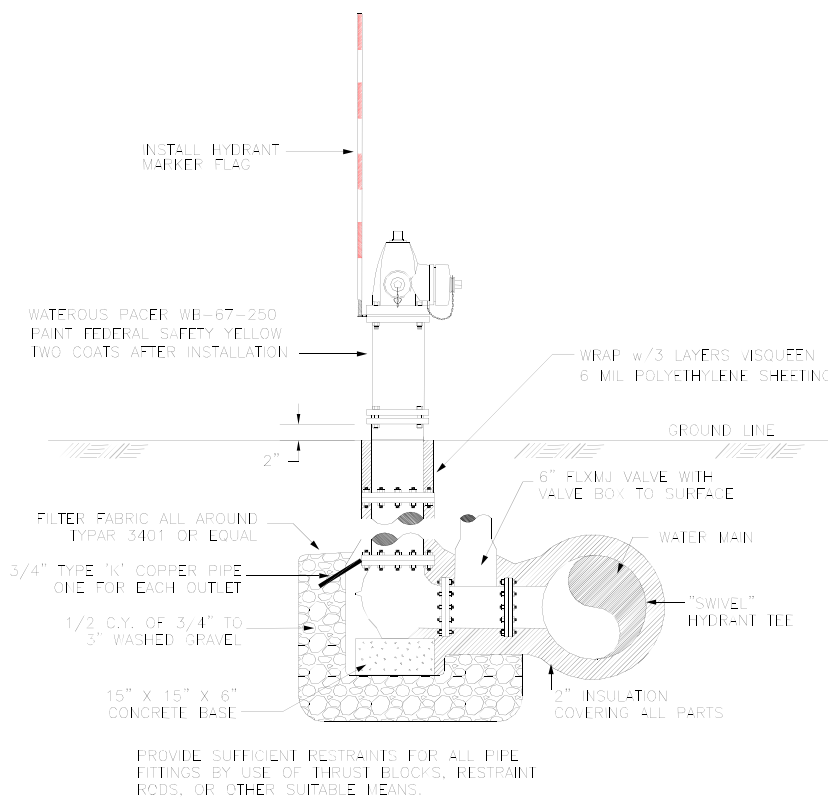
Fire hydrants shall be designed and installed in accordance with the following:

Hydrants shall be Waterous Pacer WB-67-250 or approved equal.

The hydrant shall be installed as a part of the building water system and shall be protected from freezing by the building circulation pump.

Install a hydrant marker flag, fifty-four (54") inches minimum length, Nordic Flexi Flag.

Each hydrant and guard post shall be painted with two coats of Federal Safety Yellow (M4182) industrial enamel.



**FIGURE 8: FIRE HYDRANT**

#### 5.10 COMMISSIONING

All piping shall be hydrostatically tested, disinfected, and flushed. The installer shall furnish all temporary hose, pipes, pumps, and fittings required to accomplish this work.

**Pressure Testing:** Services shall be tested at main line pressure upon energizing the service. All pipe and fittings shall be free of any drips or leaks during visual inspection. Leak-down tests are required for pipe runs of over one hundred-fifty (150') feet, and shall be conducted in accordance with the current



# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

test procedure as published in the DU Standards of Construction. See NFPA 13 and 24 for the applicable leakage rates for fire supply piping. Fire system test pressure shall be two hundred (200) psi for two (2) hours. The Utility owned valves shall only be operated by Utility personnel.

Disinfection: Disinfection of service lines over two (2") inches in diameter shall be with a chlorine solution which shall be of sufficient strength (300 PPM) to provide a contact kill of bacteria and shall remain in contact with all inside surfaces of the piping for three (3) hours. Upon completing disinfection, the chlorinated water shall be flushed to a safe location and disposed of properly. One half (1/2) cup of Clorox bleach in five (5) gallons of water is approximately a 300 PPM solution.

Flushing: Upon connection of the installed pipe to the Utility mains, the pipes shall be full bore flushed. Flushed water shall be conveyed to a safe location away from the excavation. The flushing shall be sufficient to remove all debris and disinfectant solution.

### 5.11 CROSS CONNECTIONS

Cross connections to other sources of water or interconnection to other services are expressly prohibited. Any connection that can allow entry of untreated water or contaminated water into the Utility distribution system is forbidden. Backflow prevention devices may be required by the Utility in which case they will be provided and maintained by the customer at the customer's expense.

### 5.12 INSPECTION

The Utility shall exercise the power of inspection in conjunction with the connection and construction of the service piping and installation of the water meter.

Utility personnel shall examine the piping lengths; the methods used to connect the lengths, and shall verify proper installation of isolation valves, couplings and unions prior to connection to the Utility water mains. Immediately following connection, Utility personnel shall install the thaw bus.

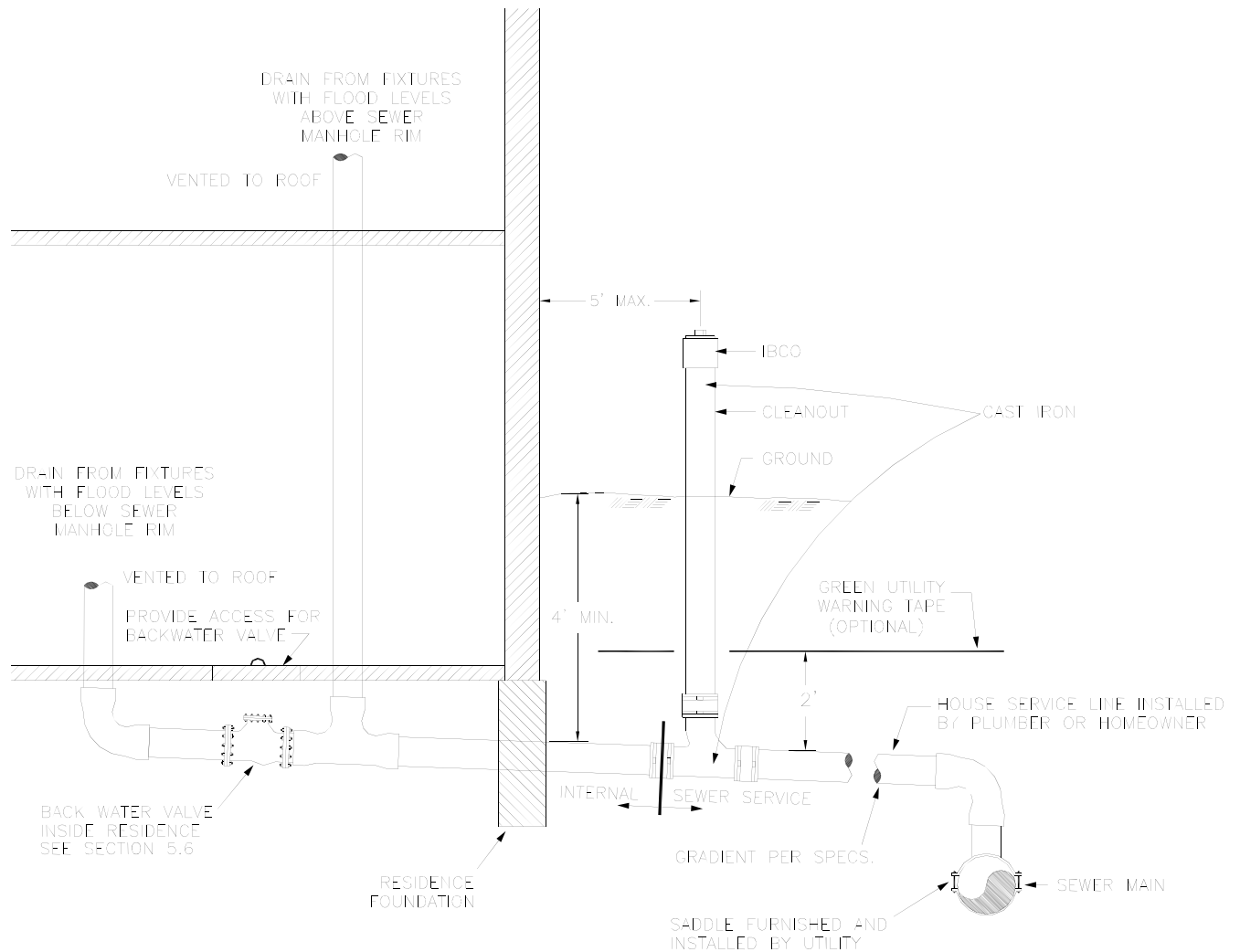
The Utility personnel shall inspect the pipe insulation prior to backfilling. They shall also inspect the service piping indoors prior to installation of the meter. This inspection shall cover all piping from the loop isolation valves to the domestic piping system.

The meter will be installed during the first inspection. The Utility requires that all the components of the water service be present at the time Utility personnel arrive on site to connect the service to the water main and to do the first inspection. If all of the components, such as the PRV, check valve, and service loop are not present and complete, utility personnel will not install the saddles and will reschedule the appointment for a later time. If all of the components are present and complete, utility personnel will install the saddles, the water meter, and do the first inspection.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### 6.0 WASTEWATER SERVICE REQUIREMENTS



**FIGURE 9: WASTEWATER SERVICE ELEVATION VIEW**

#### 6.1 CONNECTION

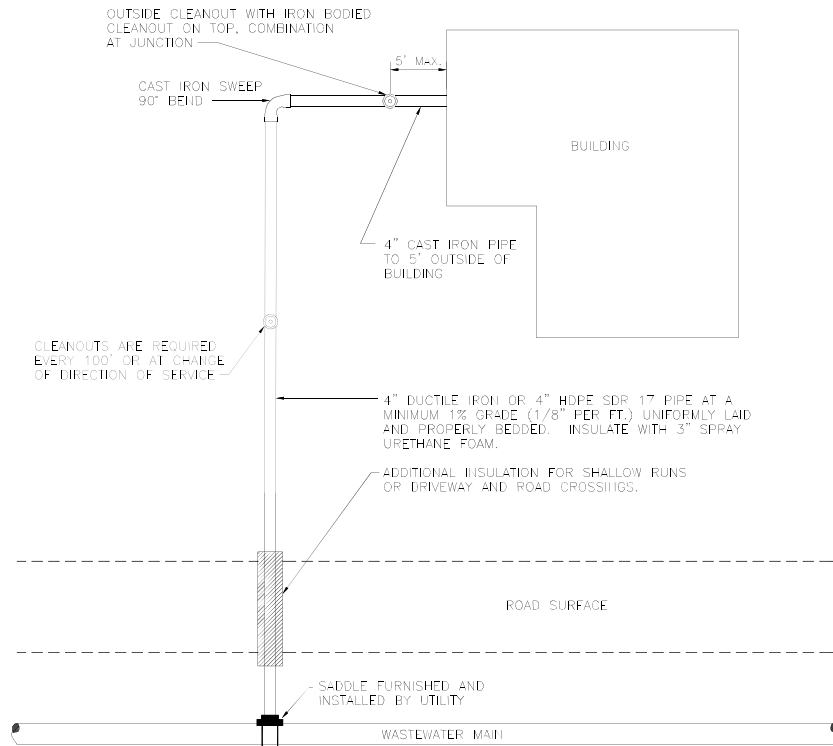
A number of connection alternatives are acceptable depending upon the type of saddle, riser, fitting(s), and service line. The Utility will furnish and install the saddle connection to the main. All other work and material shall be provided by the installer.

All wastewater service piping shall be ductile iron, or high-density polyethylene pipe. Wastewater service begins with the cleanout. Piping from the building to the cleanout is considered internal plumbing.

The building's wastewater service connection will be in compliance with Figures 9 and 10 and 11.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS



**FIGURE 10: WASTEWATER SERVICE PLAN VIEW**

## 6.2 MATERIAL STANDARDS

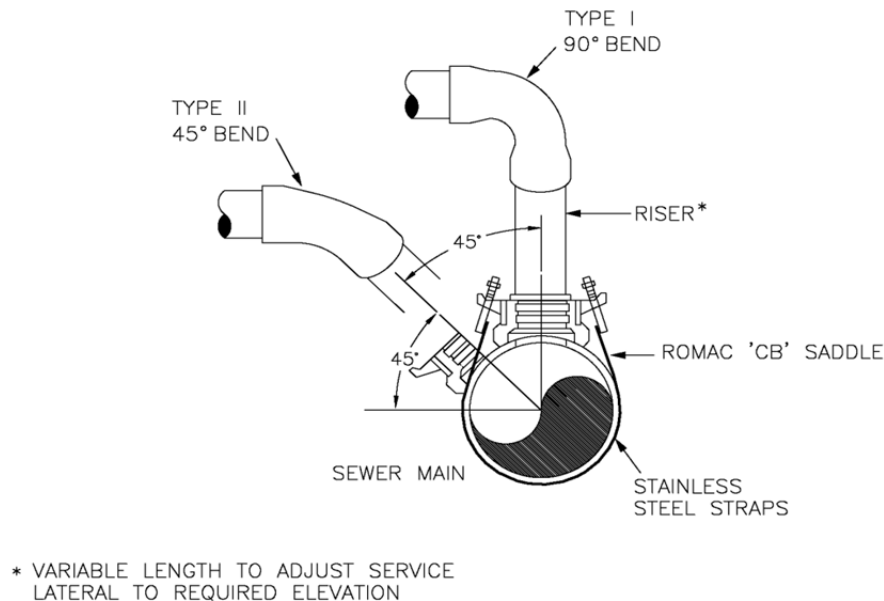
Ductile iron pipe shall conform to AWWA C-151 and shall be a minimum thickness class fifty (50). Ductile iron pipe shall be cement mortar lined. Cast iron pipe is not acceptable.

High density polyethylene pipe shall be made from P.E. 3408 resin with a Cell Classification of 345434C in accordance with ASTM 3350-83 and shall conform to standard iron pipe size outside dimensions (IPS) having a wall thickness with a standard dimensional ratio (SDR) of 17.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

### 6.3 SERVICE REQUIREMENTS



**FIGURE 11: WASTEWATER CONNECTION AT MAIN**

Wastewater service connections shall be cut or bored into wastewater mains. The Utility claims sole jurisdiction for the tapping of Utility mains and installation of wastewater service saddles and connections. All wastewater saddles, both new installations and upon replacement of a service line, shall be attached to the top of the main (Type I) as illustrated in Figure 11. Type II connections require Utility approval at the time of application. It is imperative that the installer verifies the wastewater main elevation and the wastewater service elevation/slope prior to the installation of the wastewater service piping.

The wastewater service line shall be run in practical alignment and at a uniform slope of not less than one-quarter ( $1/4''$ ) inch per foot toward the point of disposal. Where it is impractical, due to the depth of the street wastewater main or to structure features to obtain a slope of one-quarter ( $1/4''$ ) inch per foot, any such pipe four (4") inches or larger may have a slope of not less than one-eighth ( $1/8''$ ) inch per foot.

The wastewater service line shall not be laid through any existing cesspool or septic tank unless such cesspool or septic tank has been excavated, backfilled, and compacted.

Wastewater service line piping shall be laid on a firm bed of approved materials that have been properly compacted throughout its entire length.

Wastewater service lines constructed of HDPE pipe must use pipe that is pre-insulated in a factory setting with a minimum of three (3") inches of urethane spray foam insulation. Insulation shall be rigid closed cell, two (2) component, urethane foam and be applied by an experienced applicator.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

Wastewater services that are insulated in the trench shall be laid to grade and blocked every five (5') feet so that there are no sags and the bottom of the pipe is at least three (3") inches above the bottom of the trench. This is necessary to ensure adequate insulation on the bottom of the service pipe.

Fittings shall consist of the following:

No-Hub cast iron fittings for HDPE pipe (HDPE fittings are not allowed).

Ductile iron fittings for ductile iron pipe.

Persons seeking approval of materials that are not specifically mentioned as being approved in this document must do so prior to installation.

High-density polyethylene pipe shall be installed with gas tight and water tight, non-fusion joints. The connection of HDPE to HDPE pipe or HDPE pipe to a No-Hub fitting shall be a flexible coupling, such as Mission Rubber Company XL 56-44 ARC Flex-Seal Coupling for four (4") inch diameter piping. Any substitute must be approved by the Utility in writing, prior to installation. The Utility does not allow the use of standard no hub clamps from the building stub out to the wastewater main. Butt welding of HDPE pipe joints is not allowed. The Fernco Coupling 1056-44RCXL is an acceptable substitute. As an alternative, pipe connections may be made with an all stainless steel, full circle clamp coupling with neoprene gasket as a Rockwell No. 256, Romac style SS1.

When connecting wastewater service pipe having different outside diameters, an all stainless steel, full circle clamp coupling as described above shall be used and the smaller outside diameter pipe shall be built up with three (3") inch wide neoprene gasket material to match inside diameter.

## 6.4 CLEANOUTS

Wastewater clean-outs will be installed using a "No Hub" cast iron wye and one eighth (1/8) bend, or combination and a vertical cast iron pipe riser with iron bodied clean out cap, not less than four (4") inch in diameter.

A clean out shall be placed in every service line no farther than five (5') feet outside the building and at intervals not to exceed one hundred (100') feet, in straight runs.

Changes in alignment or grade in excess of forty five (45) degrees in a building wastewater shall be served by a clean out.

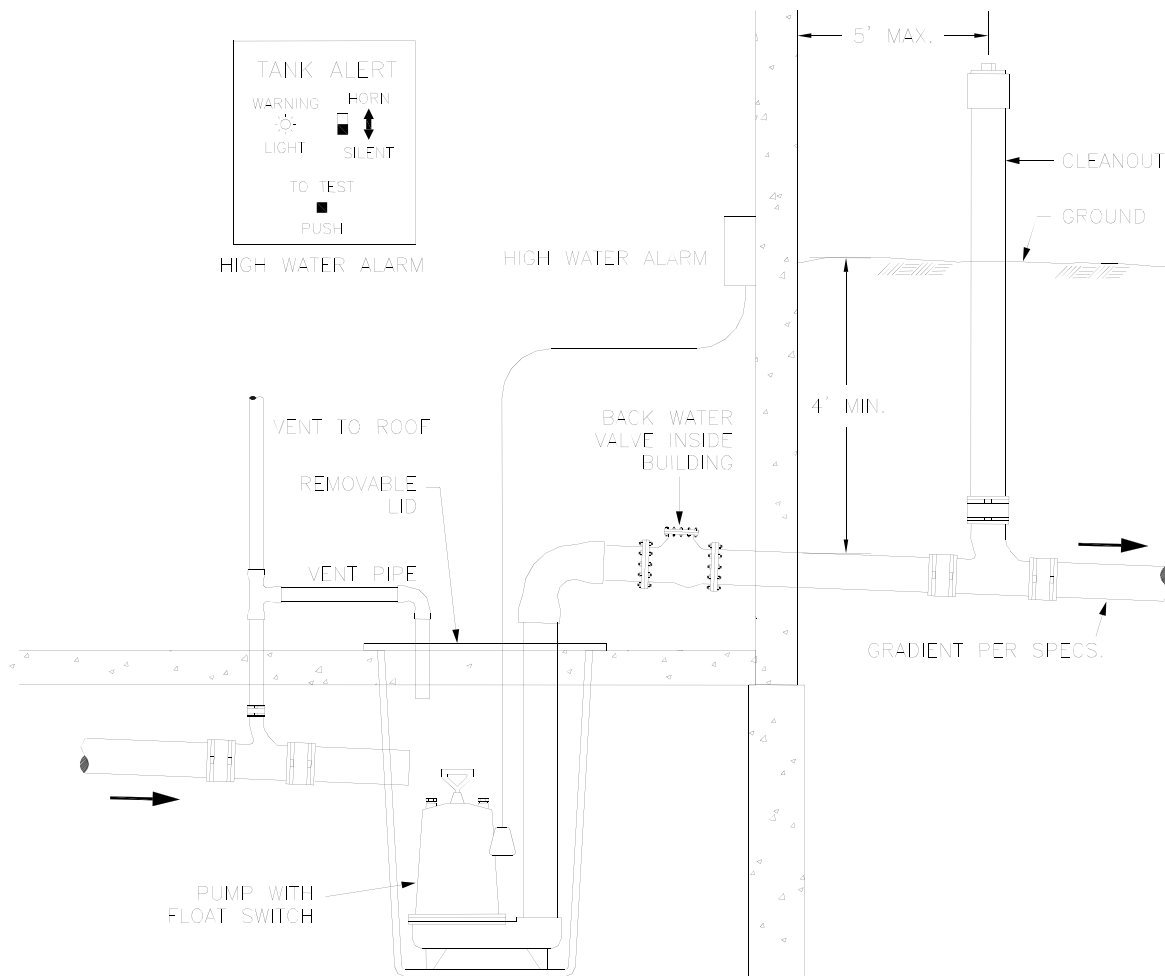
## 6.5 BACKWATER VALVES

The installer shall provide a backwater valve approved by the Utility (as shown in Figure 12 designed to prevent the flow of wastewater from Utility mains into the structure for that part of the wastewater service that is connected to fixtures with flood level rims located below the elevation of the nearest upstream manhole cover of the Utility wastewater system as required by Section 710 of the Uniform Plumbing Code.

# DESIGN AND CONSTRUCTION STANDARDS

## WATER & WASTEWATER UTILITY SYSTEMS

Backwater valves shall be located where they will be accessible for inspection and repair at all times, and unless continuously exposed shall be enclosed in a watertight pit, fitted with an adequately sized removable cover.



**FIGURE 12: WASTEWATER SERVICE LIFT STATION**

## 6.6 LIFT STATIONS

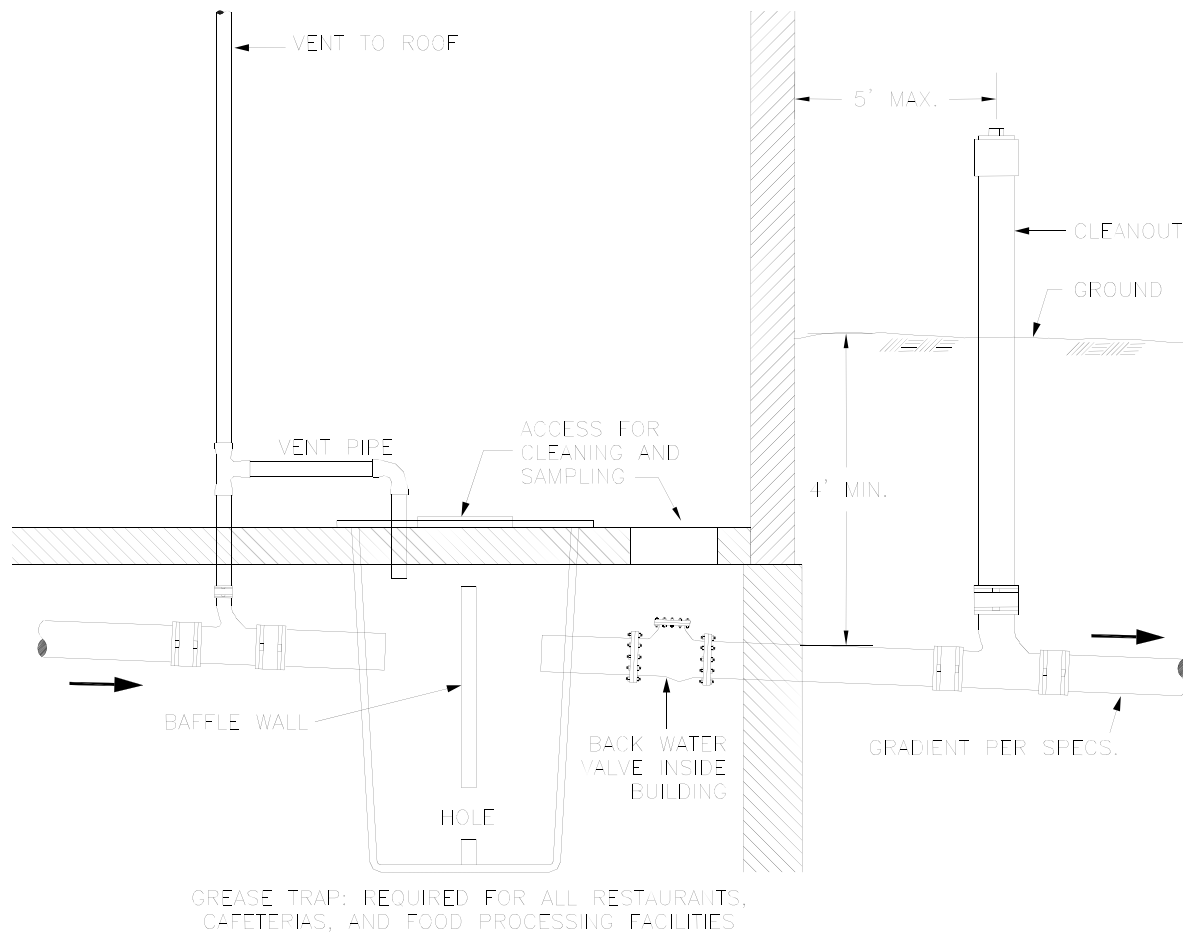
Occasionally, the location and distance of the facility to be served by the Utility is such that gravity drainage is not possible along the entire length of the wastewater service. The installer shall, at the direction of the Utility, install a suitable lift station to provide the necessary pumping capacity to meet the volume, elevation, and distance requirements of the wastewater service. Basic requirements and features of lift stations are as shown in Figure 12, and as described by the Uniform Plumbing Code.

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

The lift station shall feature a tank, a suitable pump with motor starting control, a level switch, an access plate for maintenance of the tank, and alarm switch contacts for high water level.

The installer shall furnish an alarm light and audible alarm to be activated on high water level switch closure.



**FIGURE 13: WASTEWATER INTERCEPTOR TANK**

## 6.7 PRE-TREATMENT

The Utility has established a federally required Industrial Pre-treatment Program. All solid or liquid wastes which are prohibited, by ordinance or tariff, from being discharged into the Utility wastewater system shall be removed from the waste stream or pre-treated prior to final discharge. The type of pre-treatment device or system will be determined by the designer and approved by the Utility.

### A. GREASE TRAPS/INTERCEPTORS

The customer will furnish and maintain a grease trap/interceptor to trap animal and vegetable based greases and oils. Final acceptance of such a device is subject to approval by the Utility. All commercial

## DESIGN AND CONSTRUCTION STANDARDS

### WATER & WASTEWATER UTILITY SYSTEMS

kitchens and other food processing facilities shall be equipped with such a device. Further applicability and information on this requirement can be obtained from the Utility. See Figure 13.

#### B. SAND TRAPS AND OIL/WATER SEPARATORS

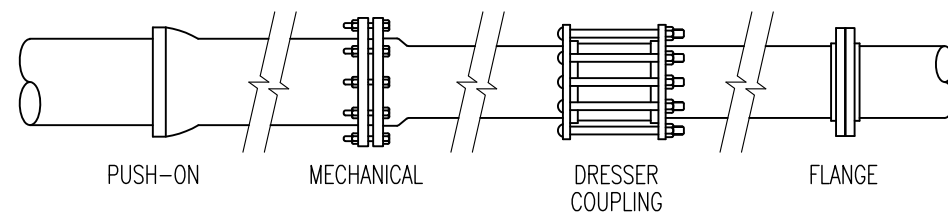
The customer will furnish and maintain an approved sand trap designed to collect sand, dirt, silt and gravel from vehicle washing facilities or those facilities of similar purpose. As determined by the Utility, the customer will furnish and maintain an approved oil/water separator designed to collect petroleum or mineral based oils and greases. Those facilities requiring an oil/water separator include, but are not limited to, those performing vehicle maintenance and vehicle washing. Specific discharge limits and applicability of such pre-treatment devices shall be determined by the Utility.

#### C. DISPOSAL

The sludges, grease, oils, silt, grit or sand collected in the pre-treatment devices shall not be disposed in the wastewater main. The waste material must be disposed in a safe and acceptable manner in accordance with the Environmental Protection Agency and Alaska Department of Environmental Conservation regulations, or any other applicable regulations.

END

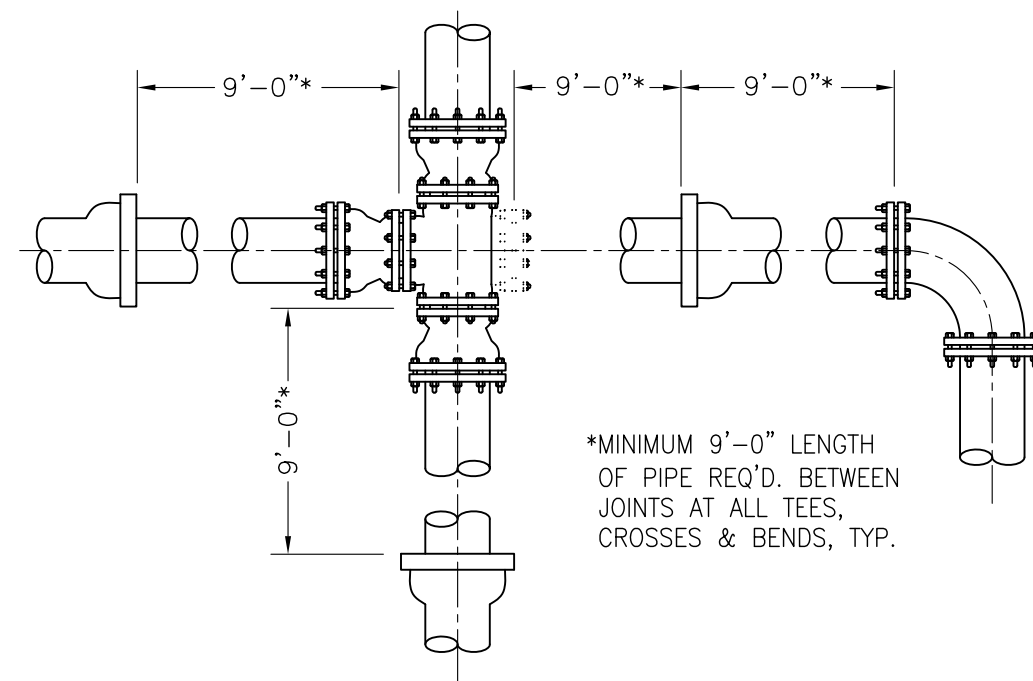




NOTE: WATER MAINS AND SERVICE LATERALS SHALL BE INSULATED WITH A MINIMUM OF 3" OF URETHANE

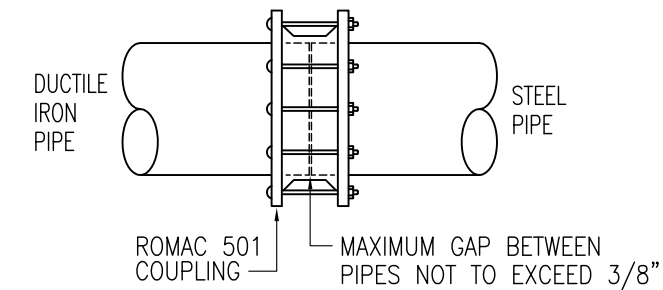
## WATER PIPE JOINTS 1

WDS-101



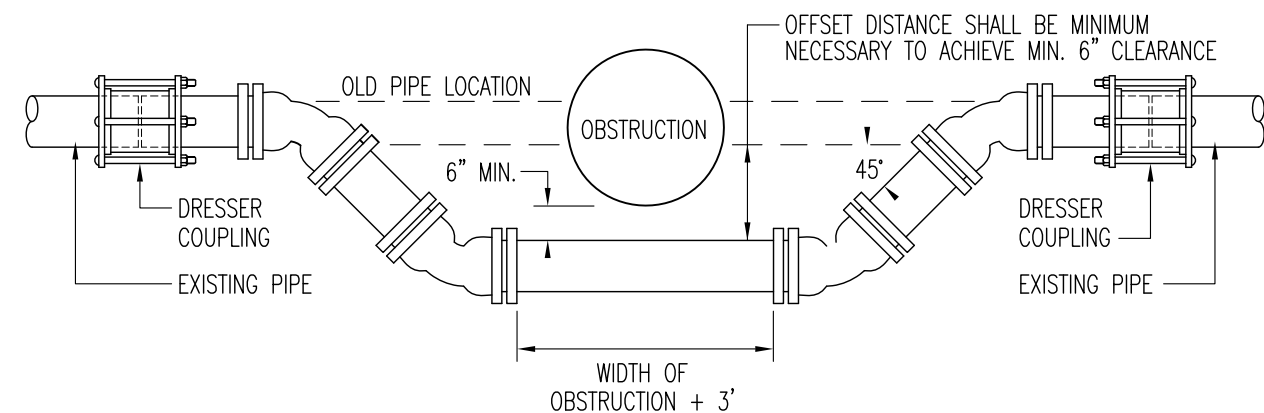
## PIPE LENGTHS REQUIRED AT TEES AND ELBOWS 2

WDS-101



## ADAPTION - STEEL TO DUCTILE IRON PIPE 4

WDS-101



## TYPICAL RELOCATION DETAIL 3

WDS-101

### NOTES:

1. OFFSET DISTANCE SHALL BE MINIMUM NECESSARY TO ACHIEVE MINIMUM CLEARANCE.
2. ALL JOINTS SHALL BE RESTRAINED AS NECESSARY.
3. PROVIDE CONCRETE THRUST BLOCKS OR THRUST RODS BASED ON WATER PRESSURE, SOIL CONDITIONS AND DOYON UTILITIES STANDARDS.
4. PROVIDE TRACER WIRE FOR CONNECTION TO NEW/EXISTING WIRE.
5. FOR DIRECT BURIED PIPING REPAIR SEE DRAWING WDS-113.

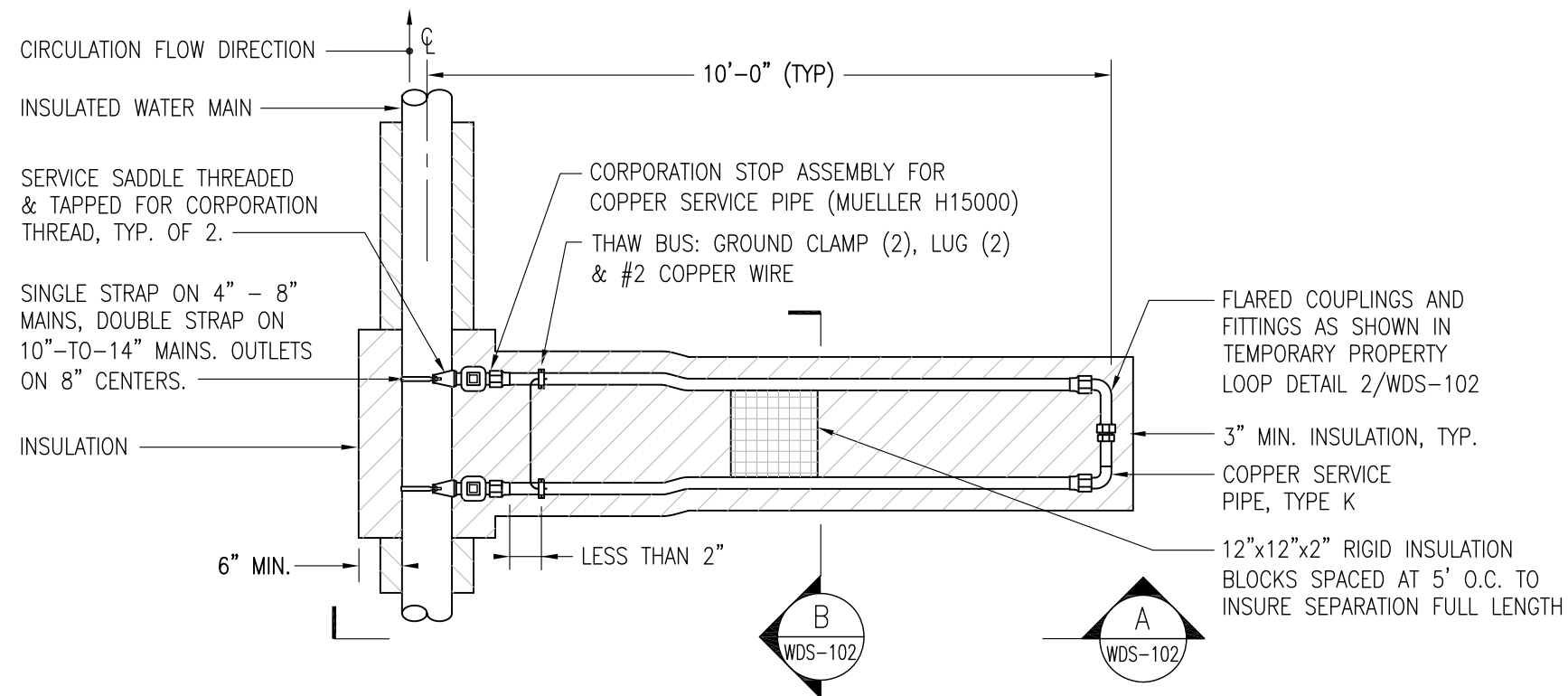


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Date: 30 APR 2010  
Scale: NONE  
Designed By: CDH  
Drawn By: MMC/GSF  
Checked By: NEM

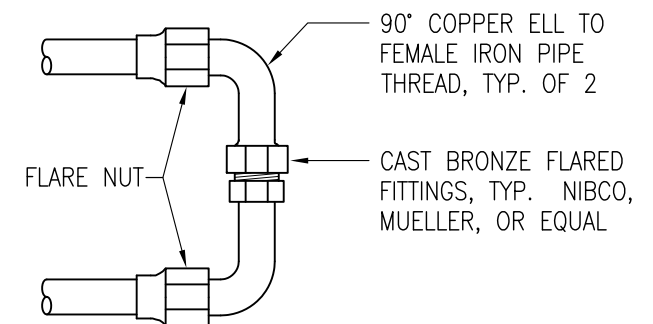
**PIPING JOINTS AND OFFSETS**  
**DESIGN & CONSTRUCTION STANDARDS**  
**DIRECT BURY WATER DISTRIBUTION SYSTEM**

Drawing No.  
**WDS-101**  
Previous: UES-DD-W101  
14 FEB 2010



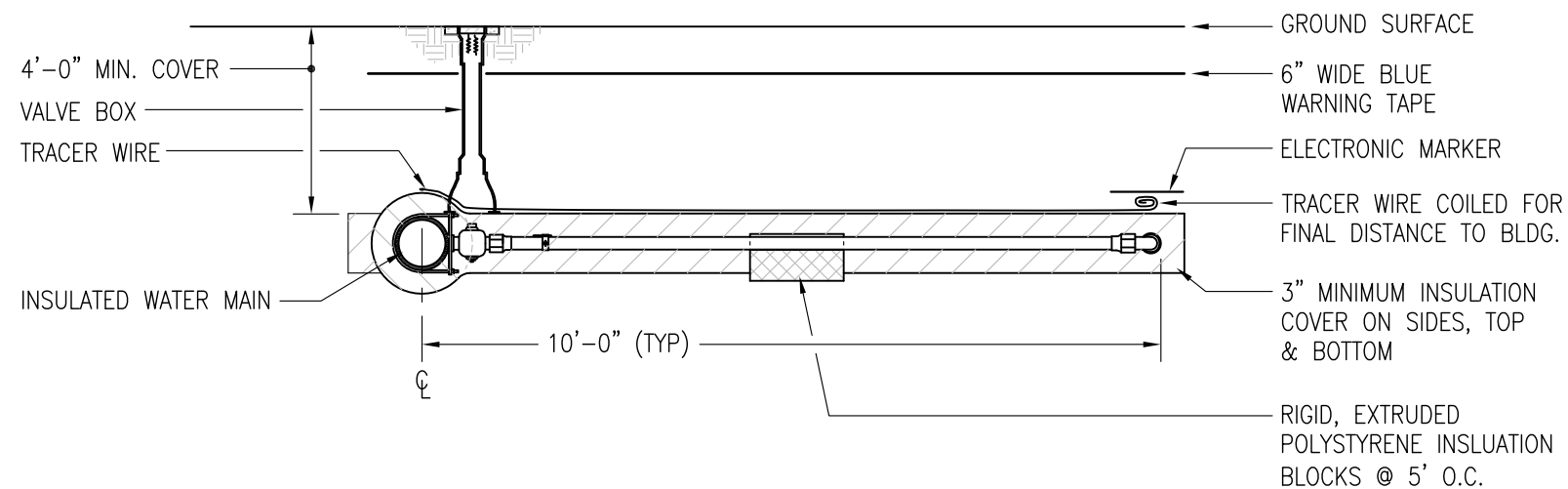
TEMPORARY DOMESTIC WATER SERVICE - PLAN

1  
WDS-102

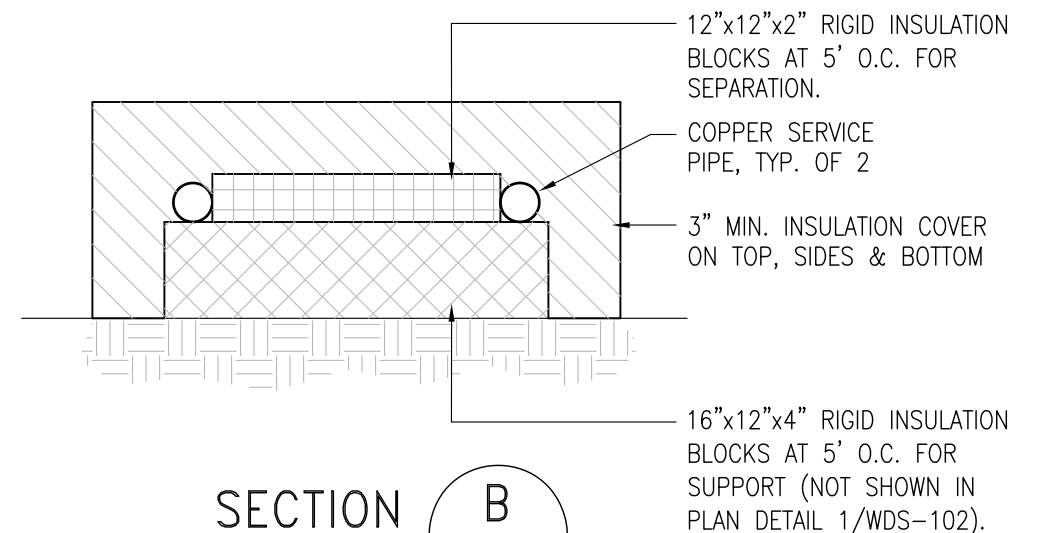


TEMPORARY PROPERTY LOOP DETAIL

2  
WDS-102



SECTION A



SECTION B

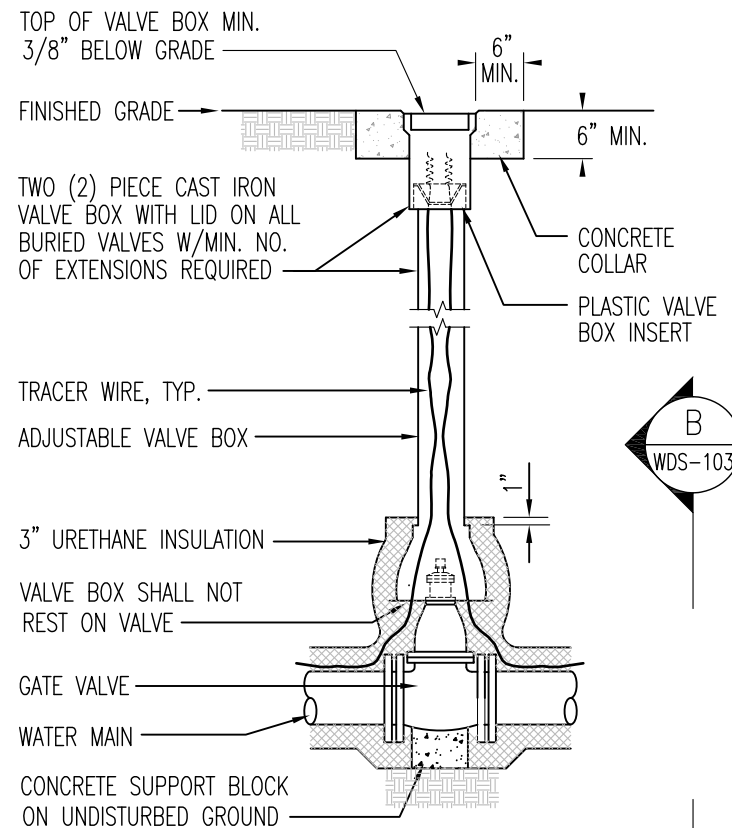


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Date: 30 APR 2010  
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Drawn By: DLW/GSF  
Checked By: NEM

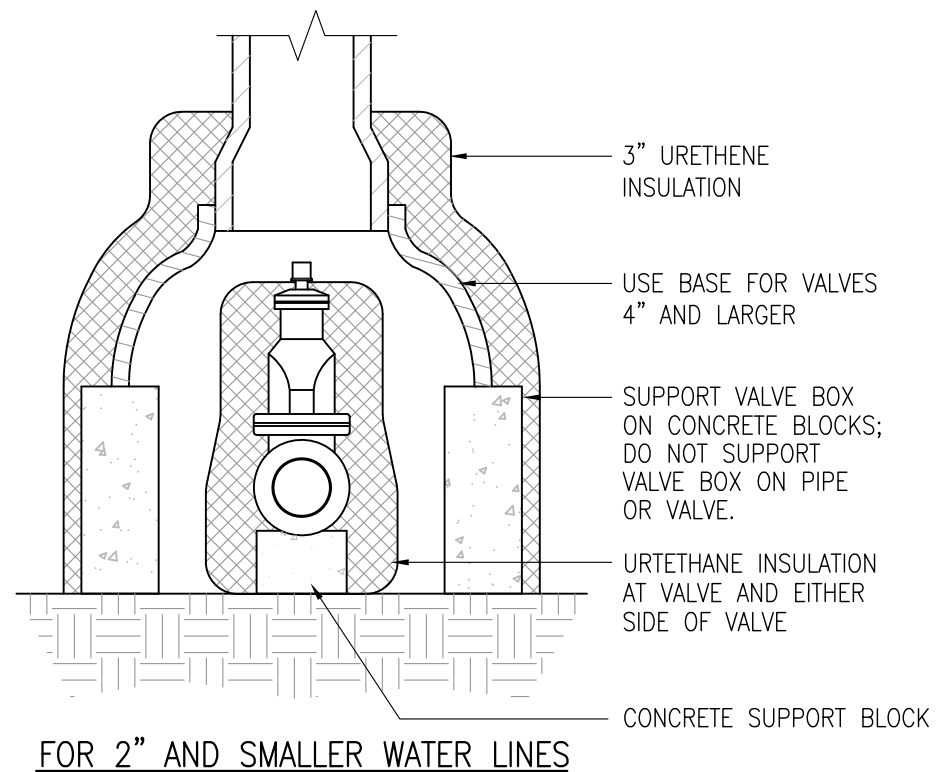
TEMPORARY DOMESTIC WATER SERVICE  
DESIGN & CONSTRUCTION STANDARDS  
DIRECT BURY WATER DISTRIBUTION SYSTEM

Drawing No.  
**WDS-102**  
Previous: UES-DD-W102  
14 FEB 2010



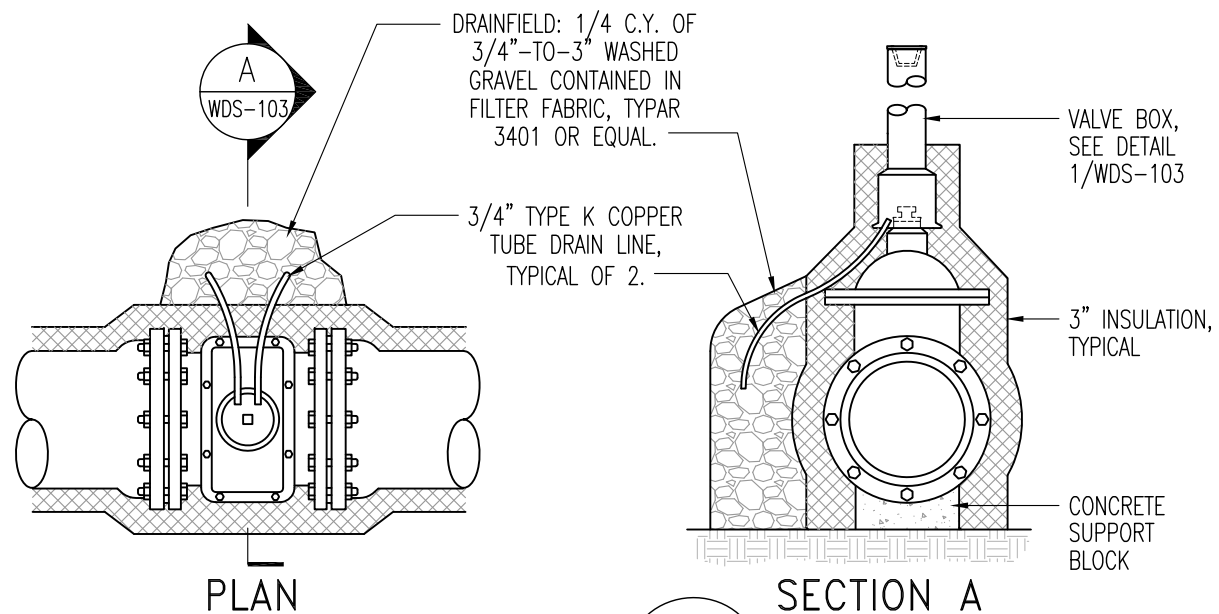
VALVE BOX DETAIL

1  
WDS-103



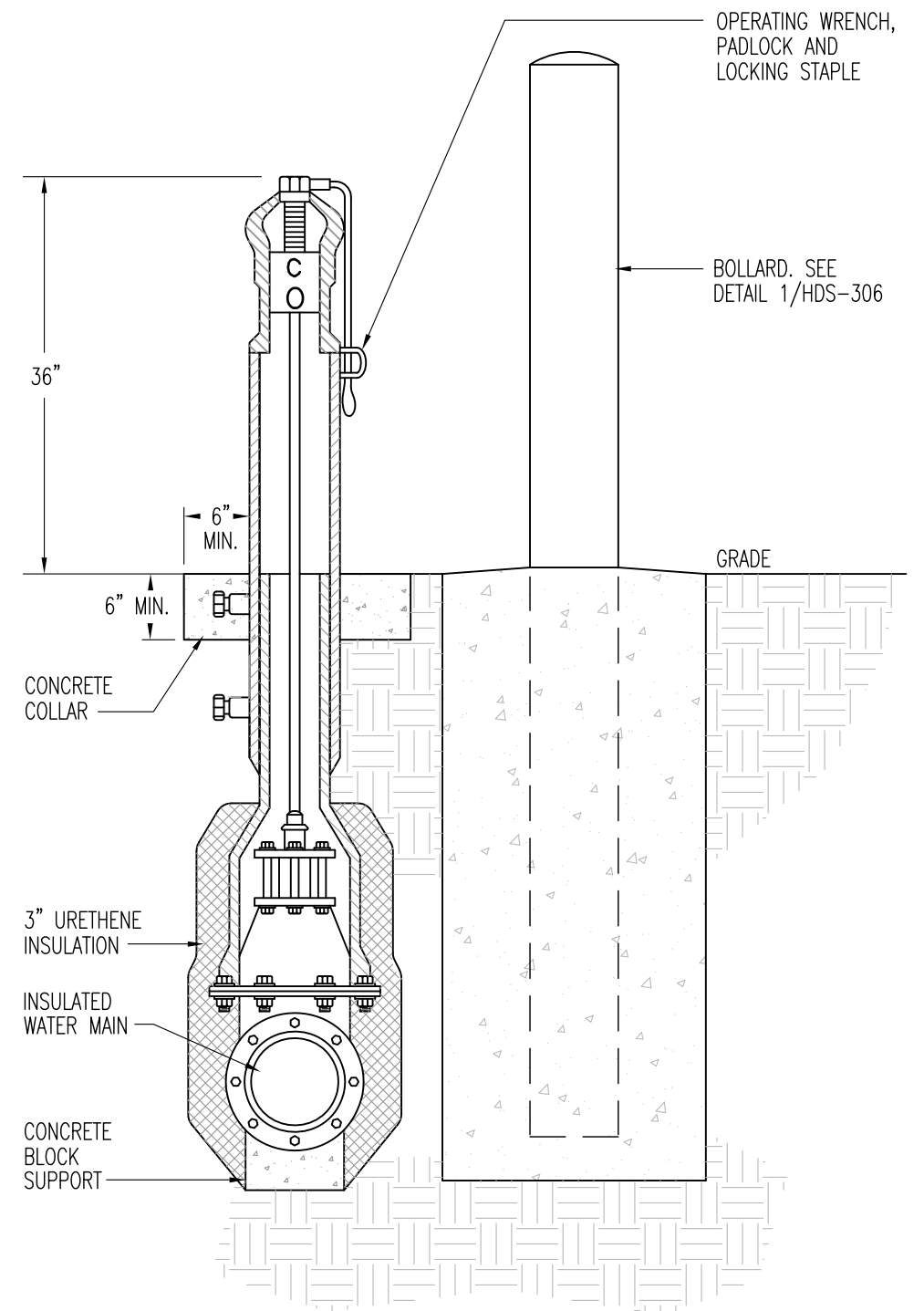
VALVE BOX SUPPRT SECTION

B  
WDS-103



GATE VALE

3  
WDS-103



GATE VALVE WITH POST INDICATOR

2  
WDS-103

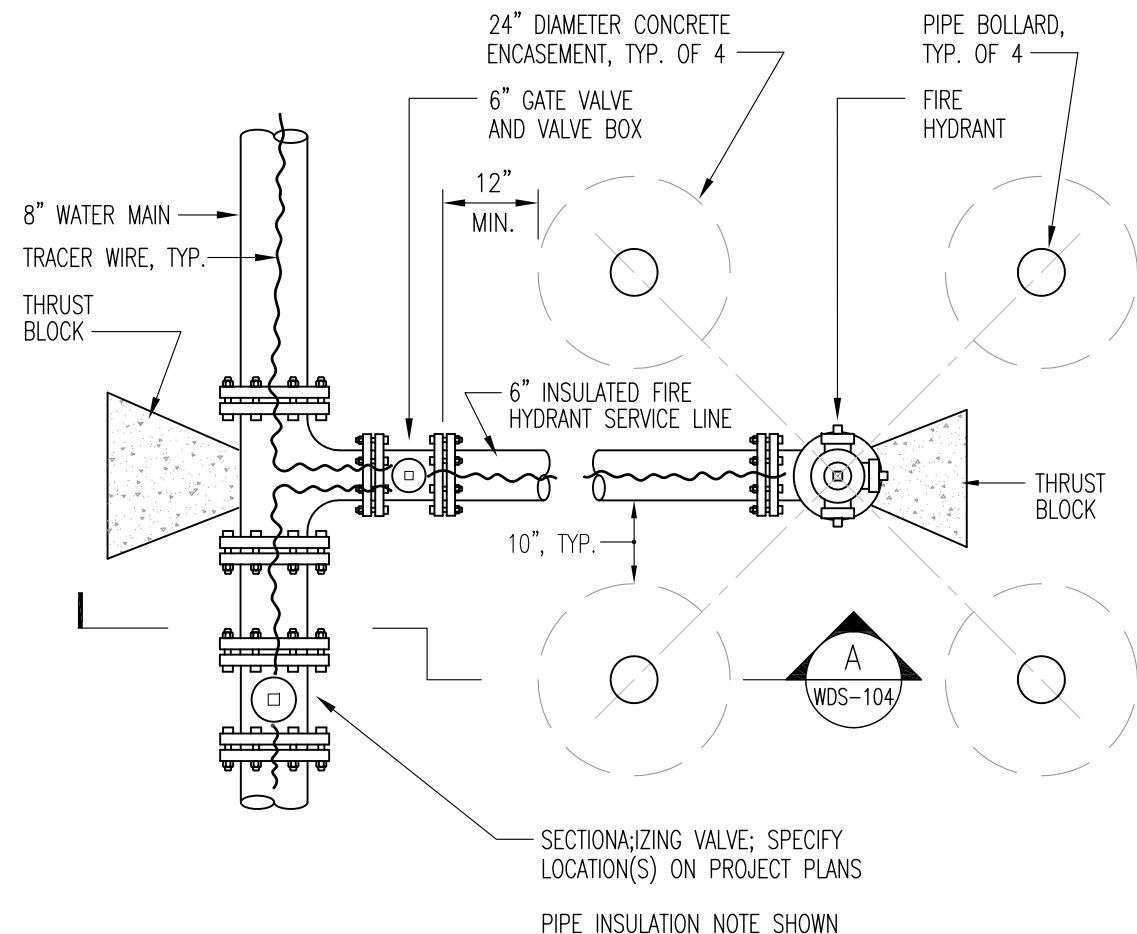


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Date: 30 APR 2010  
Scale: NONE  
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Drawn By: MMC/GSF  
Checked By: NEM

VALVE DETAILS AND SECTIONS  
DESIGN & CONSTRUCTION STANDARDS  
DIRECT BURY WATER DISTRIBUTION SYSTEM

Drawing No.  
**WDS-103**  
Previous: UES-DD-W103  
17 SEPT 2010

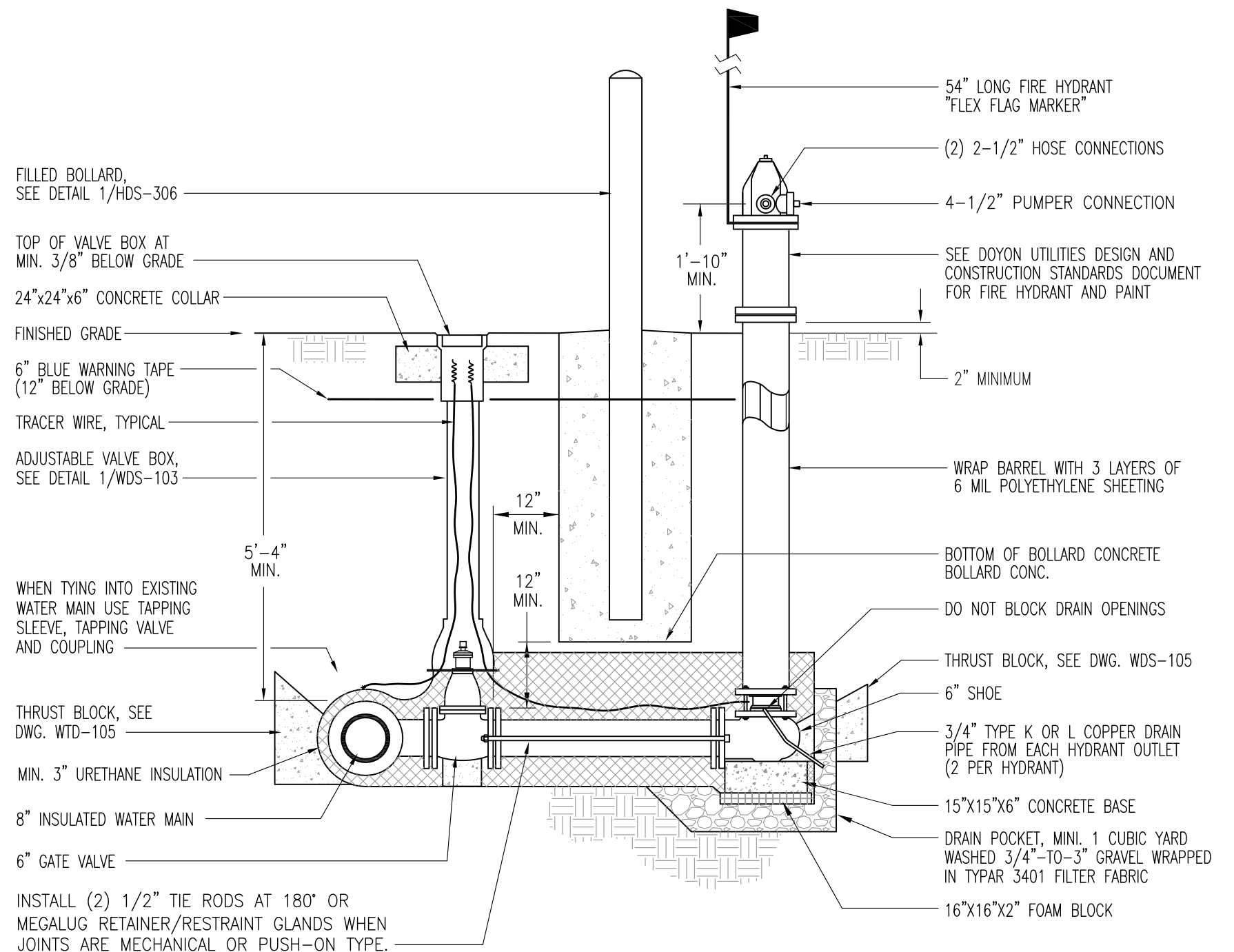


SINGLE PUMPER "L" BASE  
FIRE HYDRANT ASSEMBLY – PLAN

1  
WDS-104

NOTES:

1. A BREAKAWAY FLANGE IS REQUIRED ON FIRE HYDRANT BASE FLANGE. (SHOE)
2. FIRE HYDRANT LOCATIONS AS SPECIFIED ON PLAN SHEETS.
3. EXCAVATION SHALL CONFORM TO O.S.H.A. STANDARDS.
4. ALL FIRE HYDRANTS SHALL BE PLUMB.



SINGLE PUMPER "L" BASE  
FIRE HYDRANT ASSEMBLY – SECTION

A  
WDS-104

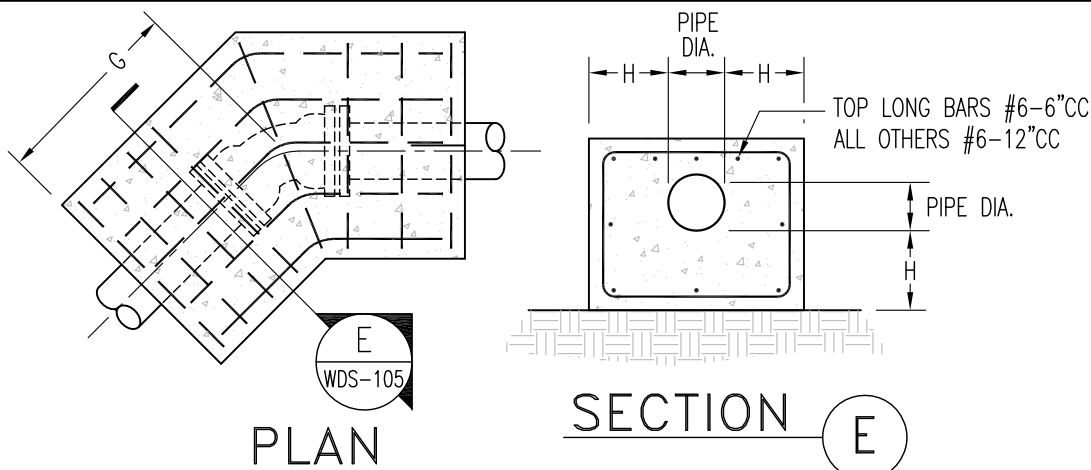
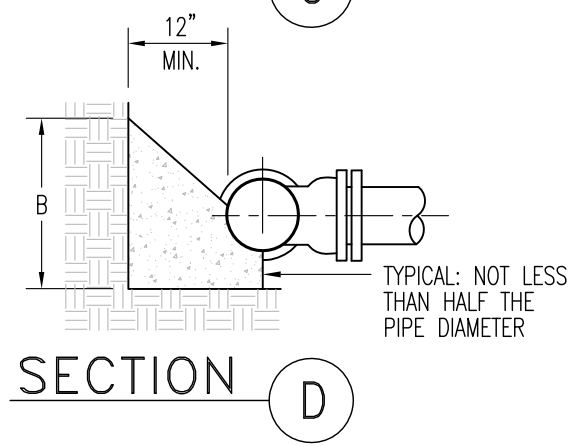
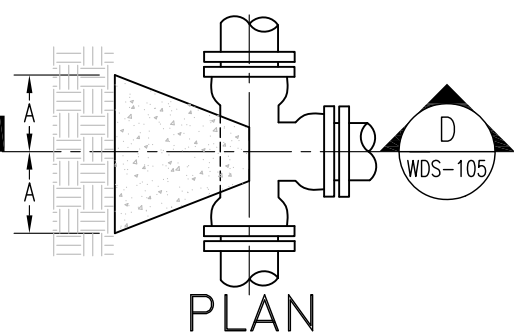
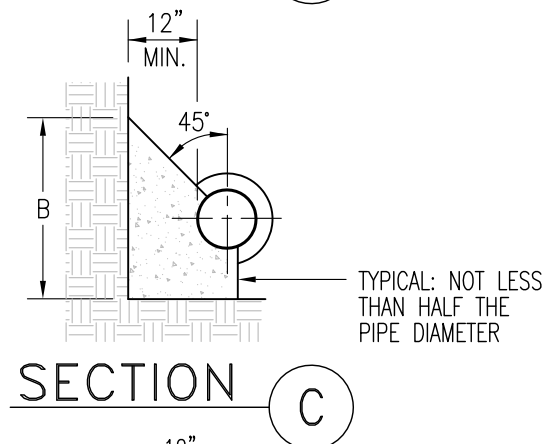
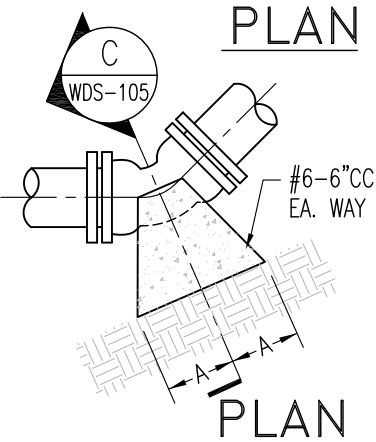
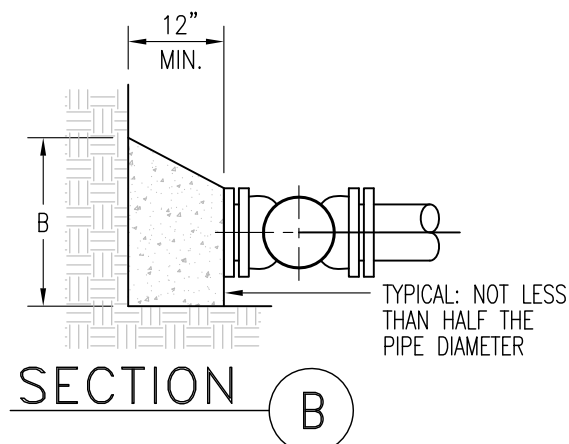
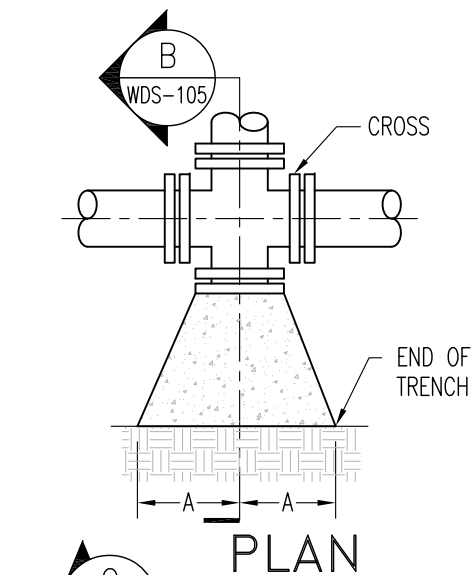
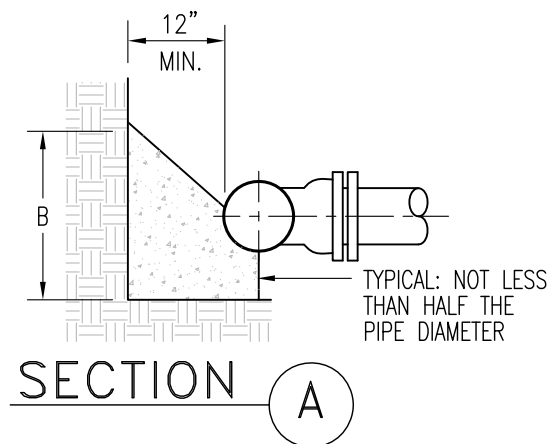
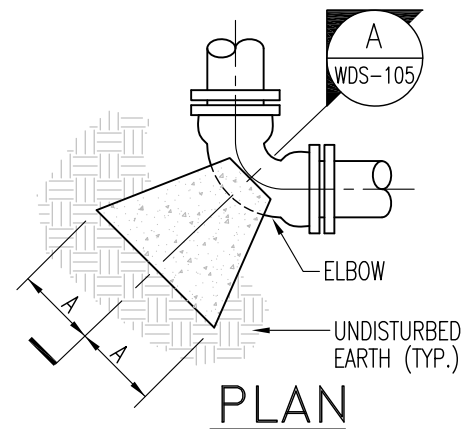


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Drawn By: MMC/GSF  
Checked By: NEM

**FIRE HYDRANT PLAN AND DETAILS**  
**DESIGN & CONSTRUCTION STANDARDS**  
**DIRECT BURY WATER DISTRIBUTION SYSTEM**

Drawing No.  
**WDS-104**  
Previous: UES-DD-W104  
14 FEB 2010



## CHANGE IN ELEVATION

GRAVITY THRUST BLOCK

| HORIZONTAL THRUST BLOCKS |           |     |           |     |               |     |      |     |       |     |                               |
|--------------------------|-----------|-----|-----------|-----|---------------|-----|------|-----|-------|-----|-------------------------------|
| SIZE                     | 90° BENDS |     | 45° BENDS |     | 22-1/2° BENDS |     | TEES |     | PLUGS |     | BEARING BLOCK AREA IN SQ. FT. |
|                          | A         | B   | A         | B   | A             | B   | A    | B   | C     | B   |                               |
| 4"                       | 12"       | 24" | 10"       | 22" | 6"            | 20" | 12"  | 24" | 12"   | 24" | 3.8                           |
| 6"                       | 16"       | 10" | 9"        | 10" | 6"            | 8"  | 10"  | 12" | 10"   | 21" | 7.9                           |
| 8"                       | 22"       | 13" | 12"       | 13" | 8"            | 10" | 13"  | 16" | 12"   | 29" | 13.6                          |
| 10"                      | 26"       | 17" | 14"       | 17" | 10"           | 13" | 16"  | 20" | 14"   | 36" | 20.5                          |
| 12"                      | 29"       | 21" | 16"       | 21" | 11"           | 16" | 18"  | 24" | 16"   | 41" | 29.0                          |
| 14"                      | 35"       | 24" | 19"       | 24" | 12"           | 20" | 22"  | 27" | 18"   | 48" | 39.0                          |
| 16"                      | 38"       | 27" | 21"       | 27" | 12"           | 24" | 24"  | 30" | 20"   | 54" | 50.4                          |

THRUST BLOCK ORIENTATION SHALL BE SUCH THAT THE CENTER OF THE FITTING CORRESPONDS WITH THE CENTER OF THE THRUST BLOCK.

THE MINIMUM ALLOWABLE ANGLE (EITHER VERTICAL OR HORIZONTAL) SHALL BE 45 DEGREES.

**EXAMPLE:**  
USING TABLE, FIND THE HORIZONTAL BEARING BLOCK AREA FOR A 6 IN. DIAMETER, 45 DEGREE BEND WITH AN INTERNAL PRESSURE OF 150 PSI. THE SOIL BEARING STRENGTH IS 3,000 LB PER SQ. FT., AND THE SAFETY FACTOR IS 1.5.

FROM THE TABLE, THE REQUIRED BEARING BLOCK AREA FOR A 6 IN. DIAMETER, 90 DEGREE BEND WITH AN INTERNAL PRESSURE OF 100 PSI AND A SOIL HORIZONTAL BEARING STRENGTH OF 1,000 PSI IS 7.9 PER SQ. FT.

FOR OUR PROBLEM:

$$\text{AREA} = \frac{7.9 \text{ FT}^2 \times (0.414) \times \left(\frac{150}{100}\right)}{\left(\frac{3,000}{1,000}\right)} = 1.64 \text{ FT}^2$$

## CHANGE OF ELEVATION THRUST BLOCKS

| SIZE | DEGREE BEND | G   | H   | SIZE | DEGREE BEND | G   | H   |
|------|-------------|-----|-----|------|-------------|-----|-----|
| 4"   | 11-1/4      | 12" | 9"  | 8"   | 11-1/4      | 18" | 9"  |
|      | 22-1/2      | 18" | 9"  |      | 22-1/2      | 30" | 12" |
|      | 45          | 24" | 12" |      | 45          | 60" | 12" |
| 6"   | 11-1/4      | 18" | 9"  | 10"  | 11-1/4      | 24" | 9"  |
|      | 22-1/2      | 24" | 9"  |      | 22-1/2      | 36" |     |
|      | 45          | 36" | 12" |      | 45          | 84" |     |

THE HORIZONTAL DIMENSION (G) OF THE BEARING AREA SHALL BE BETWEEN 1.0 AND 2.0 TIMES THE VERTICAL DIMENSION (H).  
(  $H \leq G \leq 2H$  )

THE VERTICAL DIMENSION (H) OF THE BEARING AREA SHALL BE EQUAL TO ONE-HALF THE TOTAL DEPTH (H) TO THE BOTTOM OF THE THRUST BLOCK BUT NOT LESS THAN THE OUTSIDE DIAMETER OF THE FITTING ( $D_o < H \leq H/2$ ).

## NOTES:

- THRUST BLOCK DESIGN CRITERIA IS BASED ON 100 PSI SYSTEM PRESSURE WITH 1,000 LB. PER SQ. FT. SOIL BEARING STRENGTH. A SAFETY FACTOR OF 1.5, AND DUCTILE-IRON PIPE OUTSIDE DIAMETERS.
- PLACE 4 MIL. POLYETHYLENE BETWEEN CONCRETE AND FITTING (CONCRETE SHALL NOT INTERFERE WITH JOINT).
- MINIMUM CONCRETE THICKNESS SHALL BE 12 INCHES.
- BEARING BLOCK AREA VALUES LISTED BASED ON 90 DEGREE HORIZONTAL BEND.
  - FOR OTHER HORIZONTAL BENDS , MULTIPLY BY THE FOLLOWING COEFFICIENTS:  
45 DEGREE: 0.414; 22-1/2° DEGREE: 0.199 11-1/4 DEGREE: 0.098.
  - FOR OTHER INTERNAL PRESSURES, MULTIPLY BY RATIO TO 100 PSI
  - FOR OTHER SOIL HORIZONTAL BEARING STRENGTHS, DIVIDE BY RATIO TO 1,000 LB. PER SQ. FT.
  - FOR OTHER SAFETY FACTORS, MULTIPLY BY RATIO TO 1.5.
- PIPE INSULATION NOT SHOWN.

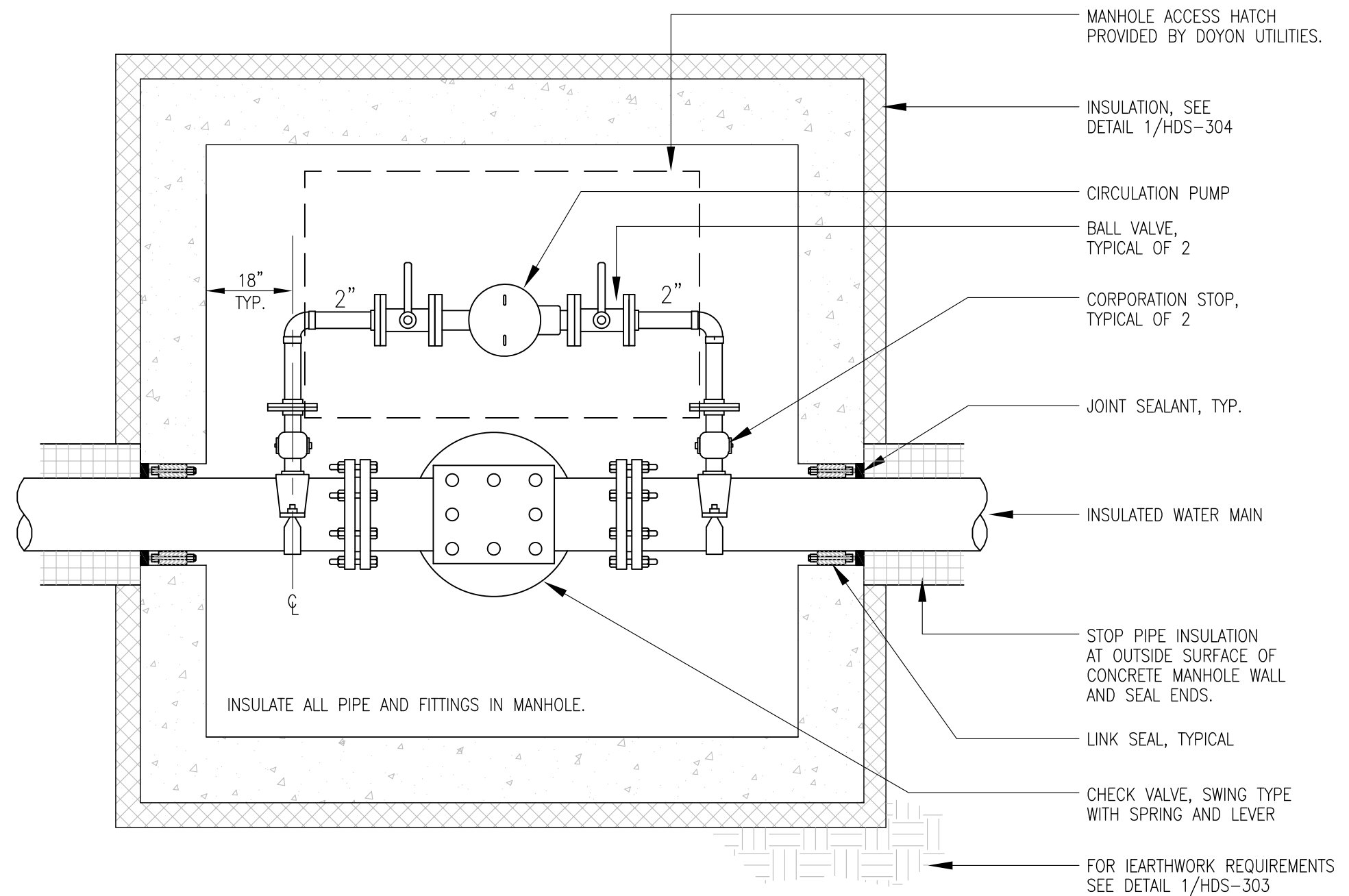


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**THRUST BLOCK DETAILS**  
**DESIGN & CONSTRUCTION STANDARDS**  
**DIRECT BURY WATER DISTRIBUTION SYSTEM**

Drawing No.  
**WDS-105**  
Previous: UES-DD-W105  
14 FEB 2010



WATER CIRCULATION PUMP MANHOLE DETAIL

1

WDS-106



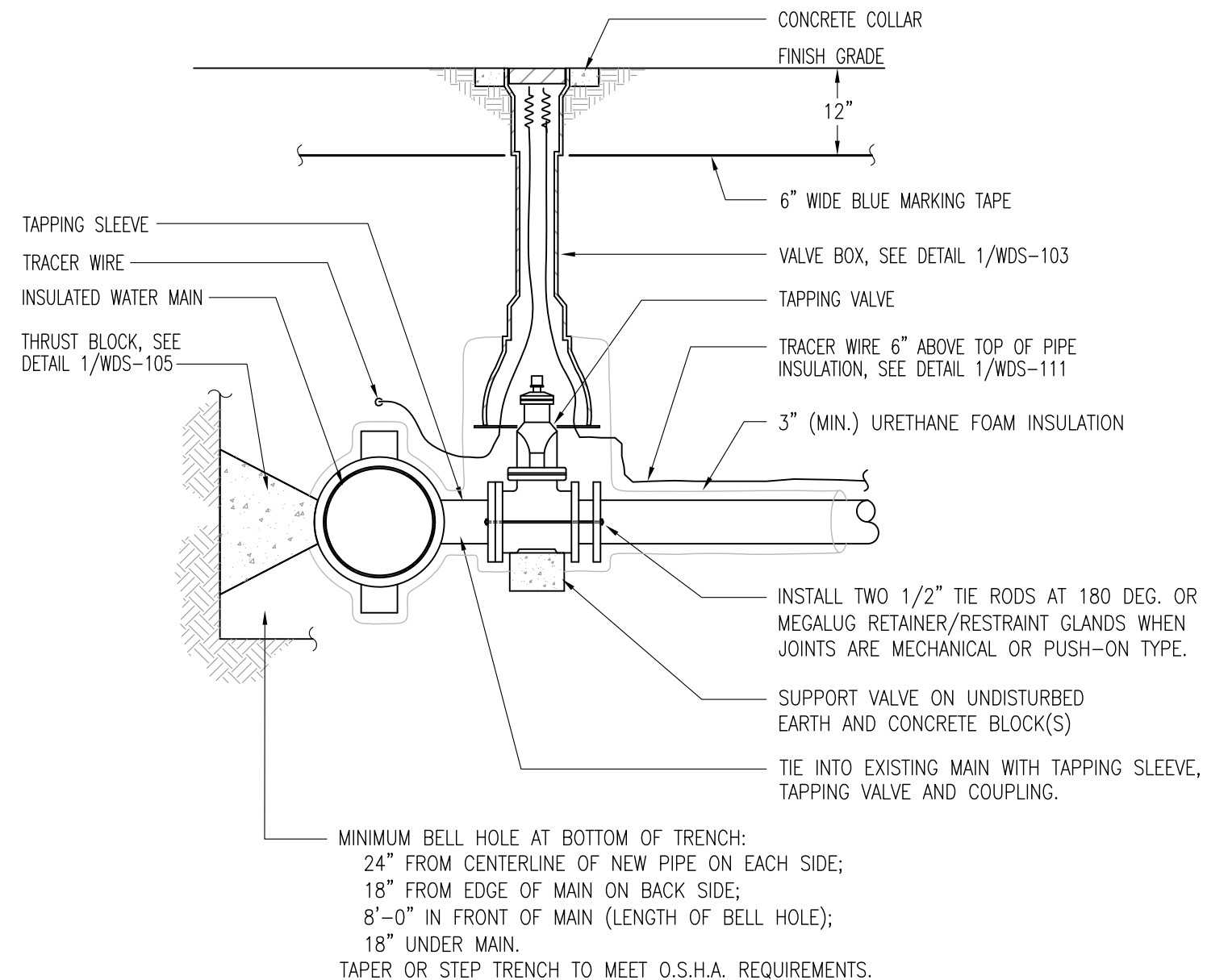
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**CIRCULATION PUMP MANHOLE**  
**DESIGN & CONSTRUCTION STANDARDS**  
**DIRECT BURY WATER DISTRIBUTION SYSTEM**

Drawing No.  
**WDS-106**  
Previous: UES-DD-W106  
14 FEB 2010





## WATER PIPING TIE-IN DETAIL

1  
WDS-107

### NOTES:

1. WATER SERVICE PIPE SHALL HAVE A LEVEL OR POSITIVE GRADE FROM THE WATER MAIN TO THE BUILDING (NO HUMPS OR DIPS) TO PREVENT AIR TRAPS.
2. CONTRACTOR SHALL ENSURE MATERIALS REQUIRED FOR HOT TAP ARE AT JOB SITE, AND DISINFECTING & PRESSURE TESTING OF SERVICE LINE HAVE BEEN COMPLETED, AND EXCAVATION OF BELL HOLE IS COMPLETE PRIOR TO NOTIFYING THE OWNER.
3. CONSTRUCTOR WILL GIVE THE OWNER 10 WORKING DAYS NOTICE OF THE NEED TO SCHEDULE A TIE-IN TO EXISTING UTILITIES.
4. ALL PARTS OF WATER DISTRIBUTION SYSTEM WITHIN SEVEN (7) FEET OF STORM DRAIN LINES SHALL REQUIRE TWO (2) ADDITIONAL INCHES OF URETHANE FOAM INSULATION.



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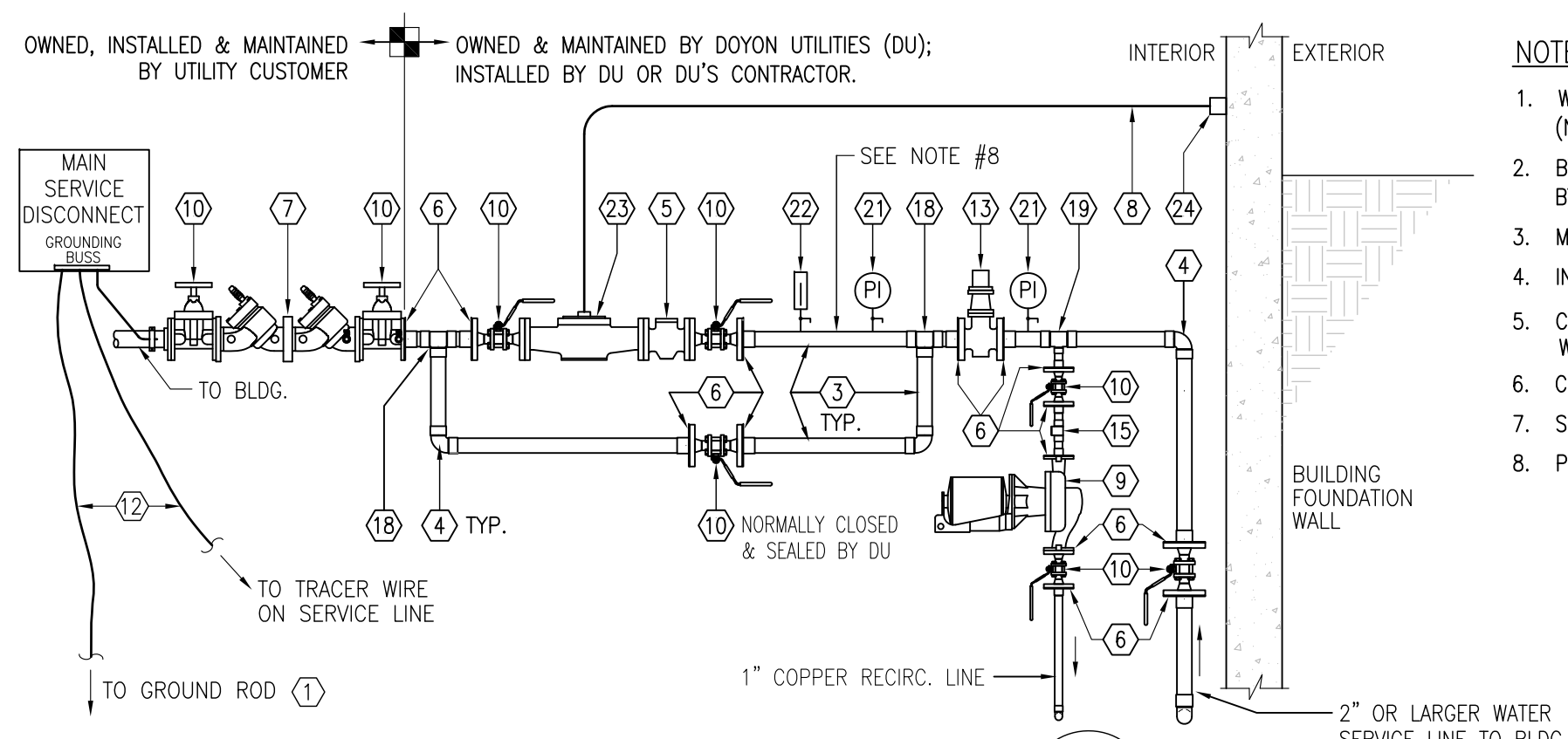
Date: 30 APR 2010  
Scale: NONE  
Designed By: CDH  
Drawn By: DLW/GSF  
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**WATER PIPING TIE-IN, 4" AND LARGER**  
**DESIGN & CONSTRUCTION STANDARDS**  
**DIRECT BURY WATER DISTRIBUTION SYSTEM**

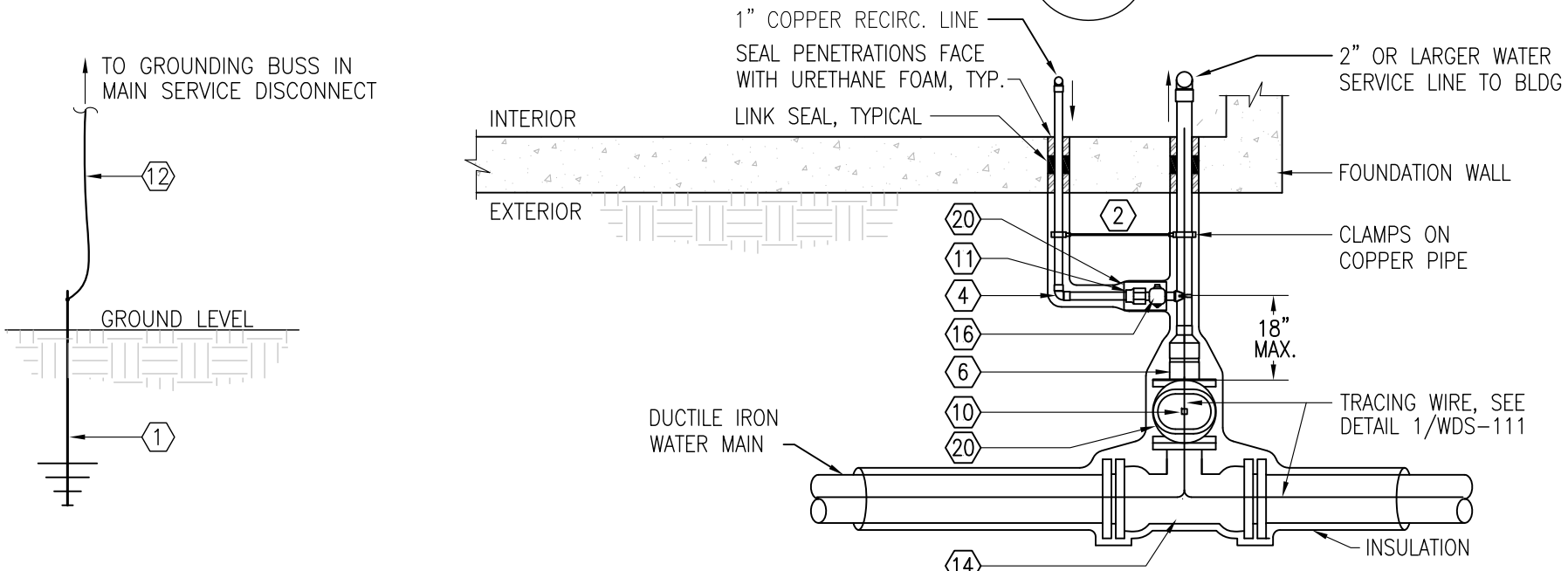
Drawing No.

**WDS-107**

Previous: UES-DD-W107  
14 FEB 2010



INSIDE BLDG. – ELEVATION VIEW 1  
WDS-108



CONNECTION AT MAIN – PLAN VIEW 2  
WDS-108

NOTES:

1. WATER SERVICE PIPE SHALL HAVE A LEVEL OR POSITIVE GRADE FROM THE WATER MAIN TO THE BUILDING (NO HUMPS OR DIPS) TO PREVENT AIR TRAPS.
2. BYPASS LINE SAME SIZE AS SERVICE LINE REQUIRED FOR 2" AND LARGE WATER METERS. BYPASS VALVE SHALL BE NORMALLY CLOSED AND SEALED BY DU.
3. METER SHALL BE A MINIMUM OF 1'-0" AND A MAXIMUM OF 4'-0" ABOVE FLOOR LEVEL.
4. INSTALL CIRCULATION PUMP ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
5. CHECK WITH DU FOR LAYING LENGTH REQUIRED FOR METER INSTALLATION LAYING LENGTHS WILL VARY WITH METER SIZE AND TYPE.
6. COORDINATE ALL GROUNDING WIRING WITH BUILDING ELECTRICAL CONTRACTOR.
7. SINGLE STRAP ON 4"-TO-8" MAINS, DOUBLE STRAP ON 10"-TO- 14" MAINS. OUTLETS ON 8" CENTERS.
8. PROVIDE A MINIMUM OF TEN (10) DIAMETERS OF STRAIGHT PIPE IMMEDIATELY UPSTREAM OF WATER METER.

| MATERIAL LIST – INSTALLER ITEMS |                                                     |
|---------------------------------|-----------------------------------------------------|
| ITEM                            | DESCRIPTION                                         |
| 1                               | GROUND ROD, RING OR OTHER APPROVED GROUNDING DEVICE |
| 2                               | THAW BUSS, #1 AWG MIN. LENGTH AS REQUIRED           |
| 3                               | PIPE AND NIPPLES, LENGTHS AS REQUIRED               |
| 4                               | ELBOW                                               |
| 5                               | PLATE STRAINER, FURNISHED AND INSTALLED BY D.U.     |
| 6                               | COPPER FLANGE                                       |
| 7                               | BACKFLOW PREVENTOR                                  |
| 8                               | CONDUIT OR #18, 2-CONDUCTOR WIRE                    |
| 9                               | CIRCULATION PUMP (MANDATORY)                        |
| 10                              | BALL VALVE                                          |
| 11                              | FLARE NUT                                           |
| 12                              | GROUND WIRE SIZED PER N.E.C., LENGTH AS REQUIRED    |
| 13                              | PRESSURE REDUCING VALVE, 80-TO-40 PSI               |
| 14                              | FLANGED DUCTILE IRON TEE – (NEW INSTALLATION)       |
| 15                              | CHECK VALVE                                         |
| 16                              | CORPORATION STOP                                    |
| 17                              | REDUCER FITTING                                     |
| 18                              | TEE FITTING                                         |
| 19                              | REDUCING TEE                                        |
| 20                              | VALVE BOX & COVER                                   |
| 21                              | PRESSURE INDICATOR WITH SHUT-OFF                    |
| 22                              | THERMOMETER WITH SHUT-OFF                           |
| 23                              | WATER METER, FURNISHED & INSTALLED BY D.U.          |
| 24                              | TRANSPONDER, FURNISHED & INSTALLED BY D.U.          |



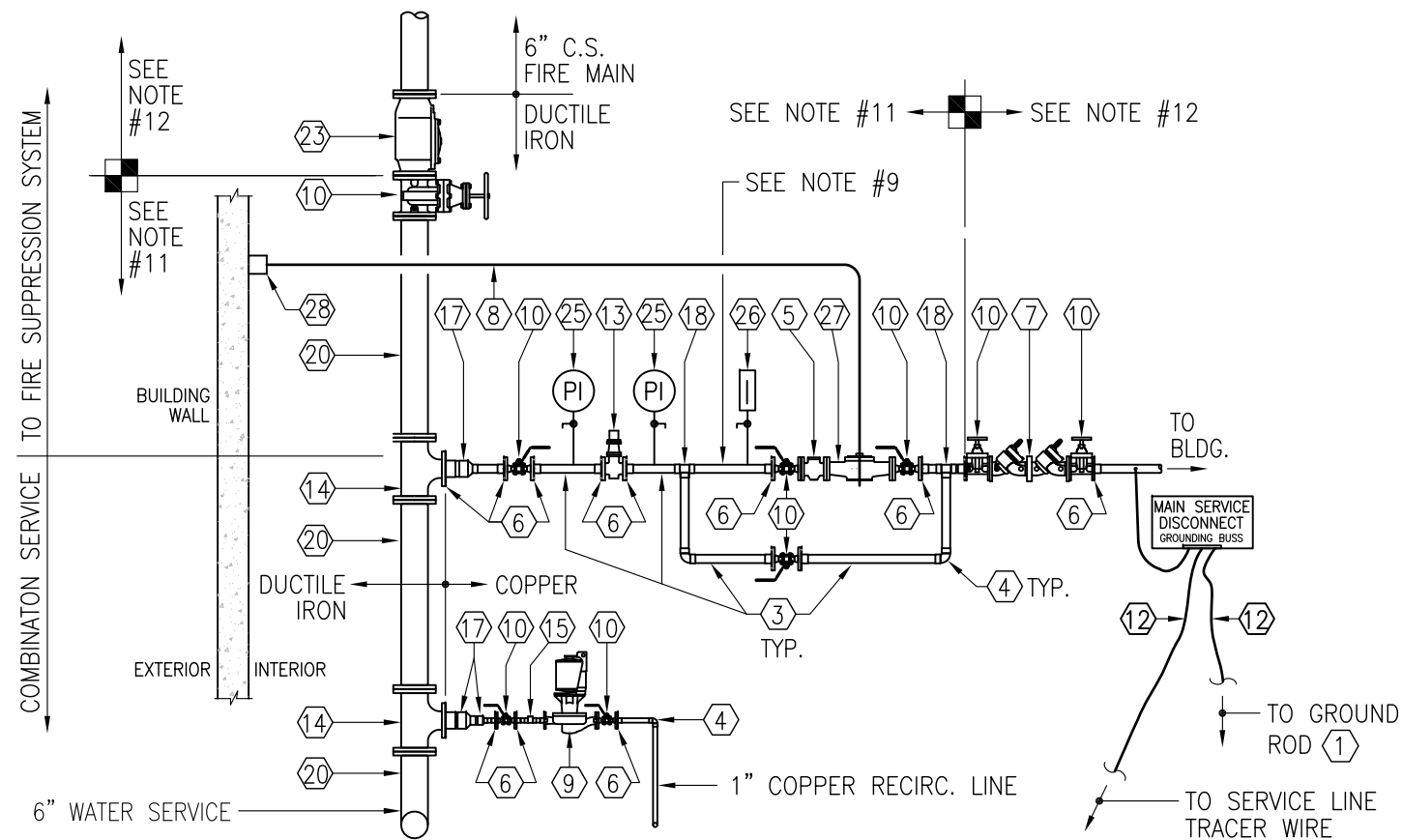
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CIRCULATING LOOP, 2" & LARGER WATER SERVICE  
DESIGN & CONSTRUCTION STANDARDS  
DIRECT BURY WATER DISTRIBUTION SYSTEM

Drawing No.  
**WDS-108**  
Previous: UES-DD-W108  
14 FEB 2010

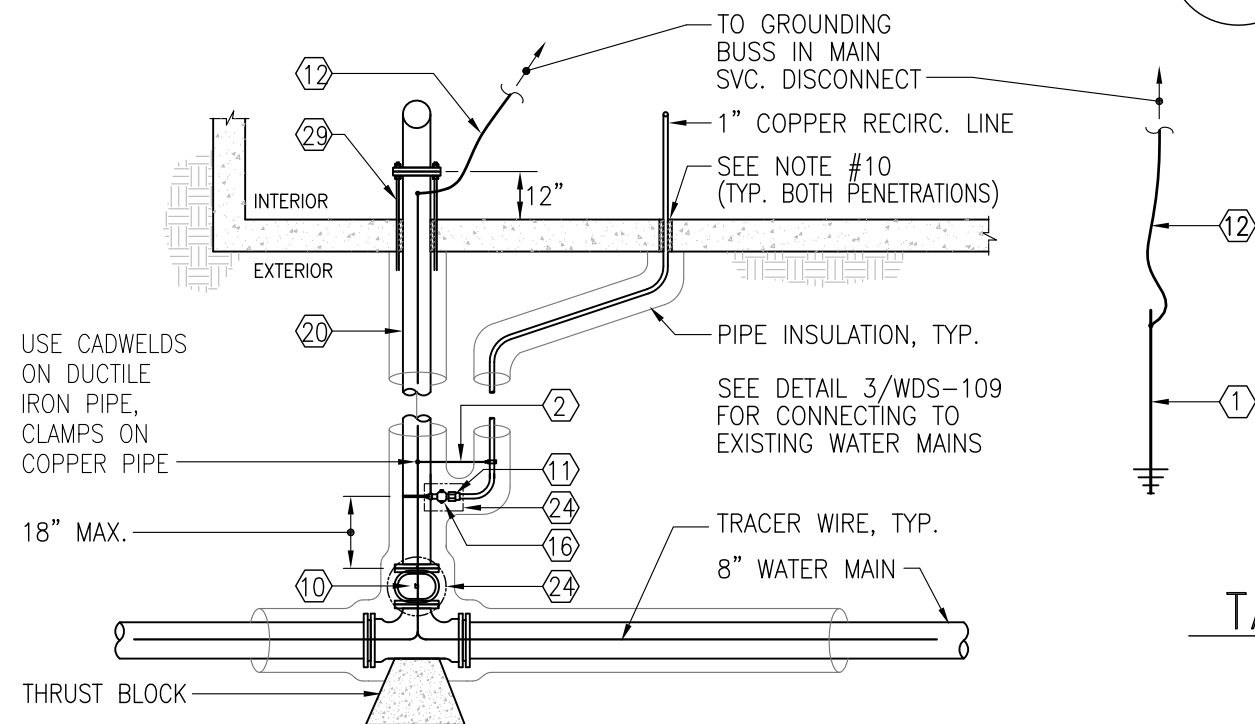




INSIDE BLDG. – ELEVATION VIEW

1

WDS-109



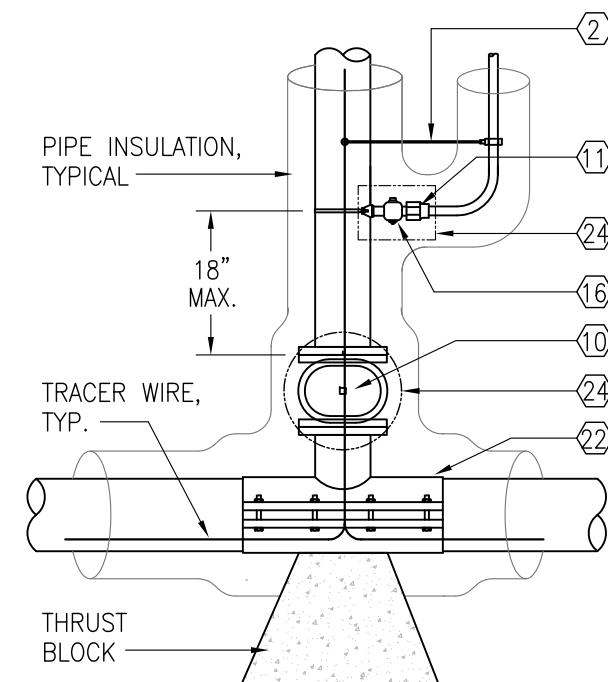
CONNECTION AT MAIN – PLAN VIEW

2

WDS-109

NOTES:

- SERVICE LINE SHALL HAVE LEVEL OR POSITIVE GRADE FROM MAIN TO BLDG., W/NO HUMPS OR DIPS TO PREVENT AIR TRAPS.
- BYPASS LINE SAME SIZE AS METERED SERVICE LINE REQUIRED ON 2" AND LARGE METERS. BYPASS VALVE SHALL BE NORMALLY CLOSED AND SEALED BY DU.
- METER SHALL BE A MINIMUM OF 1'-0" AND A MAXIMUM OF 4'-0" ABOVE FLOOR LEVEL.
- INSTALL CIRCULATION PUMP ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
- CHECK WITH D.U. FOR LAYING LENGTH REQ'D. FOR METER INSTALL. LAYING LENGTHS VARY WITH METER SIZE & TYPE.
- COORDINATE ALL GROUNDING WIRING WITH BUILDING ELECTRICAL CONTRACTOR.
- TAPPING TEE/SLEEVE AND GATE VALVE PROVIDE BY DU CONTRACTOR INSTALLED.
- SINGLE STRAP ON 4"-TO-8" MAINS, DOUBLE STRAP ON 10"-TO-14" MAINS. OUTLETS ON 8" CENTERS.
- PROVIDE A MINIMUM OF TEN (10) DIAMETERS OF STRAIGHT PIPE IMMEDIATELY UPSTREAM OF WATER METER.
- SEAL FOUNDATION WALL PENETRATIONS WITH URETHANE FOAM.
- OWNED AND MAINTAINED BY DU; INSTALLED BY DU OR DU'S CONTRACTOR.
- OWNED, MAINTAINED AND INSTALLED BY UTILITY CUSTOMER.
- INSULATION NOT SHOWN ON PIPING & EQUIPMENT INSIDE BLDG.



EXISTING WATER SERVICE TAPPING VALVE SLEEVE DETAIL

3

WDS-109

MATERIAL LIST

| ITEM | DESCRIPTION                                    |
|------|------------------------------------------------|
| (1)  | GROUND ROD, RING OR OTHER APPROVED DEVICE      |
| (2)  | THAW BUSS #1 AWG MIN. LENGTH AS REQUIRED       |
| (3)  | PIPE AND NIPPLES, LENGTHS AS REQUIRED          |
| (4)  | ELBOW                                          |
| (5)  | PLATE STRAINER (SUPPLIED BY DU)                |
| (6)  | COPPER FLANGE                                  |
| (7)  | BACKFLOW PREVENTOR                             |
| (8)  | CONDUIT OR #18, 2-CONDUCTOR WIRE               |
| (9)  | CIRCULATION PUMP (MANDATORY)                   |
| (10) | GATE VALVE OR BALL VALVE                       |
| (11) | FLARE NUT                                      |
| (12) | GROUND WIRE SIZED PER N.E.C., LENGTH AS REQ'D. |
| (13) | PRESSURE REDUCING VALVE, 80-TO-40 PSI          |
| (14) | FLANGED DUCTILE IRON REDUCING TEE              |
| (15) | CHECK VALVE                                    |
| (16) | CORPORATION STOP                               |
| (17) | REDUCER FITTING                                |
| (18) | TEE FITTING                                    |
| (19) | REDUCING TEE                                   |
| (20) | FLANGED DUCTILE IRON PIPE, LENGTHS AS REQUIRED |
| (21) | DUCTILE IRON MJ PIPE, LENGTHS AS REQUIRED      |
| (22) | TAPPING SLEEVE                                 |
| (23) | DOUBLE CHECK VALVE (FIRE RATED)                |
| (24) | VALVE BOX & COVER                              |
| (25) | PRESSURE INDICATOR W/SHUT-OFF                  |
| (26) | THERMOMETER W/SHUT-OFF                         |
| (27) | WATER METER, FURNISHED & INSTALLED BY D.U.     |
| (28) | TRANSPONDER, FURNISHED & INSTALLED BY D.U.     |
| (29) | THRUST ROD (2 REQUIRED)                        |

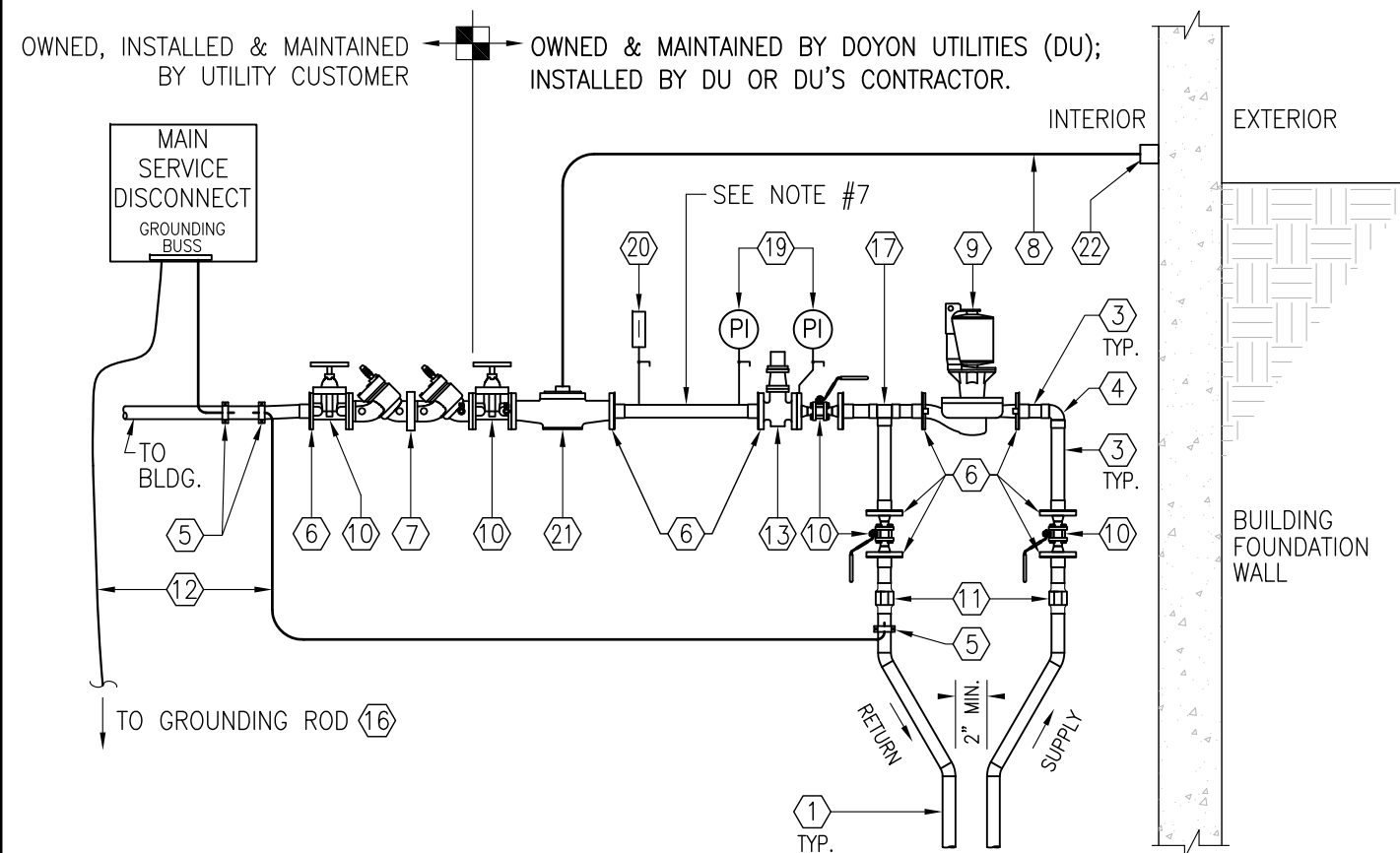


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CIRCULATING WATER SVC. WITH FIRE SUPPRESSION  
DESIGN & CONSTRUCTION STANDARDS  
DIRECT BURY WATER DISTRIBUTION SYSTEM

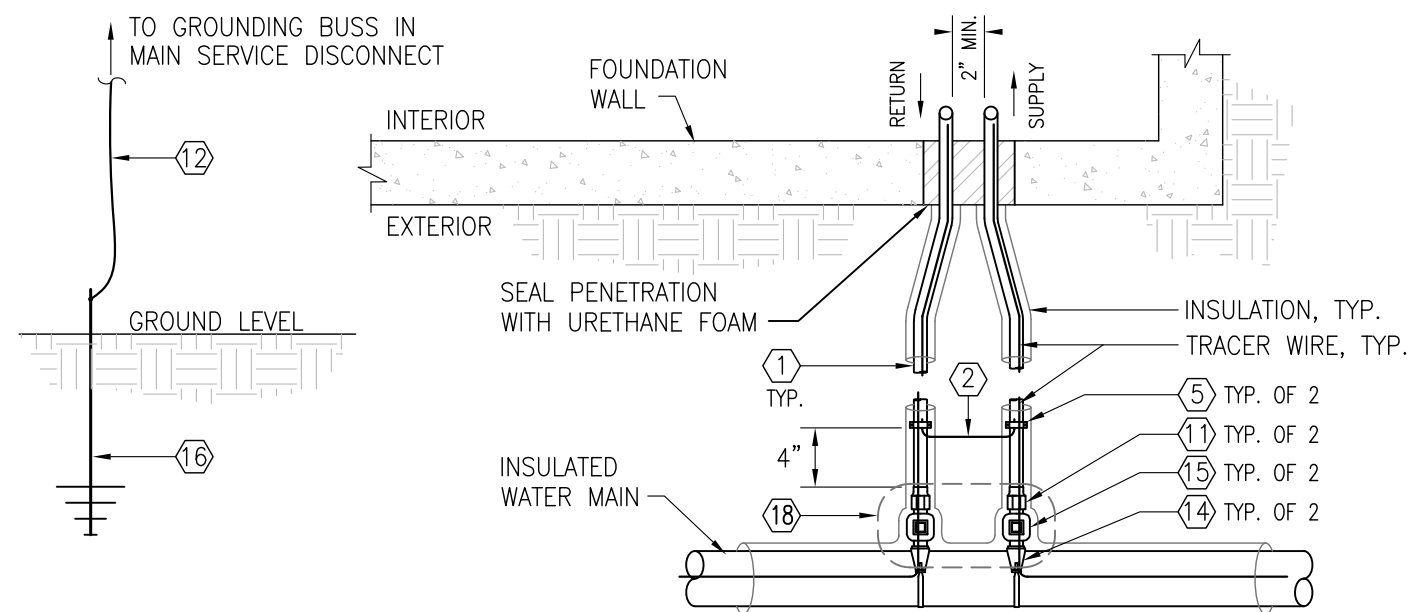
Drawing No.  
**WDS-109**  
Previous: UES-DD-W109  
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INSIDE BLDG. – ELEVATION VIEW

1

WDS-110



CONNECTION AT MAIN – PLAN VIEW

2

WDS-110

# NOTES:

1. WATER SERVICE PIPE SHALL HAVE A LEVEL OR POSITIVE GRADE FROM THE WATER MAIN TO THE BUILDING (NO HUMPS OR DIPS) TO PREVENT AIR TRAPS.
2. METER SHALL BE A MINIMUM OF 1'-0" AND A MAXIMUM OF 4'-0" ABOVE FLOOR LEVEL.
3. INSTALL CIRCULATION PUMP ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
4. CHECK WITH DOYON UTILITIES FOR LAYING LENGTH REQUIRED FOR METER INSTALLATION. LAYING LENGTHS WILL VARY WITH METER SIZE AND TYPE.
5. COORDINATE ALL GROUNDING WIRING WITH BUILDING ELECTRICAL CONTRACTOR.
6. SINGLE STRAP ON 4"-TO-8" MAINS, DOUBLE STRAP ON 10"-TO-14" MAINS. OUTLETS ON 8" CENTERS
7. PROVIDE A MINIMUM OF TEN (10) DIAMETERS OF STRAIGHT PIPE IMMEDIATELY UPSTREAM OF WATER METER.

## MATERIAL LIST

| ITEM | DESCRIPTION                                             |
|------|---------------------------------------------------------|
| 1    | COPPER TUBING, TYPE "K", LENGTH AS REQUIRED             |
| 2    | THAW BUSS, #1 AWG, MIN. LENGTH AS REQUIRED              |
| 3    | PIPE AND NIPPLES, LENGTHS AS REQUIRED                   |
| 4    | ELBOW                                                   |
| 5    | CLAMP, VARIABLE SIZE 3/4"-TO-2"                         |
| 6    | COPPER FLANGE                                           |
| 7    | BACKFLOW PREVENTOR                                      |
| 8    | CONDUIT OR #18 2-CONDUCTOR WIRE                         |
| 9    | CIRCULATION PUMP (MANDATORY)                            |
| 10   | GATE VALVE OR BALL VALVE                                |
| 11   | FLARE NUT                                               |
| 12   | GROUND WIRE SIZED PER N.E.C., LENGTH AS REQUIRED        |
| 13   | PRESSURE REDUCING VALVE, 80-TO-40 PSI                   |
| 14   | CORPORATION STOP SADDLE CONNECTION                      |
| 15   | CORPORATION STOP                                        |
| 16   | GROUND ROD, RING OR OTHER APPROVED GROUNDING DEVICE     |
| 17   | TEE FITTING                                             |
| 18   | VALVE BOX & COVER                                       |
| 19   | PRESSURE INDICATOR W/SHUT-OFF                           |
| 20   | THERMOMETER W/SHUT-OFF                                  |
| 21   | WATER METER, FURNISHED AND INSTALLED BY DOYON UTILITIES |
| 22   | TRANSPONDER, FURNISHED AND INSTALLED BY DOYON UTILITIES |



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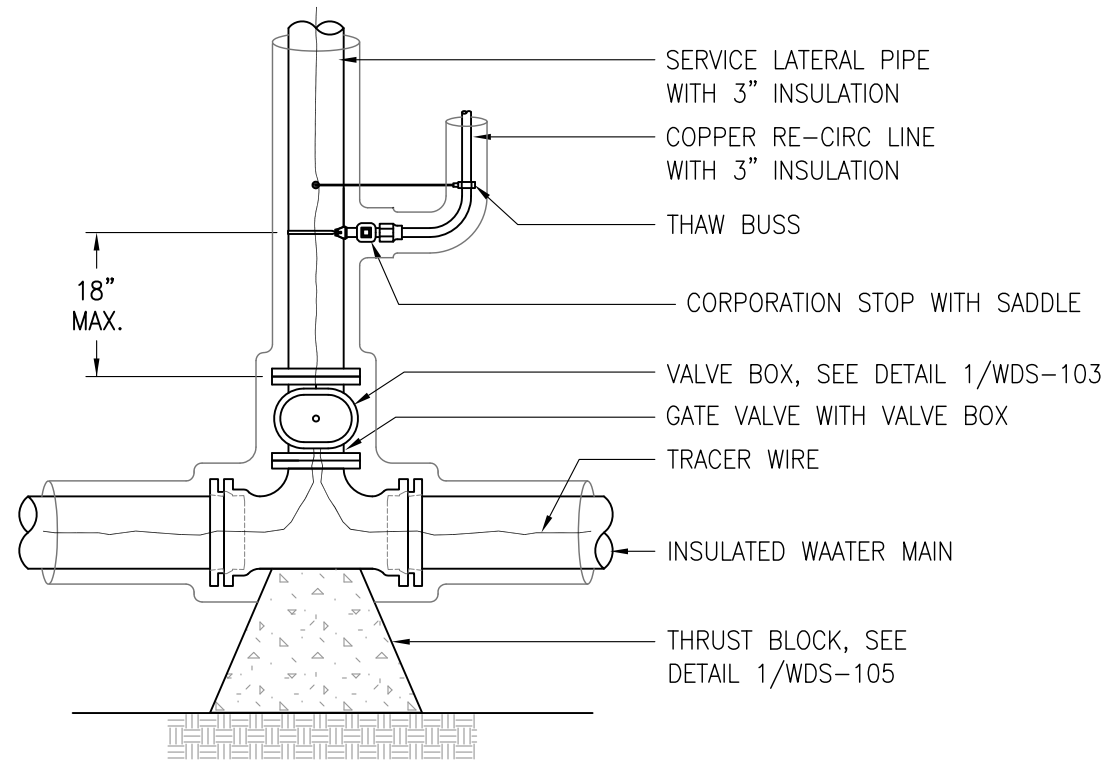
CIRCULATING LOOP, 1-1/2" & SMALLER WATER SERVICE  
DESIGN & CONSTRUCTION STANDARDS  
DIRECT BURY WATER DISTRIBUTION SYSTEM

Drawing No.

WDS-110

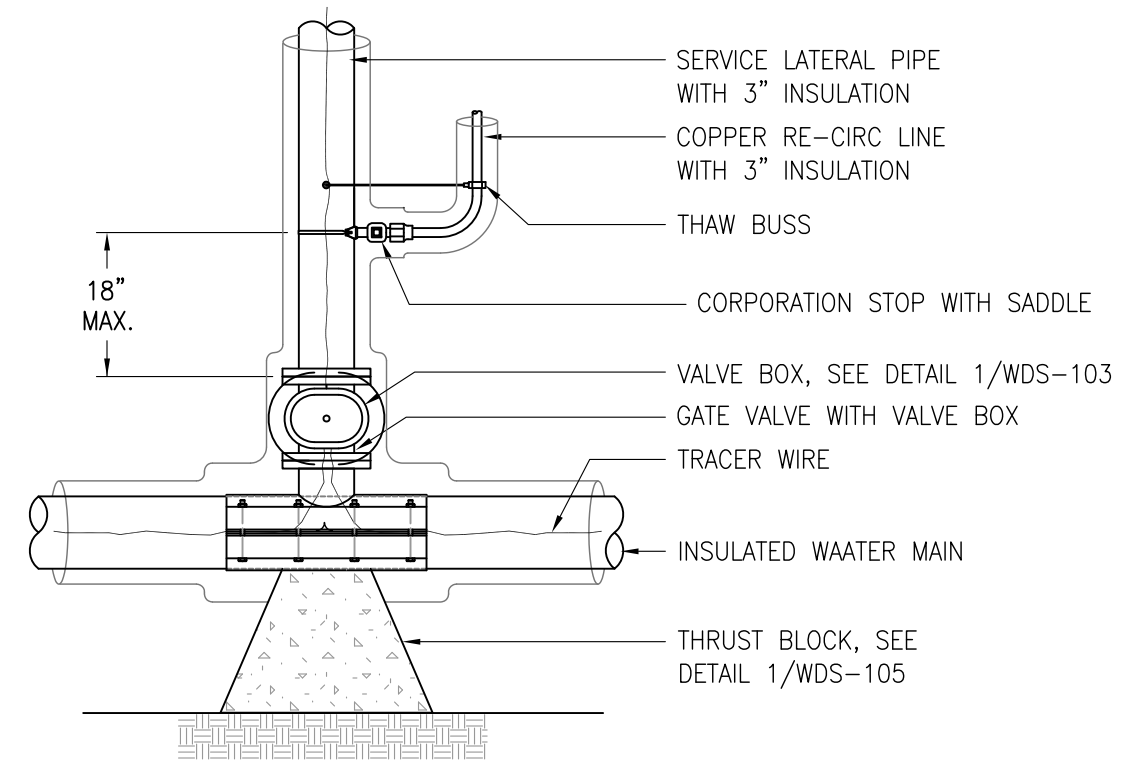
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SERVICE LATERAL MECHANICAL JOINT

1  
WDS-112



SERVICE LATERAL TAPPING SLEEVE

2  
WDS-112

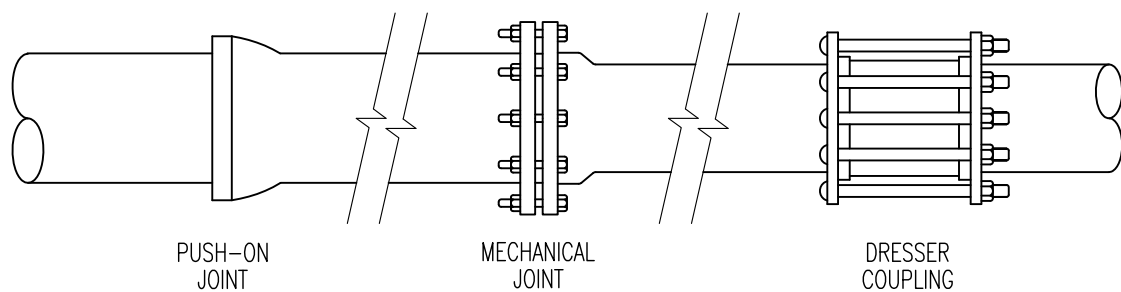


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SERVICE LATERAL TIE-IN  
DESIGN & CONSTRUCTION STANDARDS  
DIRECT BURY WATER DISTRIBUTION SYSTEM

Drawing No.  
**WDS-112**  
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14 FEB 2010

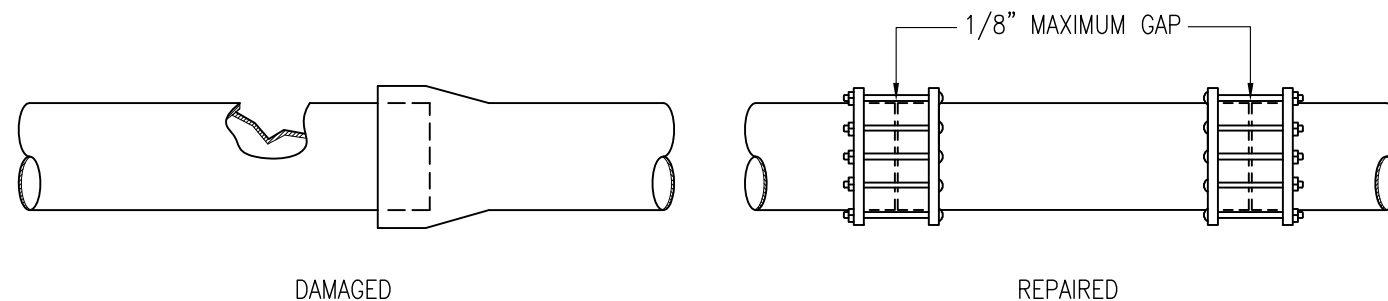


DUCTILE IRON PIPE

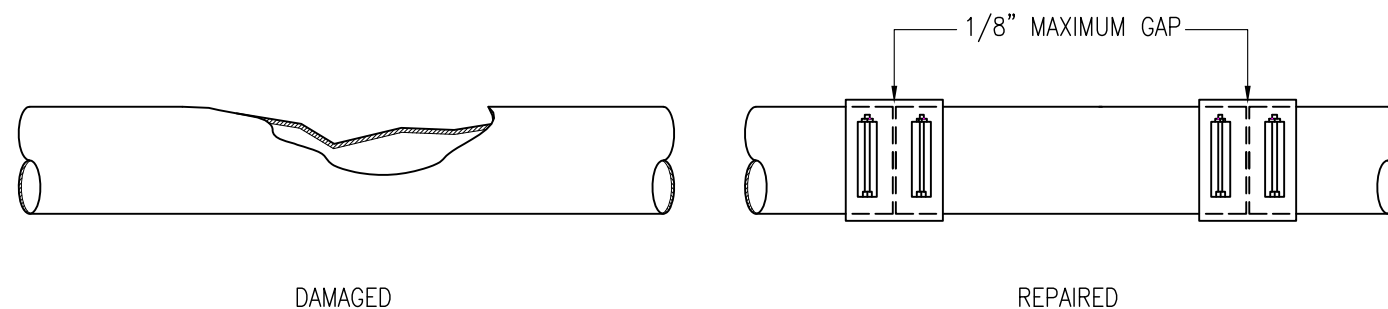
NOTE: WATER MAINS AND SERVICE LATERALS SHALL BE INSULATED WITH A MINIMUM OF 3" OF URETHANE

## TYPICAL WATER PIPE CONNECTIONS

1  
WDS-113



FOR PIPE DAMAGED NEAR END OF PUSH-ON OR HUB AND SPIGOT TYPE PIPE JOINT: CUT OFF DAMAGED SECTION AND BELL OF UNDAMAGED PIPE PERPENDICULAR TO PIPE AXIS. INSERT SAME TYPE AND DIAMETER OF PIPE. USE FULL CIRCLE CLAMP LEAVING A MAXIMUM 1/8" GAP BETWEEN PIPES (DRESSER 62 OR 263), OR FLEXIBLE COUPLING (DRESSER 253). FLEXIBLE COUPLING SHOWN.



FOR PIPE DAMAGED NEAR MIDDLE OF PUSH-ON OR HUB AND SPIGOT TYPE PIPE JOINT: REMOVE DAMAGED SECTION, MAKING CUTS PERPENDICULAR TO PIPE AXIS. INSERT SAME TYPE AND DIAMETER OF PIPE, LEAVING A MAXIMUM 1/8" GAP BETWEEN PIPES. USE A FULL CIRCLE CLAMP (ROCKWELL 256 OR EQUAL), OR FLEXIBLE COUPLING (ROCKWELL 433 OR EQUAL). FULL CIRCLE CLAMP SHOWN.

## TYPICAL WATER PIPE REPAIRS

2  
WDS-113



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Drawn By: MMC/GSF  
Checked By: NEM

**WATER PIPING REPAIR DETAILS**  
**DESIGN & CONSTRUCTION STANDARDS**  
**DIRECT BURY WATER DISTRIBUTION SYSTEM**

Drawing No.  
**WDS-113**  
Previous: UES-DD-W113  
14 FEB 2010

REPLACE PAVING TO  
MATCH EXISTING,  
SEE ROAD TIE-IN  
DETAIL 1/HDS-308

SLAB OR PAVING  
GRAVEL BASE

SHEETING & SHORING  
AS REQ'D. BY O.S.H.A.

8 MIL POLETHYLENE  
WRAP ON PIPE,  
FITTINGS AND VALVES

REPLACE OVERDEPTH  
OR UNSTABLE SOIL

12"

18"

GRADE

FINISH GRADING

4' MINIMUM COVER TO  
TOP OF PIPE INSULATION

BURIED UTILITY  
WARNING TAPE (TYP)

EXCAVATED MATERIAL OR SELECTED  
BACKFILL (ROCK AND DEBRIS FREE)

TRACER WIRE, 6" ABOVE  
TOP OF PIPE INSULATION

PIPE BEDDING MATERIAL;  
KEEP FREE OF WATER.

12" MIN. COVER WITH  
BEDDING MATERIAL

PIPE O.D. + 6" URETHANE  
FOAM INSULATION

6" MIN. BEDDING  
MAT'L. BELOW PIPE

PIPE O.D. + 6" URETHANE  
FOAM INSULATION + 24"

TRENCH - 3" LARGER WATER MAIN

1

WDS-114

## NOTES

1. PIPE BEDDING MATERIAL AND INSTALLATION PROCEDURES SHALL BE AS SPECIFIED BY THE DIRECT BURY PIPE MANUFACTURER.
2. USE EXCAVATED NATIVE SOIL MATERIAL FOR BACKFILL IF IT COMPLYS WITH THE REQUIREMENTS OF ALASKA DOT SECTION 204 - 2.01 TYPE C.
3. FOR NON-PAVING AREAS, BACKFILL MATERIAL ABOVE THE PIPE BEDDING MATERIAL SHALL COMPLY WITH ALASKA DOT SECTION 204 - 2.01 TYPE C.
4. FOR PAVING - SIDEWALK AREAS BACKFILL MATERIAL SHALL COMPLY WITH ALASKA DOT SECTION 204 - 2.01 TYPE A, ABOVE PIPE/INSULATION AND BEDDING.
5. BACKFILL BEDDING SHALL COMPLY WITH ALASKA DOT SECTION 204 - 2.01 TYPE C.
6. BACKFILL COMPACTION SHALL COMPLY WITH ALASKA DOT SECTION 301 - 3.03. MOISTURE/DENSITY RELATIONS OF SOILS SHALL BE CALCULATED IN ACCORDANCE WITH AASHTO T 99 OR T 180.
7. PIPE SHALL BE PER DOYON UTILITIES STANDARDS.
8. THERMAL INSULATION SHALL BE PER DOYON UTILITIES STANDARDS.
9. SHEETING AND SHORING SHALL BE PER OSHA STANDARDS.
10. WHERE WATERMAINS APPROACH WITHIN 10 FEET OF HORIZONTAL CLEARANCE AND ARE BELOW OR LESS THAN 3 FEET ABOVE EXISTING SANITARY OR STORM SEWERS ENCASE THE SANITARY AND STORM SEWER WITH A JACKET OF CLASS A CONCRETE 3 INCHES THICK FOR 10 FEET ON EACH SIDE OF THE CROSSING.
11. CONCRETE ENCASEMENT IS NOT REQUIRED IF EXISTING SANITARY OR STORM SEWERS ARE DUCTILE IRON PIPE WITH JOINTS AT LEAST 8 FEET FROM THE WATER MAIN, OR IF REPLACEMENT OF EXISTING SANITARY OR STORM SEWER WITH DUCTILE IRON PIPE.



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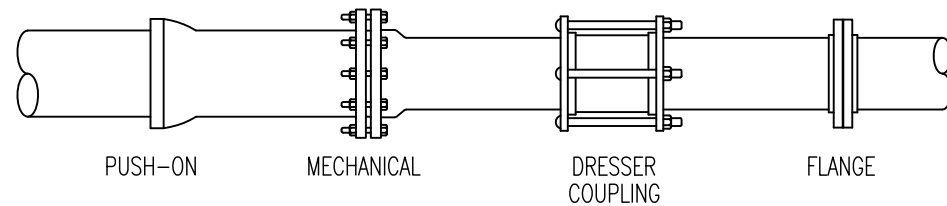
**WATER PIPING TRENCH DETAIL**  
**DESIGN & CONSTRUCTION STANDARDS**  
**DIRECT BURY WATER DISTRIBUTION SYSTEM**

Drawing No.

**WDS-114**

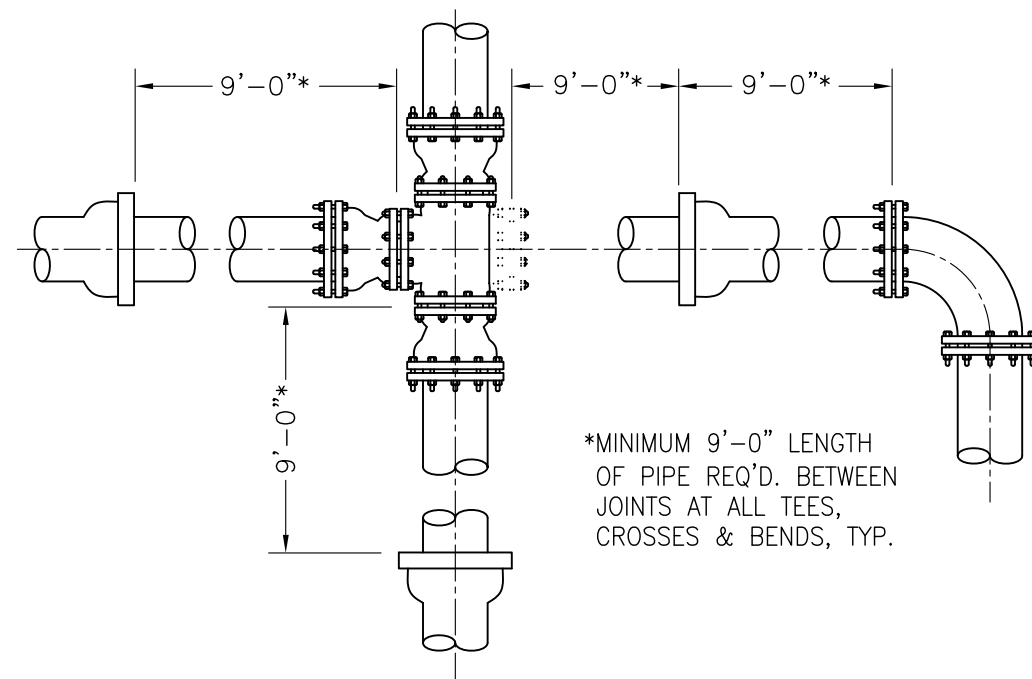
Previous: UES-DD-W114  
14 FEB 2010





## WATER PIPE JOINTS

1  
WDS-201

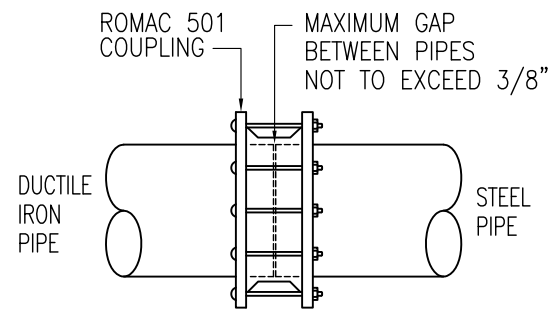


## PIPE LENGTHS REQUIRED AT TEES AND ELBOWS

2  
WDS-201

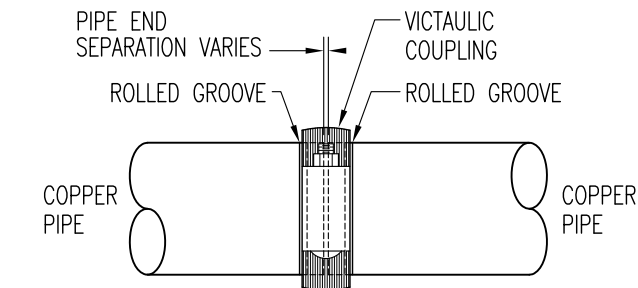
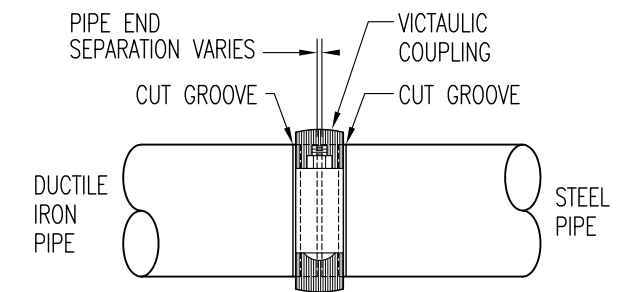
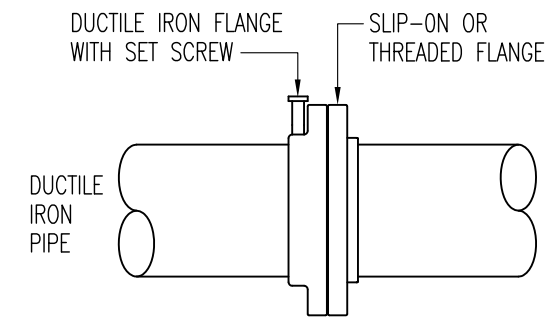
### NOTES:

1. ALL JOINTS SHALL BE RESTRAINED AS NECESSARY.
2. PROVIDE THRUST RODS BASED ON WATER PRESSURE SOIL CONDITIONS AND DOYON UTILITIES' STANDARDS.



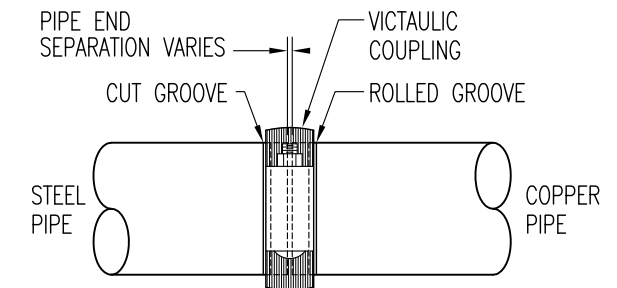
## ADAPTION - STEEL OR COPPER TO DUCTILE IRON PIPE

3  
WDS-201



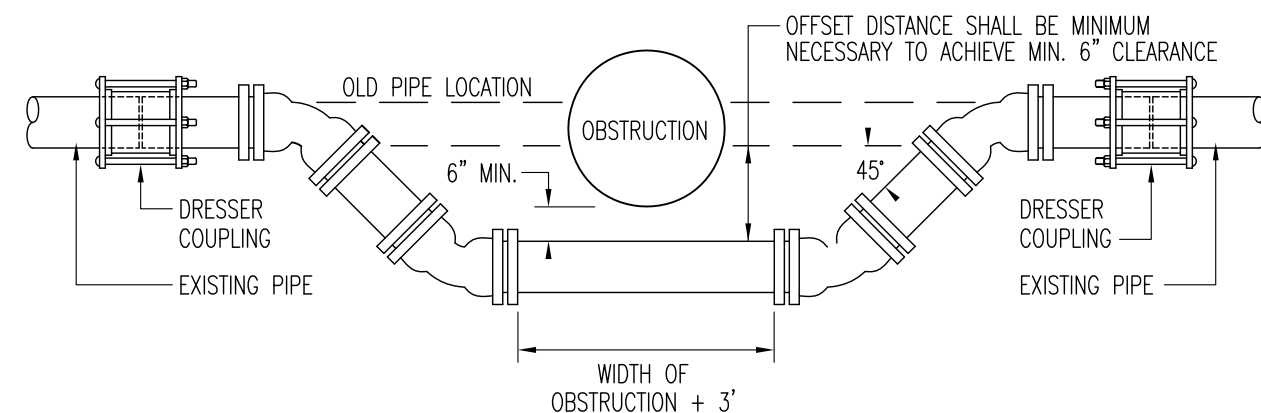
## ADAPTION - ROLLED GROOVE COPPER PIPE

4  
WDS-201



## ADAPTION - CUT GROOVE STEEL TO ROLLED GROOVE COPPER PIPE

5  
WDS-201



## TYPICAL RELOCATION DETAIL

6  
WDS-201

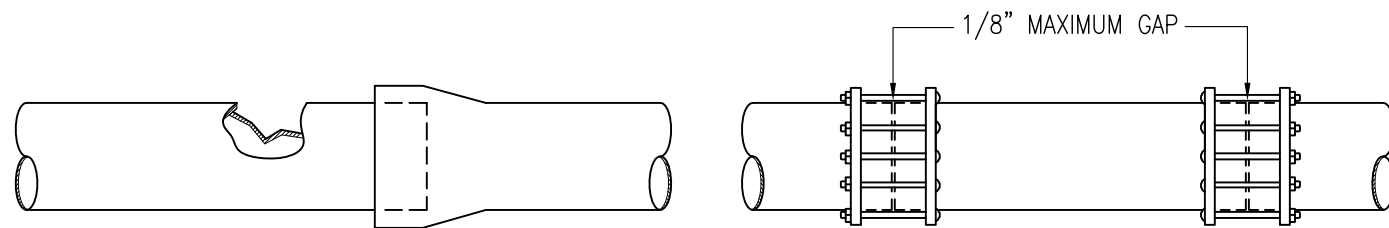


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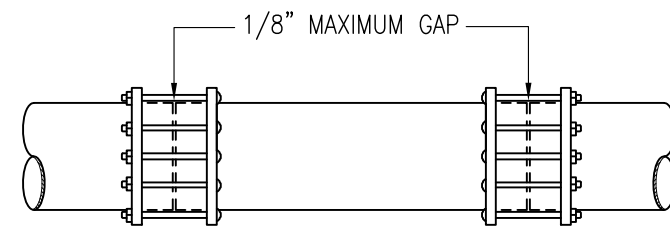
Date: 30 APR 2010  
Scale: NONE  
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PIPING JOINTS AND OFFSETS  
DESIGN & CONSTRUCTION STANDARDS  
UTILIDOR WATER DISTRIBUTION SYSTEM

Drawing No.  
**WDS-201**  
Previous: UES-DD-W001  
14 FEB 2010

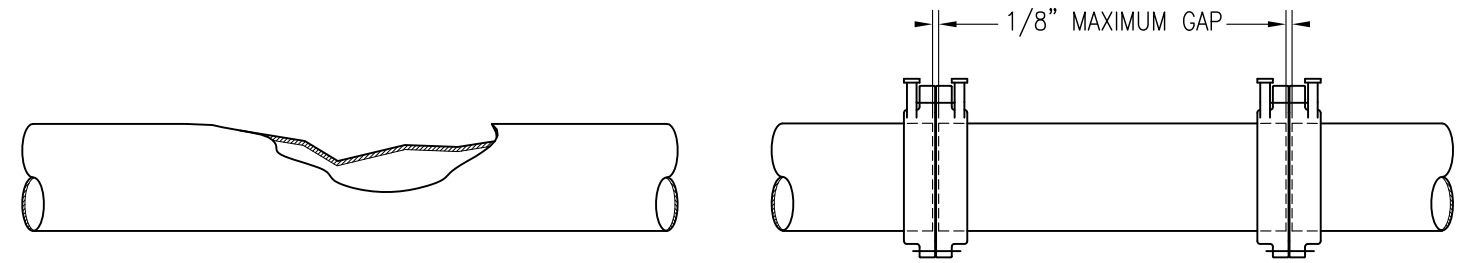


DAMAGED

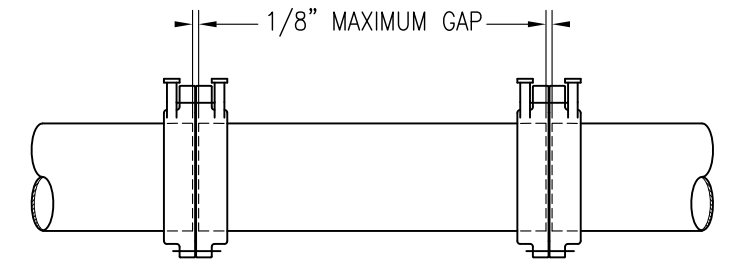


REPAIRED

FOR PIPE DAMAGED NEAR END OF PUSH-ON OR HUB AND SPIGOT TYPE PIPE JOINT: CUT OFF DAMAGED SECTION AND BELL OF UNDAMAGED PIPE PERPENDICULAR TO PIPE AXIS. INSERT SAME TYPE AND DIAMETER OF PIPE. USE FULL CIRCLE CLAMP LEAVING A MAXIMUM 1/8" GAP BETWEEN PIPES (DRESSER 62 OR 263), OR FLEXIBLE COUPLING (DRESSER 253). FLEXIBLE COUPLING SHOWN.

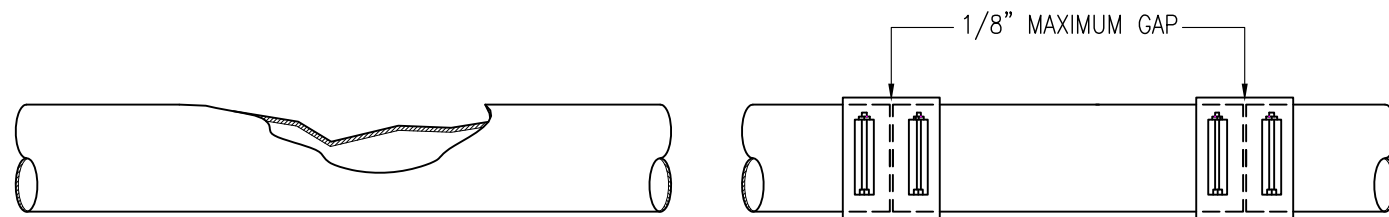


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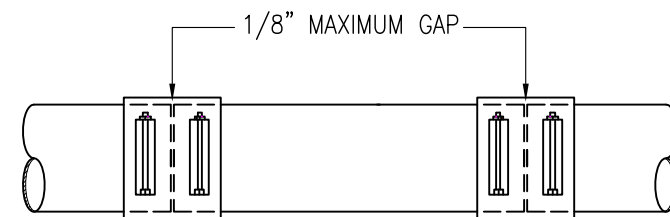


REPAIRED

FOR PIPE DAMAGED NEAR MIDDLE OF FLANGED PIPE JOINT: REMOVE DAMAGED SECTION, MAKING CUTS PERPENDICULAR TO PIPE AXIS. INSERT SAME TYPE AND DIAMETER OF PIPE, LEAVING A MAXIMUM 1/8" GAP BETWEEN PIPES. USE DUCTILE IRON, SLIP-ON, C/W UNION FLANGES.

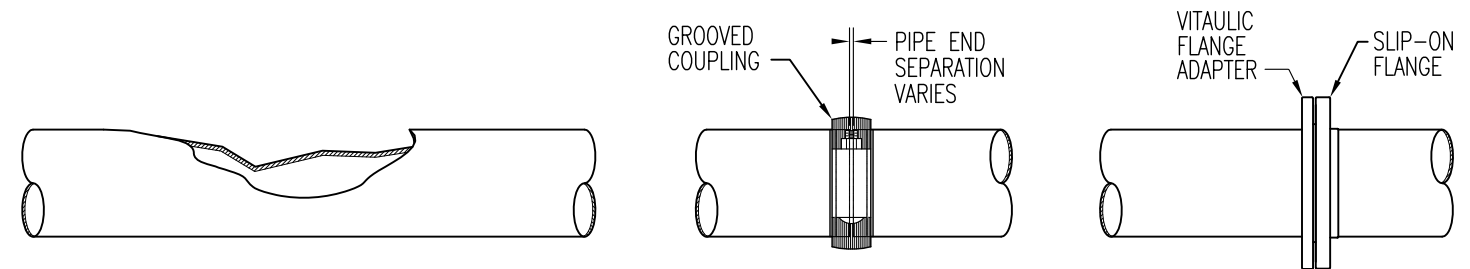


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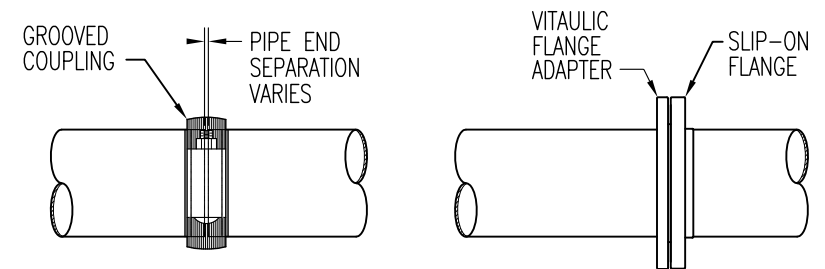


REPAIRED

FOR PIPE DAMAGED NEAR MIDDLE OF PUSH-ON OR HUB AND SPIGOT TYPE PIPE JOINT: REMOVE DAMAGED SECTION, MAKING CUTS PERPENDICULAR TO PIPE AXIS. INSERT SAME TYPE AND DIAMETER OF PIPE, LEAVING A MAXIMUM 1/8" GAP BETWEEN PIPES. USE A FULL CIRCLE CLAMP (ROCKWELL 256 OR EQUAL), OR FLEXIBLE COUPLING (ROCKWELL 433 OR EQUAL). FULL CIRCLE CLAMP SHOWN.



DAMAGED



REPAIRED

FOR PIPE DAMAGED NEAR MIDDLE OF STEEL OR COPPER PIPE JOINT: REMOVE THE DAMAGED SECTION, MAKING CUTS PERPENDICULAR TO PIPE AXIS. INSERT SAME TYPE AND DIAMETER OF PIPE. USE A RIGID COUPLING (VITAULIC STYLE 07), FLEXIBLE COUPLING (VITAULIC STYLE 75), FLANGE ADAPTERS (VITAULIC STYLE 741) OR SLIP-ON FLANGES.

## TYPICAL REPAIRS TO EXISTING PIPE

1  
WDS-202



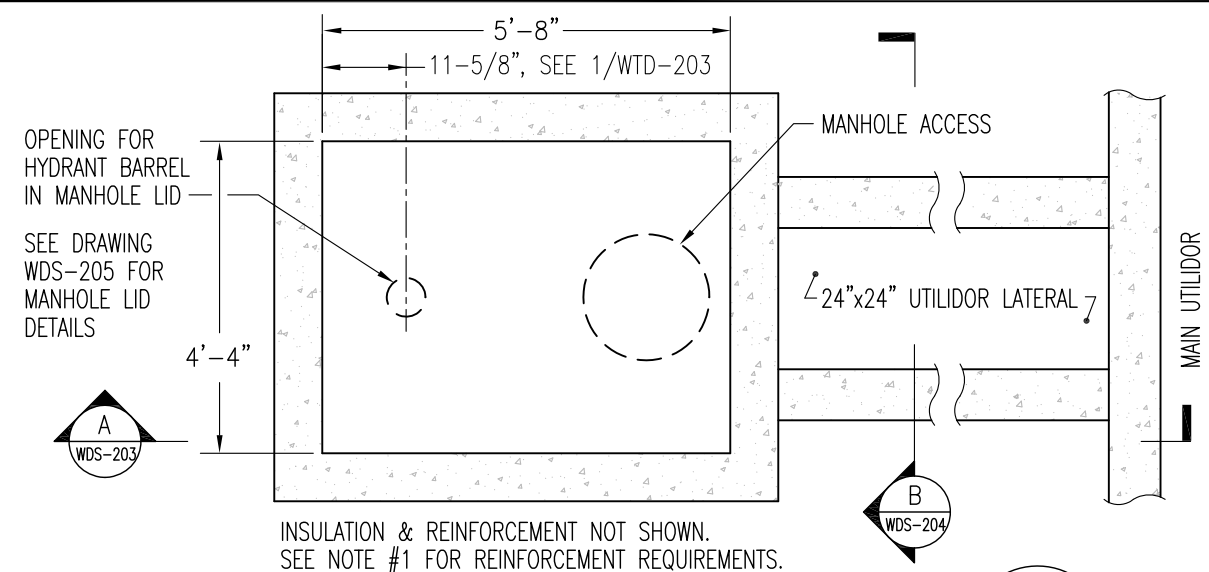
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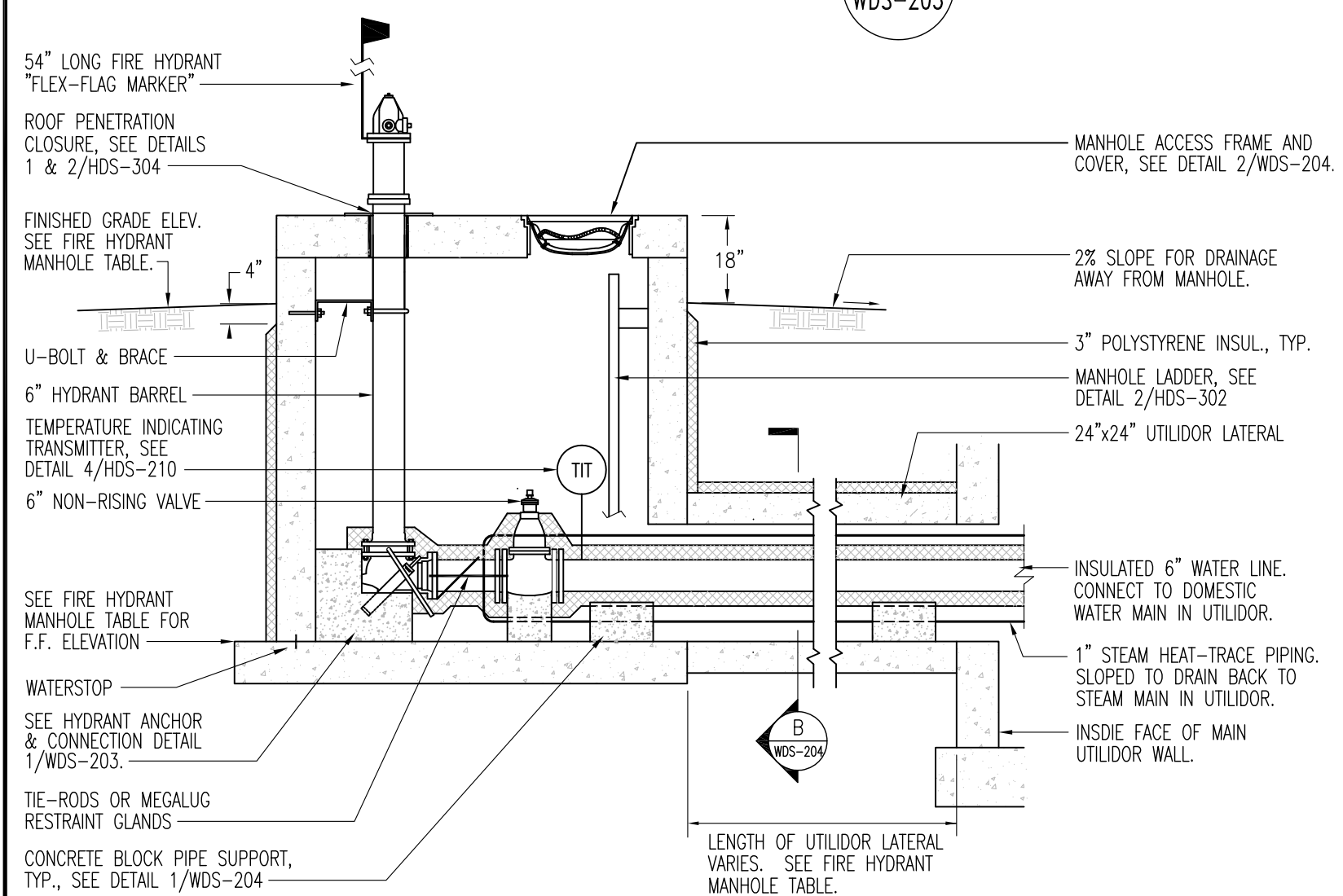
PIPE REPAIRS  
DESIGN & CONSTRUCTION STANDARDS  
UTILIDOR WATER DISTRIBUTION SYSTEM

Drawing No.  
**WDS-202**  
Previous: UES-DD-W002  
14 FEB 2010





FIRE HYDRANT MANHOLE PLAN 2 WDS-203



FIRE HYDRANT MANHOLE SECTION A WDS-203

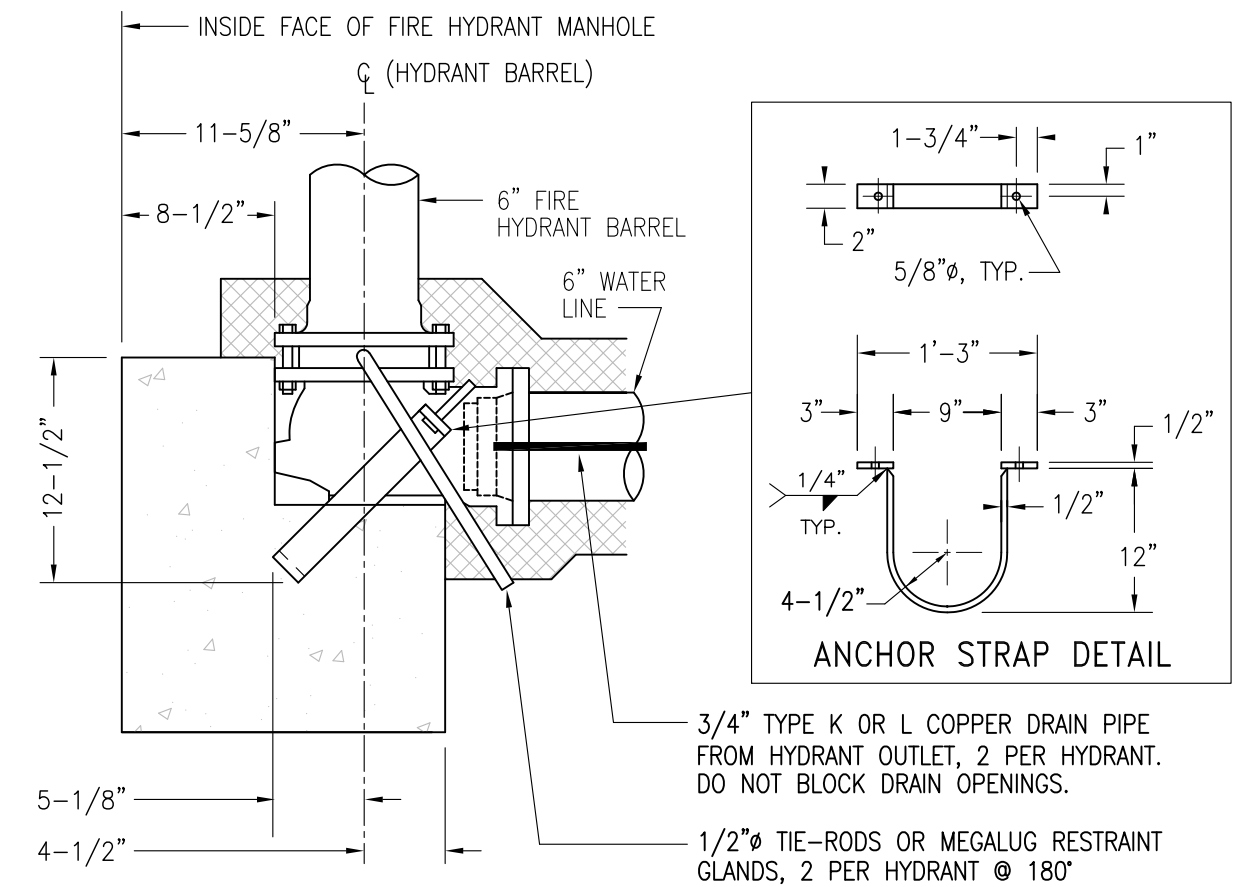
REINFORCEMENT NOT SHOWN. SEE NOTE #1 FOR REINFORCEMENT REQUIREMENTS.

FIRE HYDRANT MANHOLE TABLE

| FIRE HYDRANT LOCATION | FF ELEVATION AT HYDRANT | FINISHED GRADE ELEVATION | LENGTH OF LATERAL UTILIDOR | REMARKS |
|-----------------------|-------------------------|--------------------------|----------------------------|---------|
| EXAMPLE               | 484.23                  | 493.78                   | 10'-8"                     |         |
|                       |                         |                          |                            |         |
|                       |                         |                          |                            |         |
|                       |                         |                          |                            |         |

NOTES:

1. REINFORCE 8" MH WALLS & SLABS W/#5 REBAR @ 8" O.C. EACH WAY CENTERED IN WALL. PROVIDE MATCHING 24"x24" CORNER BARS @ WALL INTERSECTIONS AND MATCHING BENT DOWELS AND WATERSTOPS AT SLAB/WALL JOINTS.
2. A BREAKAWAY FLANGE IS REQUIRED ON FIRE HYDRANT BASE FLANGE (SHOE).
3. FIRE HYDRANT LOCATIONS AS SPECIFIED ON PROJECT CONSTRUCTION DOCUMENTS.
4. EXCAVATION SHALL CONFORM TO OSHA STANDARDS.
5. ALL FIRE HYDRANTS SHALL BE PLUMB.



FIRE HYDRANT ANCHOR & CONNECTION DETAIL 1 WDS-203

26-5/8" MANHOLE FRAME AND COVER, NEENAH R-6320-H.

TIE 1/8" BRAIDED NYLON ROPE TO VALVES SECURELY

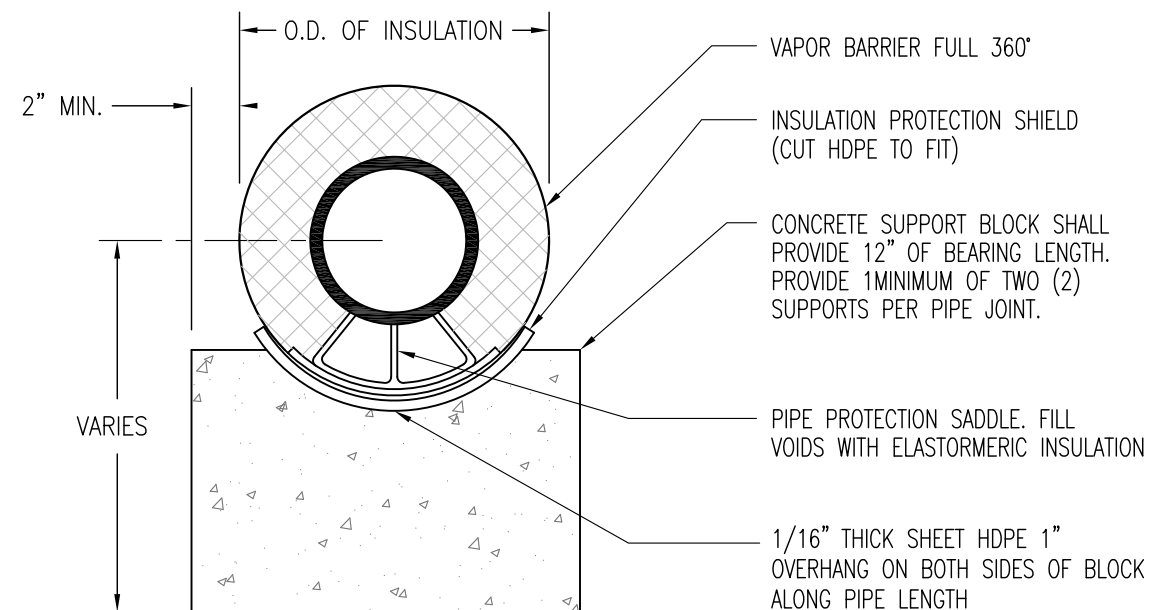
SEWER GUARD WATERTIGHT MANHOLE INSERT

APPLY 4" URETHANE FOAM & 40 MIL POLYURETHANE ELASTOMER COATING. (DO NOT COVER VALVES.)

## WATERTIGHT MANHOLE ACCESS FRAME & COVER DETAIL

2

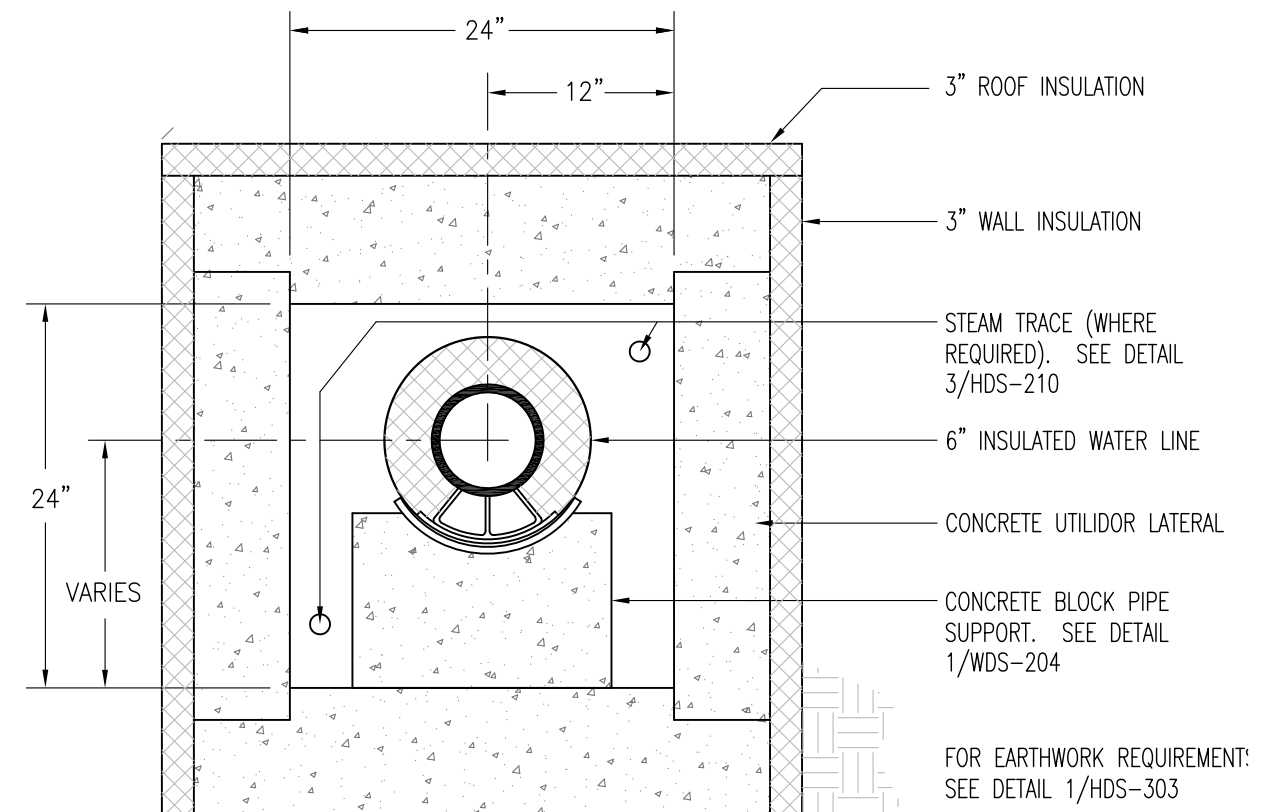
WDS-204



## FIRE HYDRANT LATERAL CONCRETE BLOCK PIPE SUPPORT DETAIL

1

WDS-204



## FIRE HYDRANT UTILIDOR LATERAL SECTION

B

WDS-204

NOTE: COORDINATE CUT GROOVE COUPLINGS WITH STEAM PIPING CLEARANCES.



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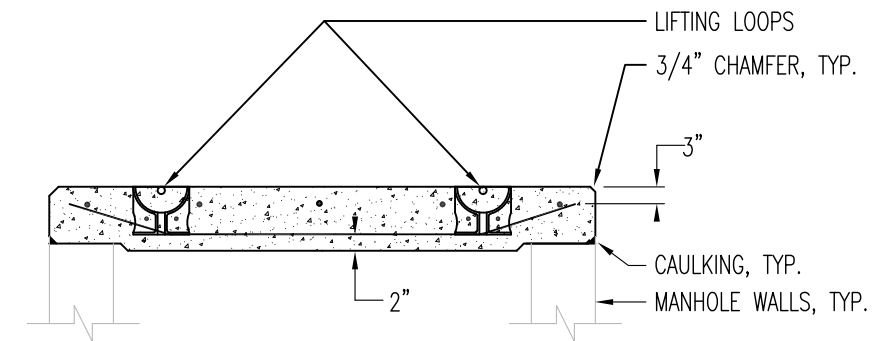
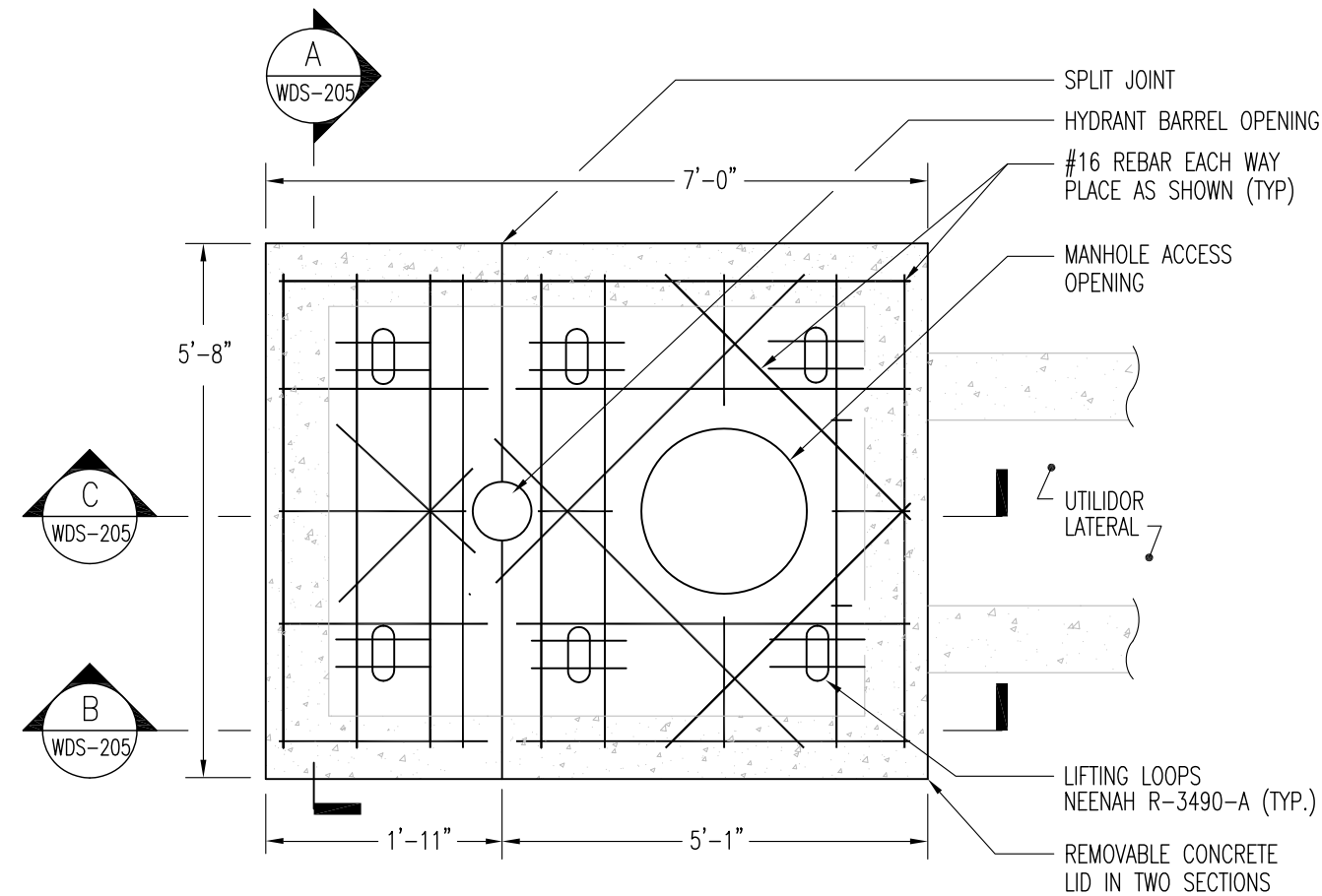
Date: 30 APR 2010  
Scale: NONE  
Designed By: CDH  
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LATERAL OFF UTILIDOR  
DESIGN & CONSTRUCTION STANDARDS  
UTILIDOR WATER DISTRIBUTION SYSTEM

Drawing No.

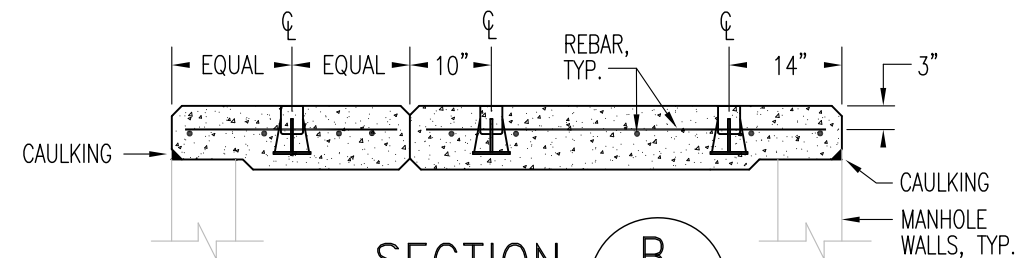
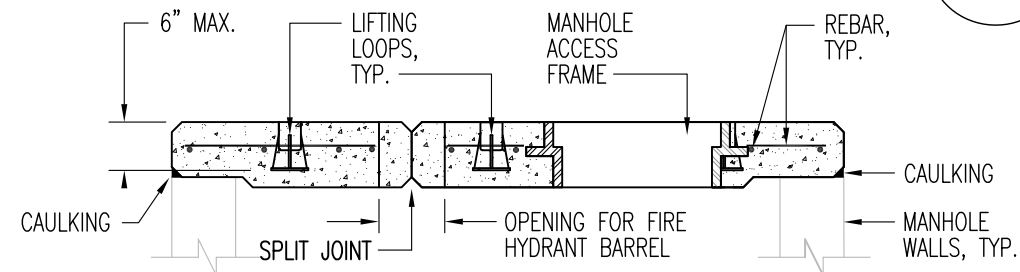
WDS-204

Previous: UES-DD-W004  
14 FEB 2010



## FIRE HYDRANT MANHOLE LID PLAN

1  
WDS-205



### NOTES:

1. LIFTING LOOPS SHALL BE 1/2" DIAMETER GALVANIZED A-36 ROUND BAR WITH 3/8" THICK x 3/4" x 3/4" HEAD WELDED TO ROD ENDS, 4" MIN. EMBED, SPACED AS SHOWN HEREIN ORBAT THIRD POINTS OF LID ALONG UTILIDOR. FLUSH OR RECESSED LIFTING LOOPS OF EQUAL OR GREATER STRENGTH AND SIMILAR ACCESSIBILITY MAY BE PROVIDED TO ALLOW "STACK CASTING" OF LIDS. ALTERNATE LIFTING LOOP DESIGN SHALL BE SUBJECT TO DOYON UTILITIES' APPROVAL.



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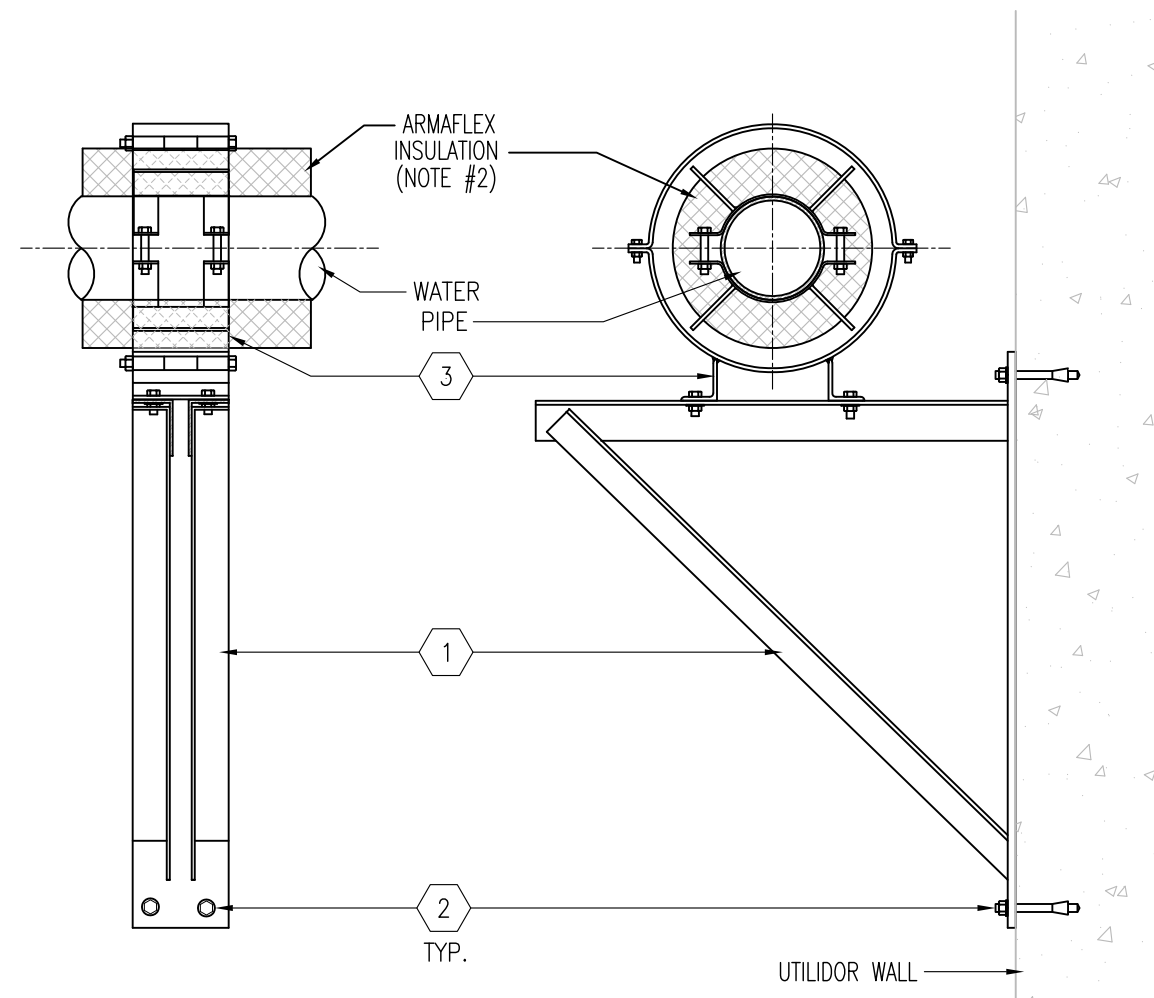
Date: 30 APR 2010  
Scale: 1/2" = 1'-0"  
Designed By: CDH  
Drawn By: MMC/GSF  
Checked By: NEM

**FIRE HYDRANT MANHOLE LID**  
**DESIGN & CONSTRUCTION STANDARDS**  
**UTILIDOR WATER DISTRIBUTION SYSTEM**

Drawing No.

**WDS-205**

Previous: UES-DD-W005  
14 FEB 2010



ELEVATION

SECTION

PIPE GUIDE DETAIL

1  
WDS-206

#### MATERIAL LIST:

| ITEM | DESCRIPTION                                           |
|------|-------------------------------------------------------|
| 1    | ANVIL FIG. 199 HEAVY WELDED STEEL BRACKET             |
| 2    | 1/2"Øx4" HILTI STAINLESS STEEL QUICK BOLT 3. (4 REQ.) |
| 3    | ANVIL FIG. 255 PIPE GUIDE                             |

#### NOTES:

- ITEMS 1 AND 3 SHALL BE SANDBLASTED AND EPOXY COATED AFTER FABRICATION. PIPE ANCHORS WITHIN 6" OF THE FLOOR SHALL ALSO BE COATED WITH ASPHALT FOR ADDITIONAL PROTECTION.
- REFER TO SPECIFICATIONS FOR PROPER INSULATION THICKNESS.

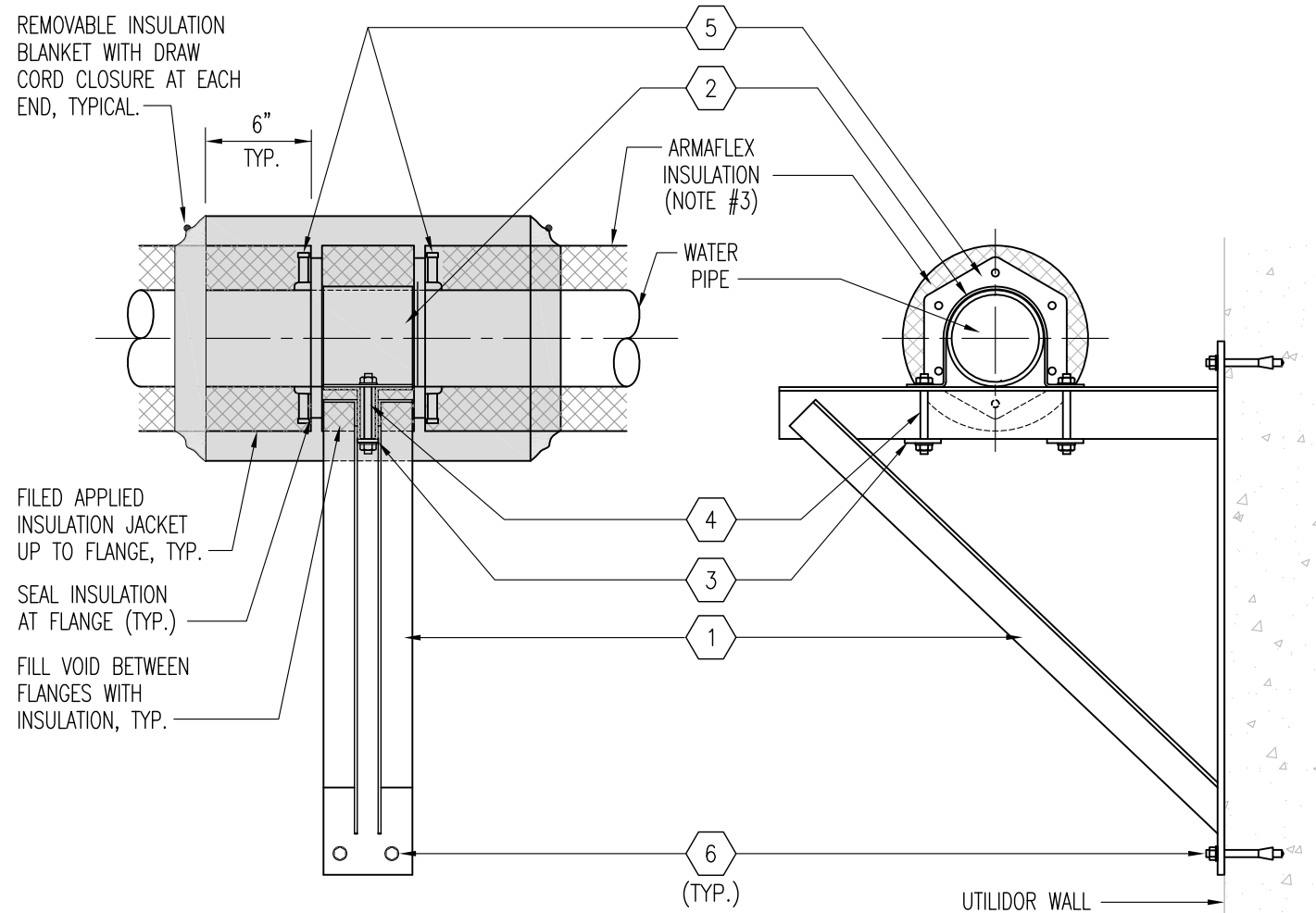


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PIPE GUIDE DETAIL  
DESIGN & CONSTRUCTION STANDARDS  
UTILIDOR WATER DISTRIBUTION SYSTEM

Drawing No.  
**WDS-206**  
Previous: UES-DD-W006  
14 FEB 2010



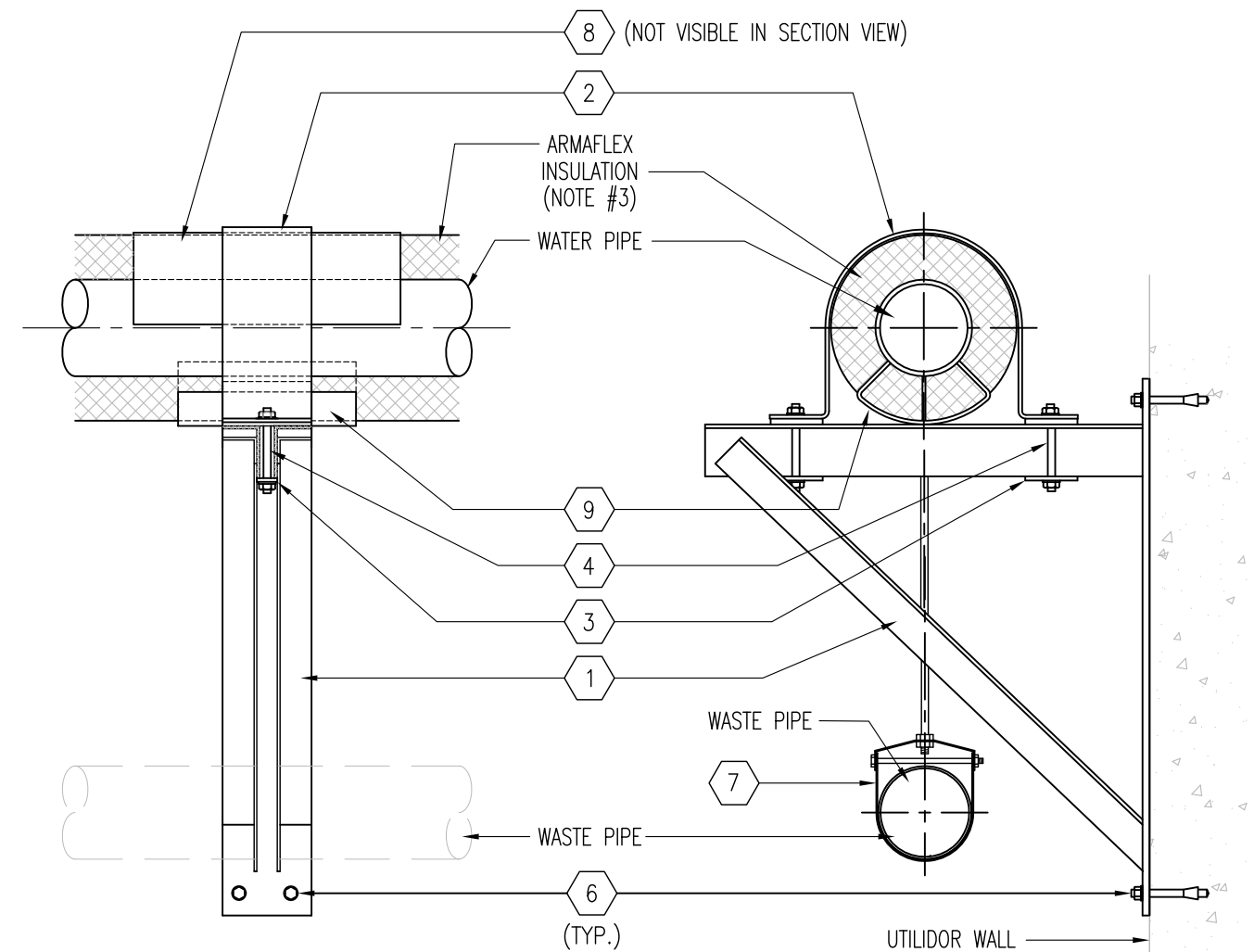
REMOVABLE INSULATION BLANKET NOT SHOWN IN SECTION VIEW

FRONT ELEVATION

SECTION

PIPE ANCHOR DETAIL

1  
WDS-207



WASTE PIPE HANGERS ARE NOT CLOSE ENOUGH TO WATER PIPE SUPPORTS TO BE VISIBLE IN THE ELEVATION VIEW.

FRONT ELEVATION

SECTION

ALTERNATE PIPE SUPPORT DETAIL

(SEE NOTE #1 BELOW.)

2  
WDS-207

# MATERIAL LIST:

| ITEM | DESCRIPTION                                                                                                                                                    |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | ANVIL FIG. 199 HEAVY WELDED STEEL BRACKET                                                                                                                      |
| 2    | B-LINE FIG. X HOLD DOWN ANCHOR CLAMP<br>X: B-LINE FIG. X SHALL BE BASED ON B3252 SERIES AND PIPE OUTER DIAMETER OR PIPE O.D. PLUS THERMAL INSULATION THICKNESS |
| 3    | ANVIL FIG. 60 GALV. STEEL WASHER PLATE                                                                                                                         |
| 4    | ANVIL FIG. 140 GALV. THREAD ROD WITH DOUBLE HEX NUTS AND FLAT WASHERS                                                                                          |

| ITEM | DESCRIPTION                                                  |
|------|--------------------------------------------------------------|
| 5    | CLOW MECHANICAL JOINT RETAINER FIG. F-1058 BOLT TIGHT FLANGE |
| 6    | 1/2"Øx4" HILTI STAINLESS STEEL QUICK BOLT 3. (4 REQ.)        |
| 7    | ANVIL FIG 590 CLEVIS HANGER                                  |
| 8    | ANVIL FIG. 167 INSULATION PROTECTION SHIELD                  |
| 9    | ANVIL FIG. 160 PIPE SADDLE                                   |

## NOTES:

- REFER TO DRAWING HDS-203 FOR PRIMARY PIPE SUPPORT METHOD. ALTERNATE PIPE SUPPORT METHOD SHOWN IN DETAIL #2 ON THIS SHEET MAY BE USED TO HANDLE SPECIFIC CONDITIONS.
- ITEMS 1 AND 2 SHALL BE SANDBLASTED AND EPOXY COATED AFTER FABRICATION. PIPE ANCHORS WITHIN 6" OF FLOOR SHALL ALSO BE COATED WITH ASPHALT FOR ADDITIONAL PROTECTION.
- \*REFER TO SPECIFICATIONS FOR PROPER INSULATION THICKNESS.



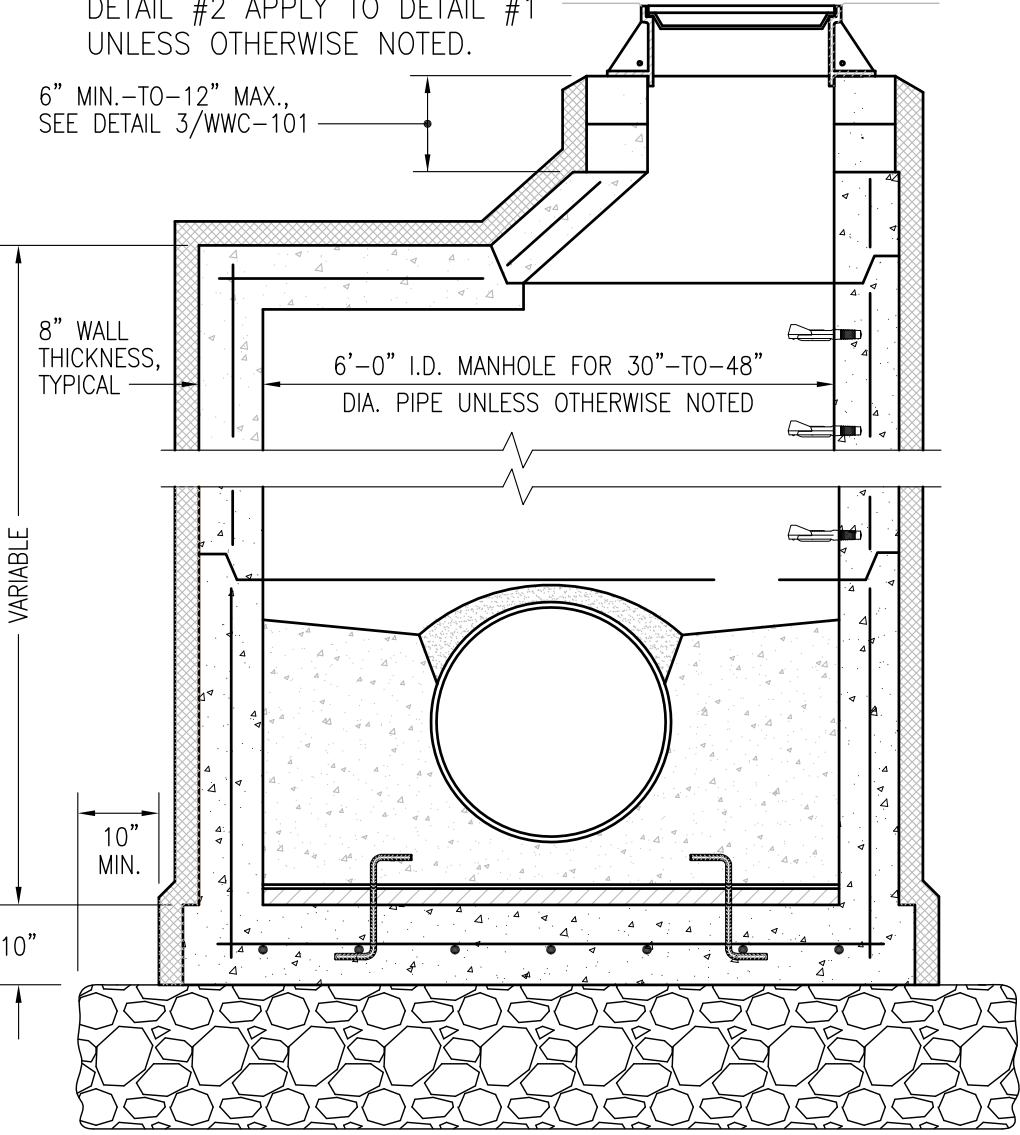
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PIPE ANCHOR AND ALTERNATE SUPPORT DETAILS  
DESIGN & CONSTRUCTION STANDARDS  
UTILIDOR WATER DISTRIBUTION SYSTEM

Drawing No.  
**WDS-207**  
Previous: UES-DD-W007  
14 FEB 2010

NOTE: ALL NOTES AND DIMENSIONS ON  
DETAIL #2 APPLY TO DETAIL #1  
UNLESS OTHERWISE NOTED.



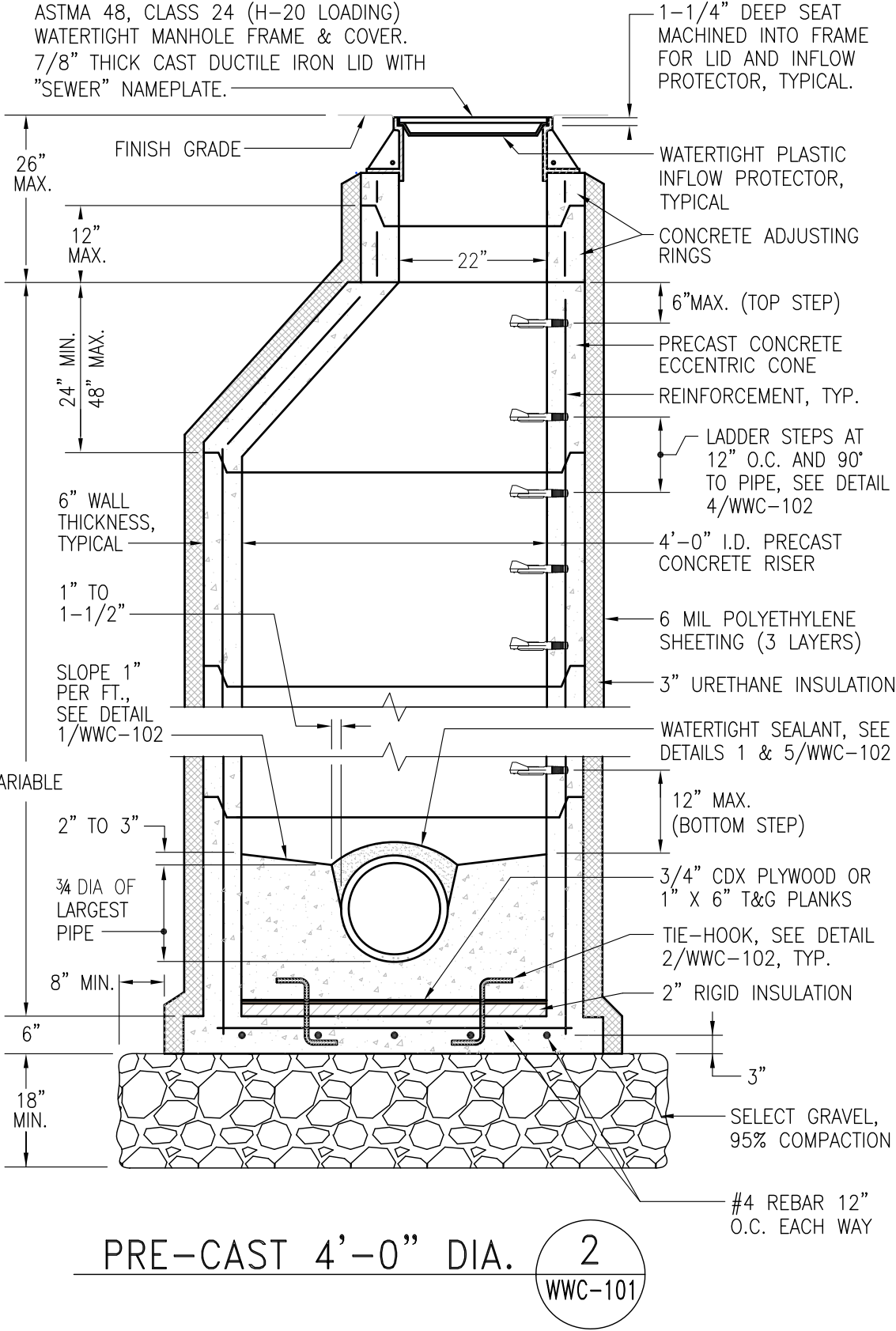
PRE-CAST 6'-0" DIA. 1  
WWC-101

| SECTION        | MANHOLE SIZE              |                           |
|----------------|---------------------------|---------------------------|
|                | 48"                       | 72"                       |
| FLAT BASE      | 0.39 SQ IN/FT<br>EACH WAY | 0.39 SQ IN/FT<br>EACH WAY |
| RISER SECTION* | 0.12 SQ IN/FT             | 0.18 SQ IN/FT             |
| CONE SECTION*  | 0.12 SQ IN/FT             | -----                     |
| ADJUSTING RING | 0.024 SQ IN               | 0.024 SQ IN               |

\*CIRCUMFERENTIAL REINFORCING 0.024 SQ. IN.  
ALL AREAS ARE MINIMUM CROSS-SECTIONAL AREA O  
REINFORCEMENT PER FOOT OF SECTION.

# MANHOLE REINFORCEMENT SCHEDULE

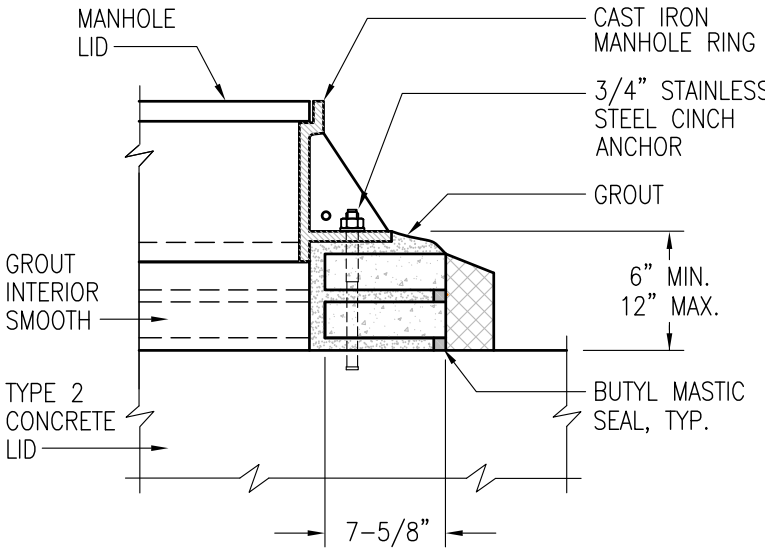
(SHALL COMPLY WITH AASHTO M-199-ASTM C-478)



PRE-CAST 4'-0" DIA. 2  
WWC-101

- NOTES:
1. MASTIC GASKETS ALL BARREL JOINTS.
  2. NO REBAR TO EXTEND INTO PIPE OPENINGS.
  3. RUNGS TO BE PLACED 12" ON CENTER ON UNOBSTRUCTED SIDE OF MANHOLE 18" MAX. FROM BOTTOM OF MANHOLE AND 6" MAX. FROM TOP OF CONE. IF UNOBSTRUCTED SIDE NOT AVAILABLE, BOTTOM RUNG TO BE PLACED 6" OVER SMALLEST PIPE.
  4. MANHOLE SHALL RECEIVE 3 LAYERS OF 6 MIL. POLYETHYLENE ALL AROUND PLACE BETWEEN BACKFILL AND INSULATION.
  5. BACKFILL UNDER MANHOLE WITH SUBBASE MATERIAL AT 95% MAX. DENSITY OR COMPACT NATIVE MATERIALS TO 95% MAX. DENSITY.
  6. ALL PRECAST MANHOLE SECTIONS SHALL CONFORM TO ASTM-478.
  7. COVERS DEPRESSED 3/8" BELOW FINISHED GRADE.
  8. CONCRETE 2500 PSI (MIN.) WALLS & BOTTOM
  9. LIFT HOLES IN MANHOLES TO BE SEALED WITH HYDRAULIC CEMENT, AND EXTERIOR COATED WITH A BITUMINOUS PAINT.

2-1/4" X 3-5/8" X 7-5/8" CONCRETE BRICK,  
TWO (2) COURSES MINIMUM AS SHOWN, OR TWO  
(2) CONCRETE ADJUSTING RINGS SET IN GROUT.  
ALL GROUT SHALL BE NON-SHRINK.



GROUT & CONCRETE  
BRICK ALTERNATIVE 3  
WWC-101



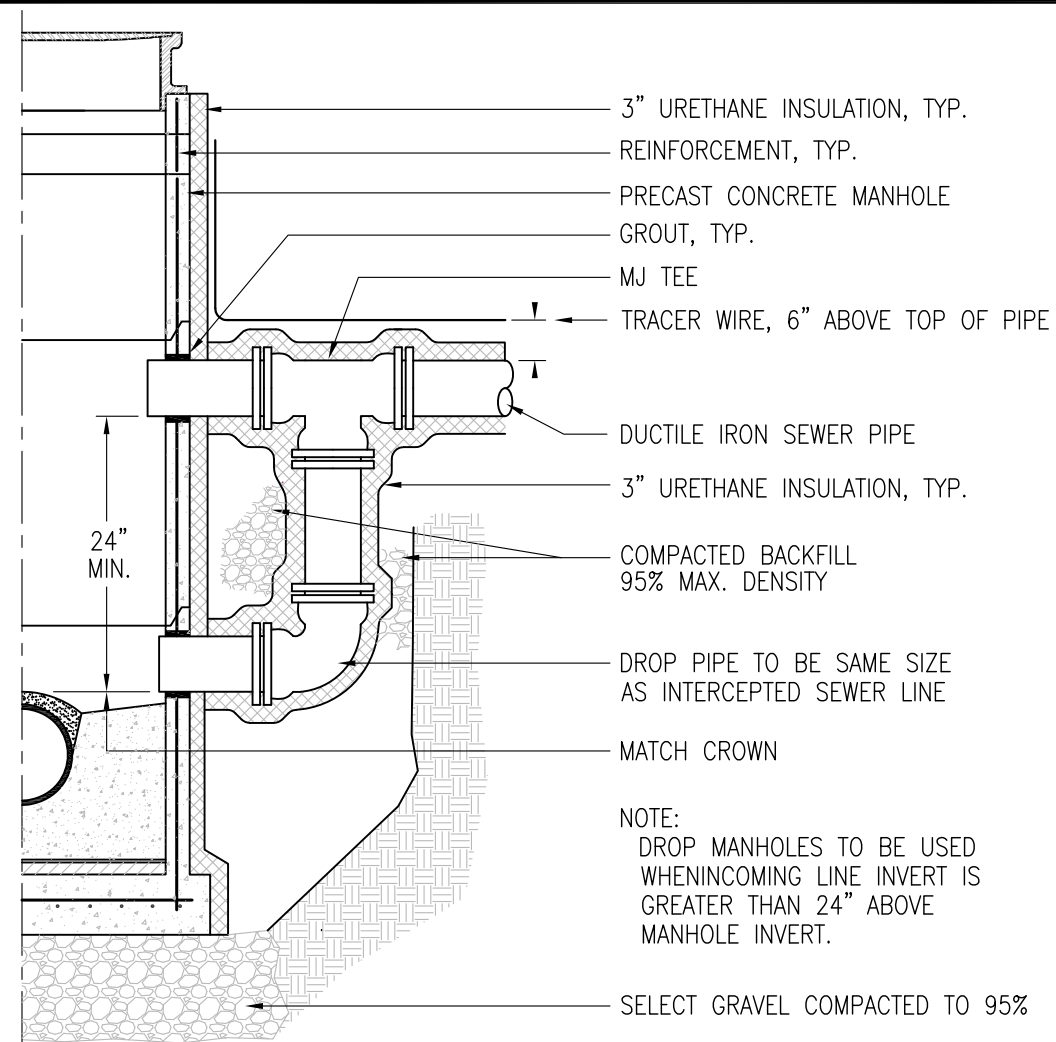
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714 Fourth Avenue, Suite 201  
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Telephone (907) 455-1500  
Fax (907) 455-6788

Date: 30 APR 2010  
Scale: N/A  
Designed By: CDH  
Drawn By: MMC/GSF  
Checked By: NEM

GRAVITY SEWER MANHOLE SECTIONS  
DESIGN & CONSTRUCTION STANDARDS  
DIRECT BURY WASTEWATER COLLECTION SYSTEM

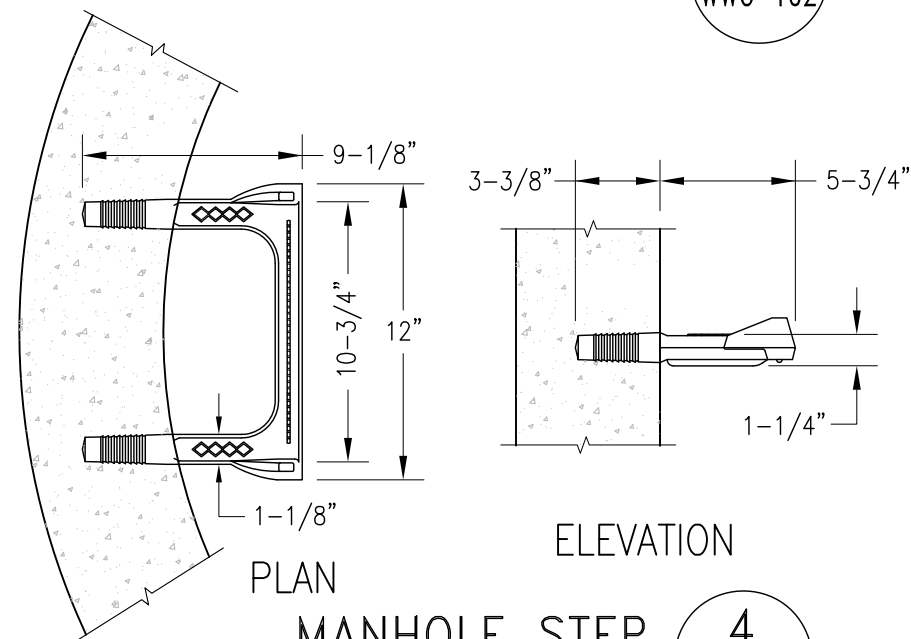
Drawing No.  
**WWC-101**  
Previous: UES-DD-S101  
19 MAR 2010





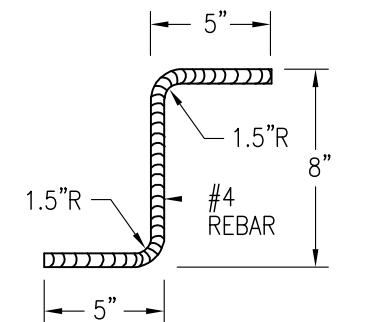
DROP MANHOLE CONNECTION

1  
WWC-102



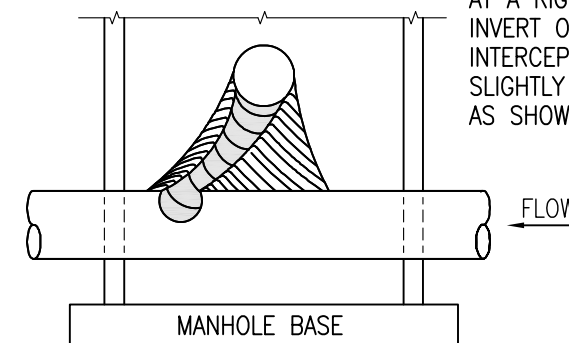
MANHOLE STEP

4  
WWC-102



TIE HOOK

2  
WWC-102



WHEN INSTALLING A BEAVER SLIDE THAT  
INTERCEPTS AN EXISTING SEWER LINE  
AT A RIGHT ANGLE. THE CONNECTING  
INVERT OF THE BEAVER SLIDE IS TO  
INTERCEPT THE EXISTING SEWER  
SLIGHTLY ABOVE THE EXISTING SPRINGLINE  
AS SHOWN.

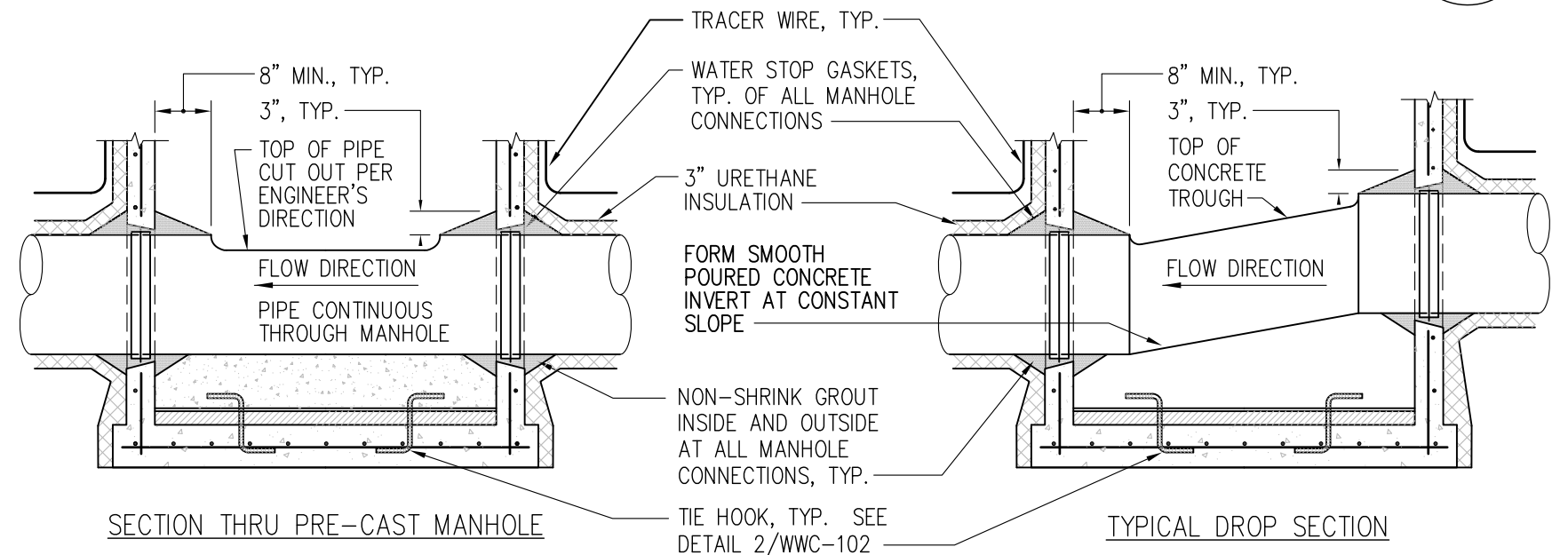
MAXIMUM VERTICAL DROP FOR BEAVER  
SLIDE (MEASURED CROWN TO CROWN):

32" FOR 12" PIPE  
30" FOR 10" PIPE  
28" FOR 8" PIPE

WHEN INSTALLING A BEAVER SLIDE WHERE  
THE FLOW IS STRAIGHT THROUGH THE  
MANHOLE, THE BEAVER SLIDE IS TO MATCH  
THE INVERT OF THE EXISTING LINE AND  
NOT EXTEND MORE THAN HALFWAY  
THROUGH THE MANHOLE.

TYPICAL BEAVER SLIDES

3  
WWC-102



TYPICAL MANHOLES

5  
WWC-102

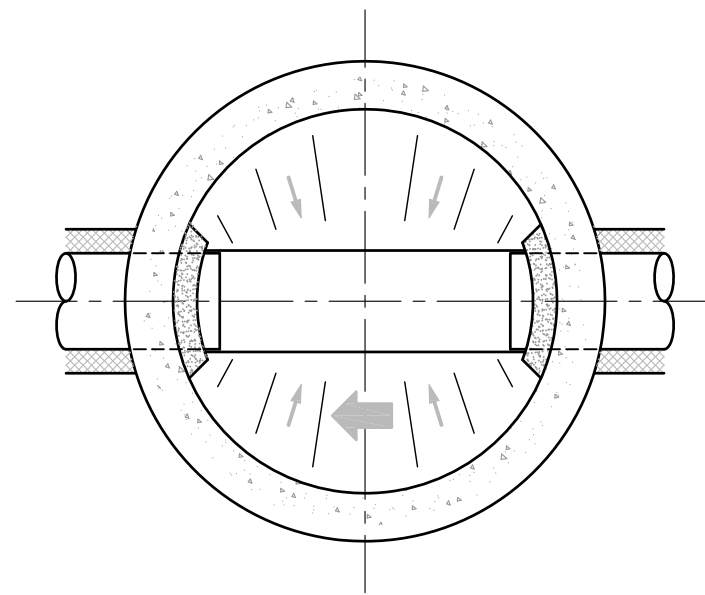


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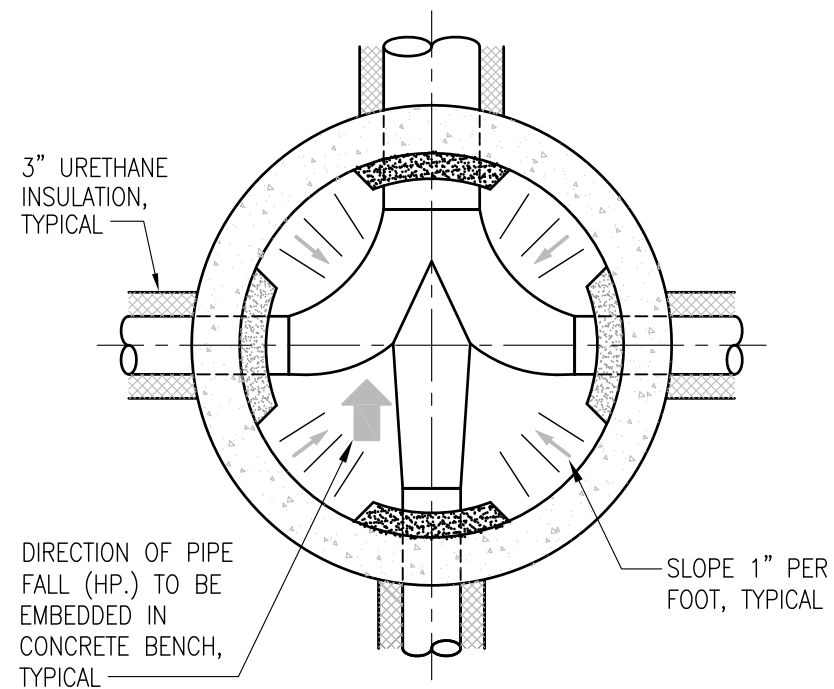
Date: 30 APR 2010  
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GRAVITY SEWER MANHOLE DETAILS  
DESIGN & CONSTRUCTION STANDARDS  
DIRECT BURY WASTEWATER COLLECTION SYSTEM

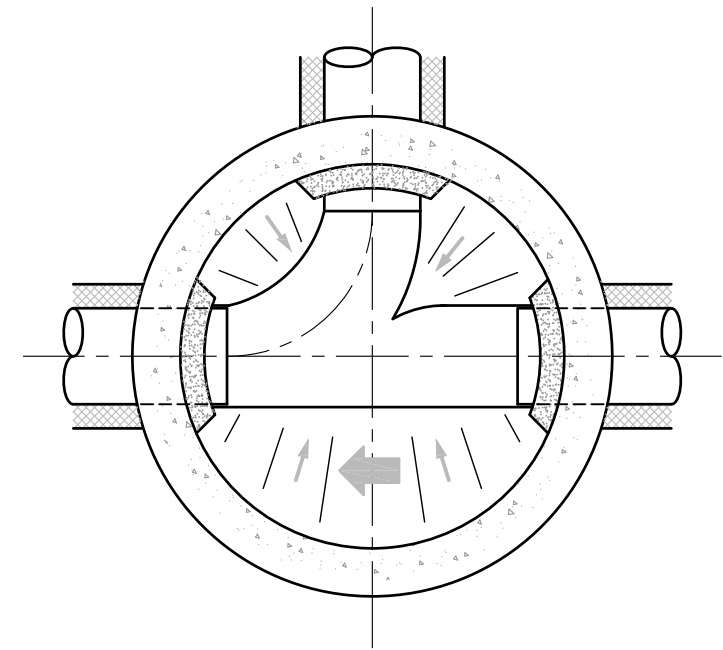
Drawing No.  
**WWC-102**  
Previous: UES-DD-S102  
15 SEPT 2009



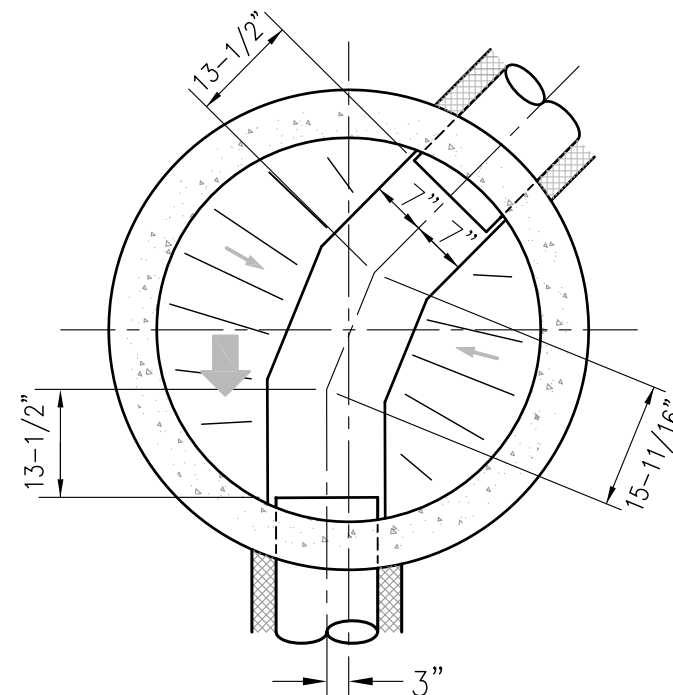
STRAIGHT-THROUGH BASE



DOUBLE "TY" BASE



"TY" BASE



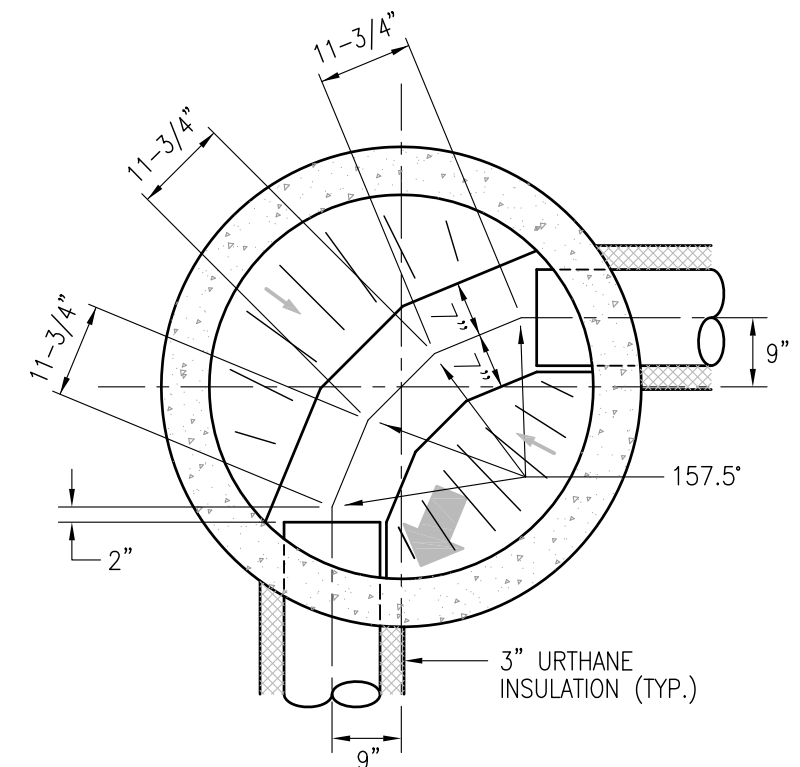
45° BEND BASE

CONCRETE BASE DIAMETER MAY BE:  
64" FOR A8" MANHOLES; 92" FOR 72" MANHOLES

DIMANSIONS SHOWN ARE FOR 48" MANHOLE

TYPICAL PLANS, MANHOLE BASE

1  
WWC-103



90° BEND BASE



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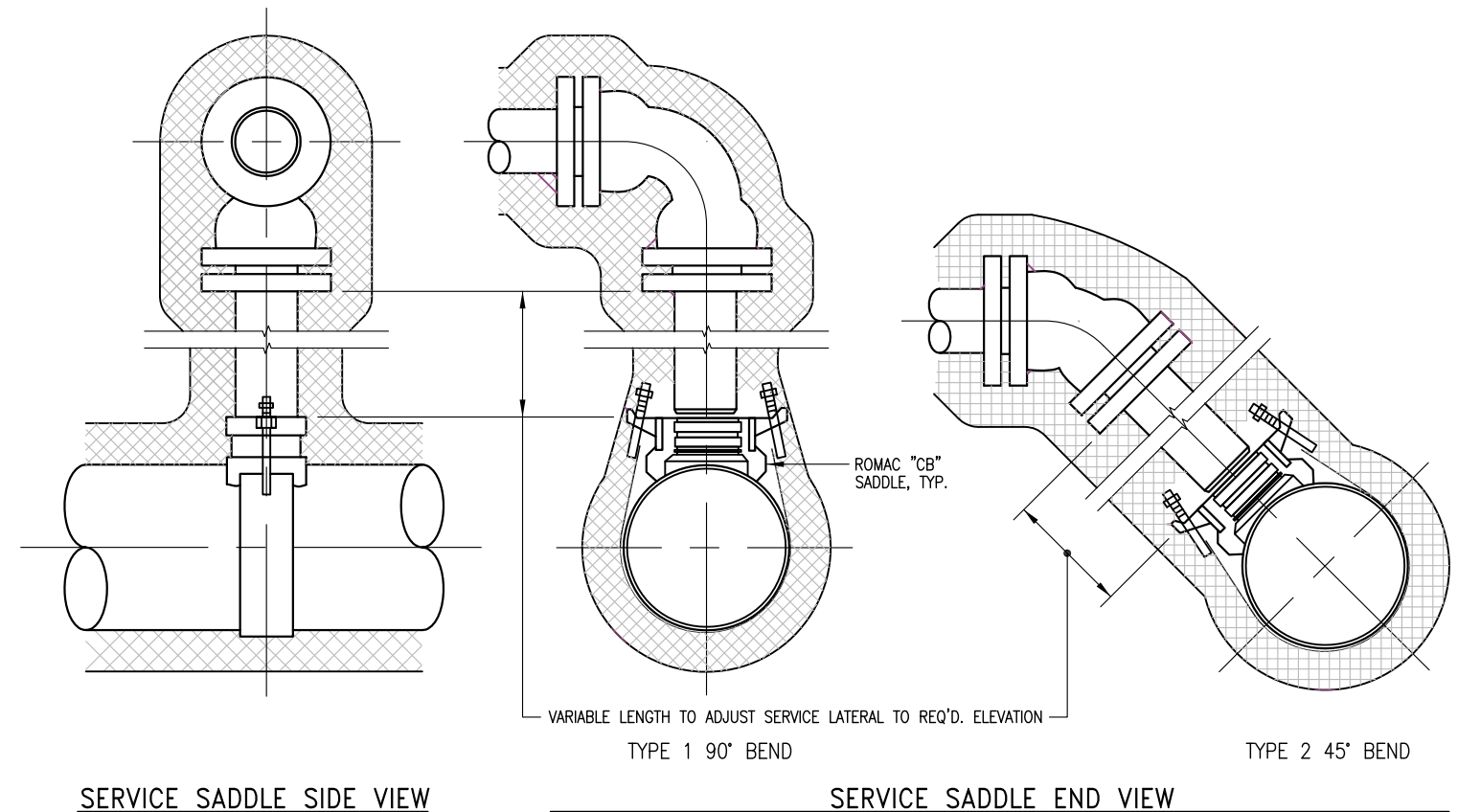
**GRAVITY SEWER MANHOLE DETAILS**  
**DESIGN & CONSTRUCTION STANDARDS**  
**DIRECT BURY WASTEWATER COLLECTION SYSTEM**

Drawing No.  
**WWC-103**  
Previous: UES-DD-S103  
15 SEPT 2009



# NOTES

1. WHEN BUILDING SERVICE PIPING IS HDPE OR WOODSTAVE, ALL FITTINGS SHALL BE NO HUB CAST IRON CONNECTED WITH MISSION/FERNCO COUPLINGS.
2. WHEN BUILDING SERVICE PIPING IS D.I.P., ALL FITTINGS AND BENDS SHALL BE OF DUCTILE IRON.
3. BUILDING SERVICE PIPING AND FITTINGS SHALL BE INSULATED WITH A MINIMUM 3" OF URETHANE.
4. BUILDING SERVICES ARE TYPICALLY 4" DIAMETER, WITH 6" FOR SPECIAL CASES.
5. MINIMUM COVER FOR SEWER SERVICES IS 4 FT.
6. MINIMUM SLOPE OF SERVICE LATERAL – 1/4" PER 1 FT. (S=0.02 FT/FT)



## SEWER SERVICE LATERAL CONNECTION DETAILS

1  
WWC-104

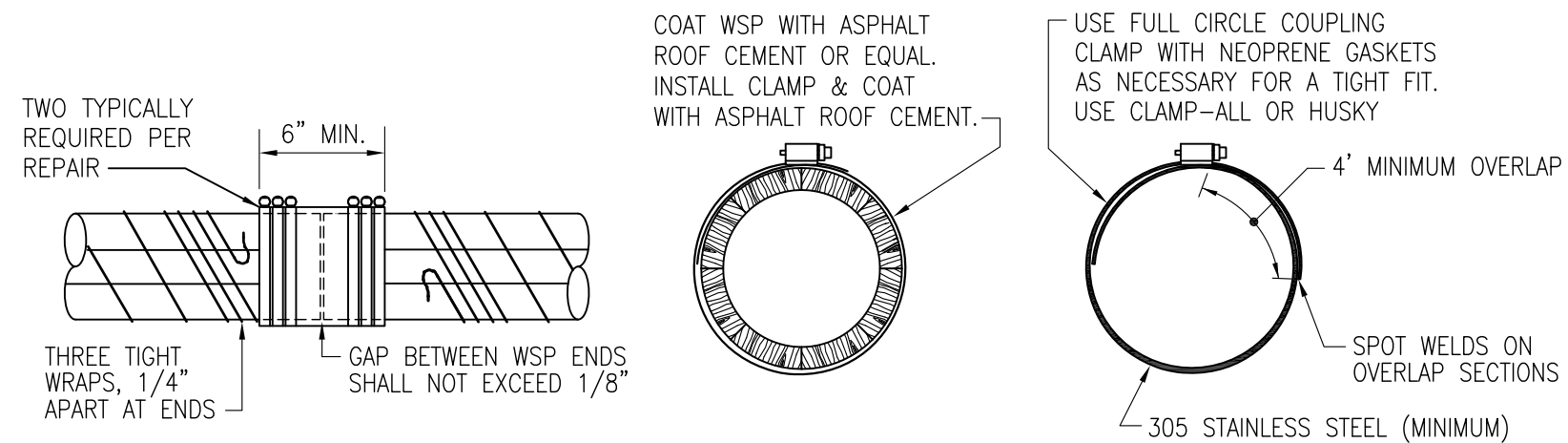


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**SERVICE LATERAL CONNECTION DETAILS**  
**DESIGN & CONSTRUCTION STANDARDS**  
**DIRECT BURY WASTEWATER COLLECTION SYSTEM**

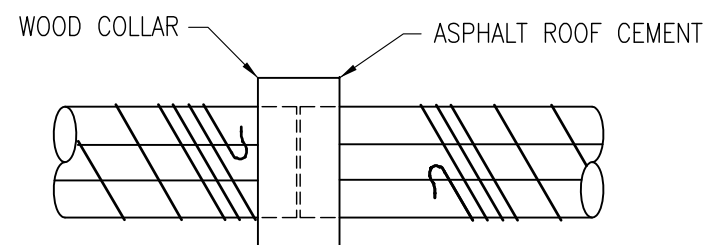
Drawing No.  
**WWC-104**  
Previous: UES-DD-S104  
15 SEPT 2009



NOTE: WHEN CONNECTING SEWER SERVICE PIPES DIFFERENT OUTSIDE DIAMETERS, MATCH INSIDE DIAMETERS AND BUILD UP THE SMALLER O.D. PIPE WITH 3" WIDE NEOPRENE GASKET MATERIAL. COAT WITH ASPHALT ROOF CEMENT.

## WOOD STAVE PIPE REPAIR DETAIL

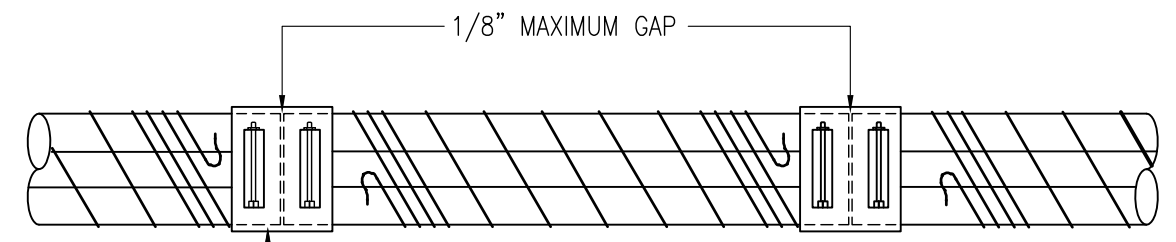
1  
WWC-105



NOTE: SEWER MAINS AND SERVICE MAINS SHALL BE INSULATED WITH MIN. 3" URETHANE INSULATION.

## TYPICAL WOOD STAVE PIPE CONNECTION DETAIL

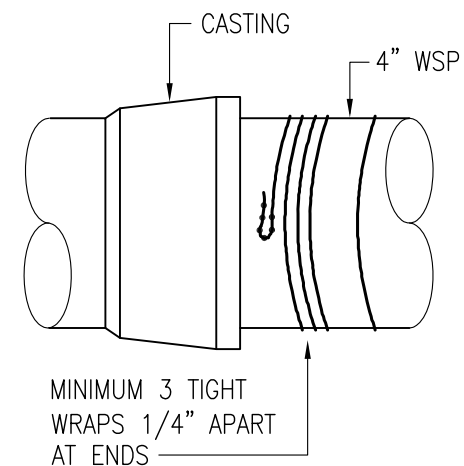
2  
WWC-105



WHEN REPAIRING WOOD STAVE PIPE, CUT AND REMOVE THE DAMAGED SECTION, MAKING CUTS PERPENDICULAR TO THE PIPE AXIS. STAPLE BANDING TO ALLOW A MINIMUM OF THREE WRAPS OF THE WIRE AT EACH END. STAPLE ACCORDING TO DETAIL THIS SHEET. CUT NEW WSP TO LENGTH, ALLOWING A MAXIMUM OF 1/8" GAP AT EACH END. CREOSOTE SHALL BE APPLIED TO ALL FRESHLY CUT ENDS OF PIPE. INSTALL FLEXIBLE COUPLING (DRESSER 62 OR 263), FULL CIRCLE CLAMP (DRESSER 253).

## WOOD STAVE PIPE REPAIR DETAIL

4  
WWS-105



### NOTES:

1. TYPE 45° AND 60° WSP HOUSE SERVICE LINES SHALL BE STAPLED ON TOP OF PIPE.
2. SIX GALVANIZED STAPLES TO BE USED AT EACH WIRE ENDING.
3. STAPLES NOT TO PENETRATE INNER SURFACE OF PIPE.
4. STAPLES EVERY 18" THROUGHOUT THE LENGTH OF THE PIPE SECTION.

## TYPICAL WOOD STAVE PIPE STAPLE DETAIL

3  
WWC-105



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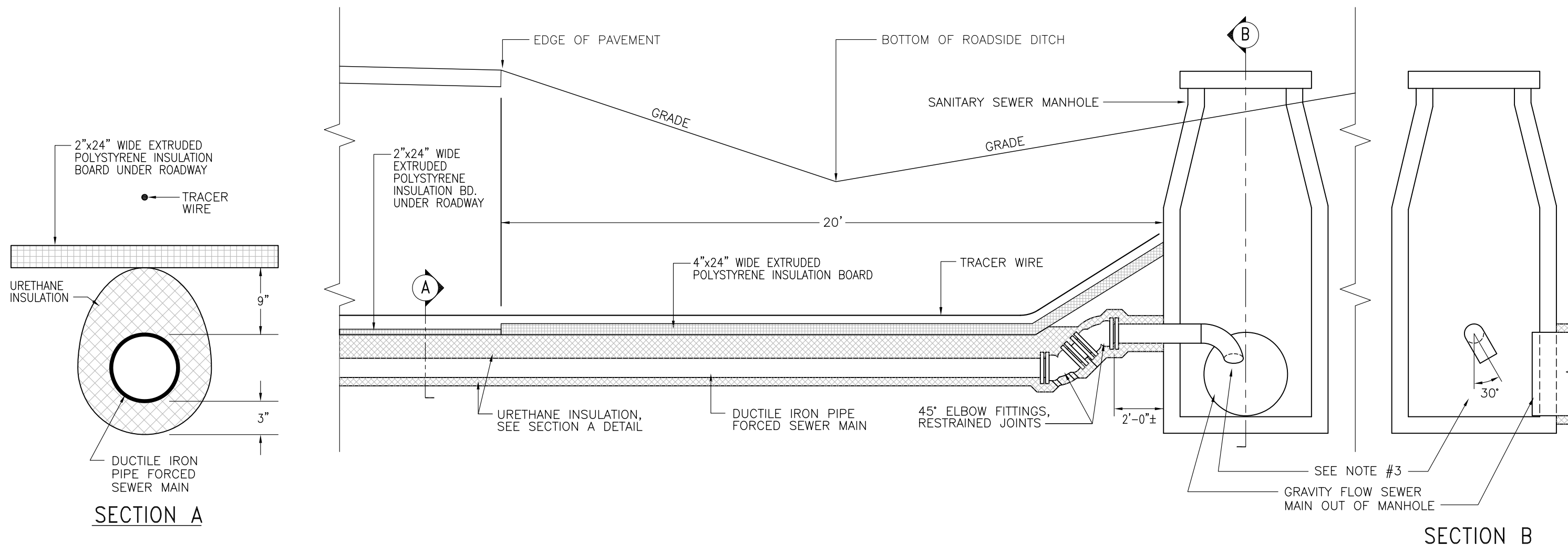
**GRAVITY SEWER PIPING DETAILS**  
**DESIGN & CONSTRUCTION STANDARDS**  
**DIRECT BURY WASTEWATER COLLECTION SYSTEM**

Drawing No.

**WWC-105**

Previous: UES-DD-S105  
15 SEPT 2009





## FORCED SEWER MAIN AT ROAD CROSSING

1  
WWC-107

### NOTES:

1. BOARD INSULATION 4" WIDE CENTERED ON PIPE.
2. INVERT ELEVATION IS AT DIP. EXCAVATE TRENCH AS REQUIRED TO ACCOMMODATE PIPE INSULATION.
3. TERMINATE PIPE INSULATION AT OUTSIDE WALL OF MANHOLE. BORE HOLE IN MANHOLE WALL TO INSERT PIPE. DOUBLE WRAP PIPE WITH POLYETHYLENE SHEET AT PENETRATION. GROUT PIPE IN PLACE WITH NON-SHRINK GROUT. INSTALL 90° ELBOW AT DISCHARGE END WITH OPEN END ROTATED 30° FROM STRAIGHT DOWN TOWARD DIRECTION OF FLOW.
4. ROAD: SAWCUT PAVEMENT. SEGREGATE AND STORE EXCAVATED STRUCTURAL FILL FOR USE AS TRENCH BACKFILL. PLACE BACKFILL TO MATCH EXISTING STRUCTURAL SECTION. USE CLASSIFIED MATERIAL AS MAKE-UP. REPLACE ASPHALT, MATCH EXISTING THICKNESS

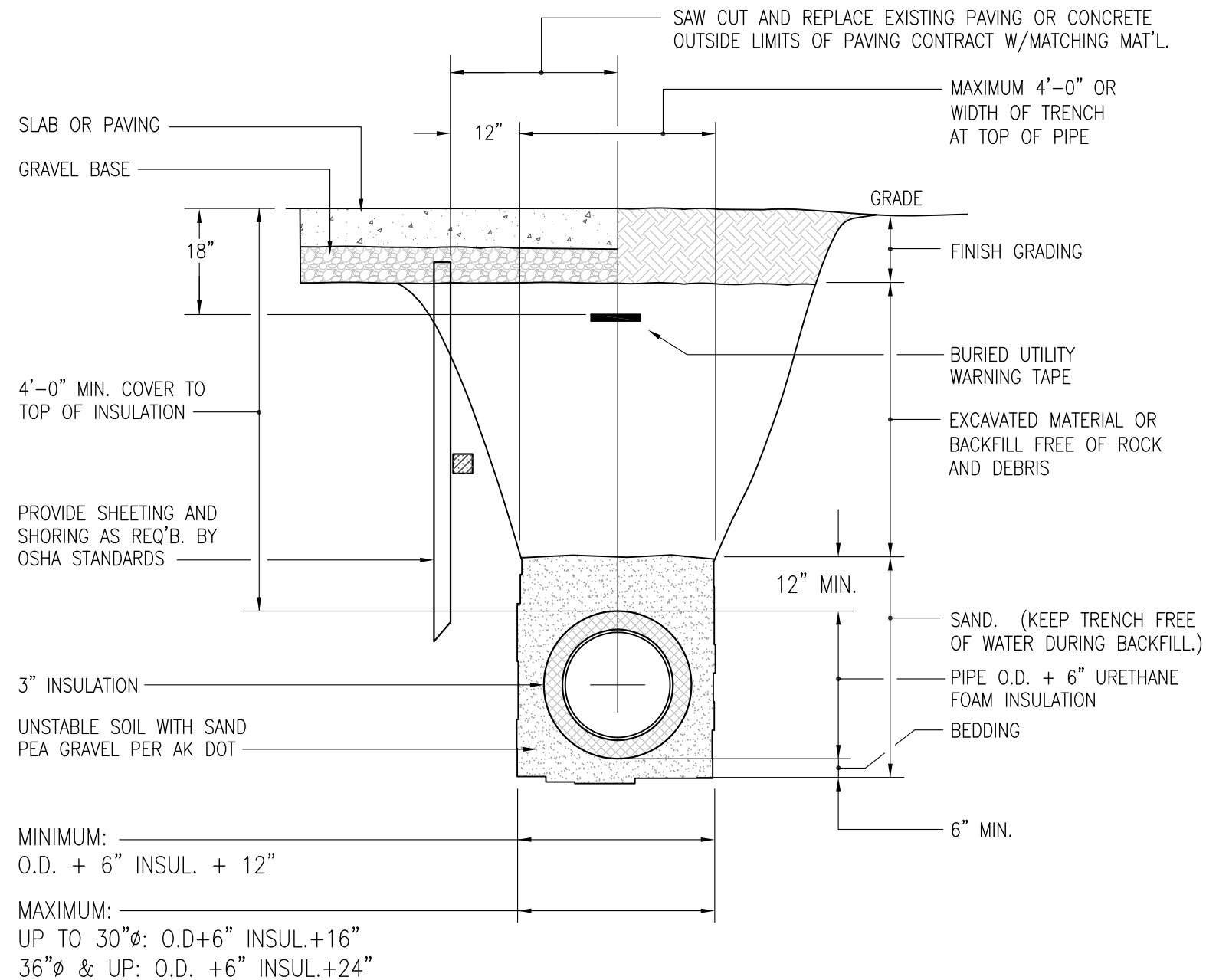


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**FORCED MAIN AT ROAD CROSSING**  
**DESIGN & CONSTRUCTION STANDARDS**  
**DIRECT BURY WASTEWATER COLLECTION SYSTEM**

Drawing No.  
**WWC-107**  
Previous: UES-DD-S107  
15 SEPT 2009



SEWER TRENCH

1

WWC-108

#### NOTES

1. PIPE BEDDING MATERIAL AND INSTALLATION PROCEDURES SHALL BE AS SPECIFIED BY THE DIRECT BURY PIPE MANUFACTURER.
2. FOR NON-PAVING AREAS, BACKFILL MATERIAL ABOVE THE PIPE BEDDING MATERIAL SHALL COMPLY WITH ALASKA DOT SECTION 204 - 2.01 TYPE C.
3. FOR PAVING - SIDEWALK AREAS BACKFILL MATERIAL SHALL COMPLY WITH ALASKA DOT SECTION 204 - 2.01 TYPE A, ABOVE PIPE/INSULATION AND BEDDING.
4. BACKFILL BEDDING SHALL COMPLY WITH ALASKA DOT SECTION 204 - 2.01 TYPE C.
5. BACKFILL COMPACTION SHALL COMPLY WITH ALASKA DOT SECTION 301 - 3.03 MOISTURE/DENSITY RELATIONS OF SOILS SHALL BE CALCULATED IN ACCORDANCE WITH AASHTO T 99 OR T 180.
6. PIPE SHALL BE PER DOYON UTILITIES, STANDARDS UES-TS-S102.
7. THERMAL INSULATION SHALL BE PER DOYON UTILITIES , STANDARDS UES-TS-S104.
8. SHEETING AND SHORING SHALL BE PER OSHA STANDARDS.
9. EXCAVATION, EARTHWORK, CLEARING AND GRUBBING SHALL BE ALASKA DOT 201, 204 AND 603.
10. WHERE WATERMAINS APPROACH WITHIN 10 FEET OF HORIZONTAL CLEARANCE AND ARE BELOW OR LESS THAN 3 FEET ABOVE EXISTING SANITARY OR STORM SEWERS ENCASE THE SANITARY AND STORM SEWER WITH A JACKET OF CLASS A CONCRETE 3 INCHES THICK FOR 10 FEET ON EACH SIDE OF THE CROSSING.
11. CONCRETE ENCASEMENT IS NOT REQUIRED IF EXISTING SANITARY OR STORM SEWERS ARE DUCTILE IRON PIPE WITH JOINTS AT LEAST 8 FEET FROM THE WATER MAIN, OR IF REPLACEMENT OF EXISTING SANITARY OR STORM SEWER WITH DUCTILE IRON PIPE.



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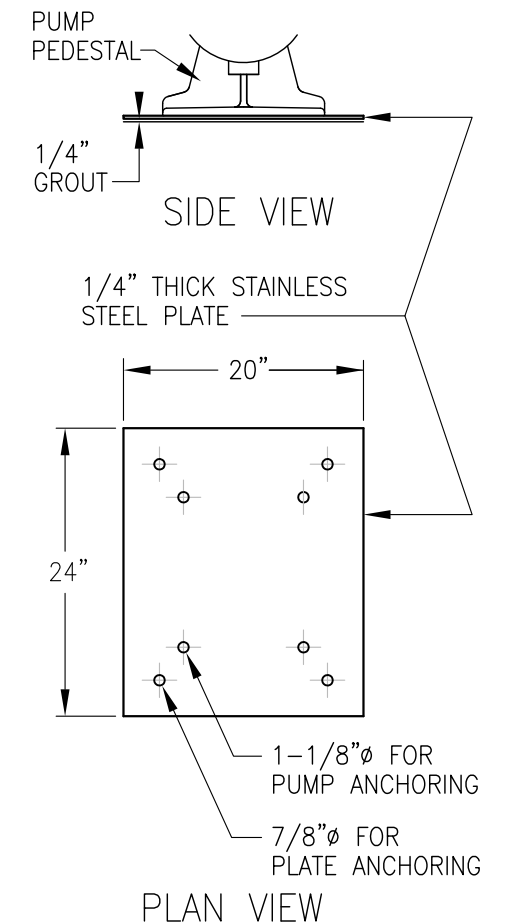
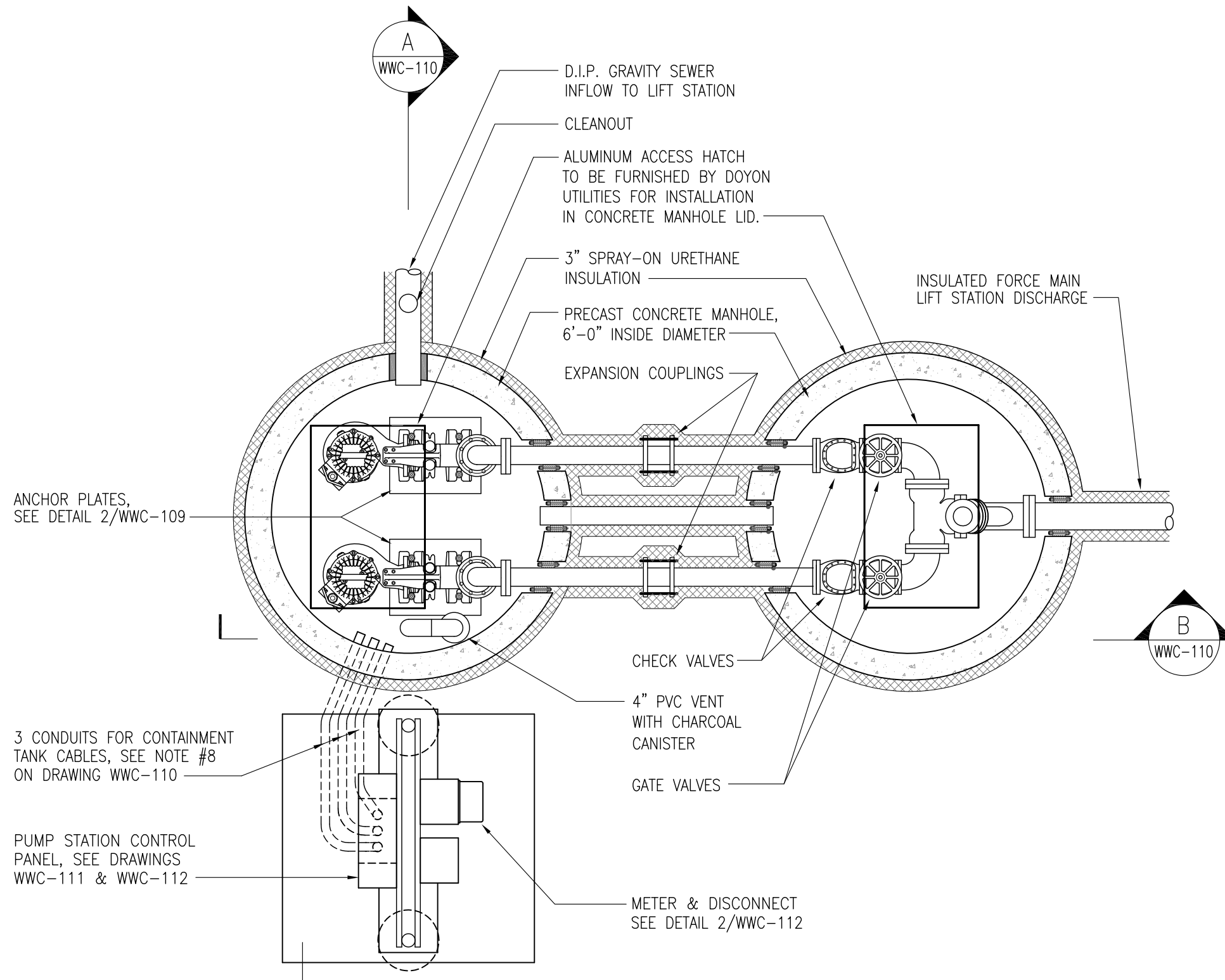
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Designed By: CDH  
Drawn By: MMC/GSF  
Checked By: NEM

**GRAVITY SEWER TRENCH DETAIL**  
**DESIGN & CONSTRUCTION STANDARDS**  
**DIRECT BURY WASTEWATER COLLECTION SYSTEM**

Drawing No.

**WWC-108**

Previous: UES-DD-S108  
15 SEPT 2009



ANCHOR PLATE DETAIL

2  
WWC-109

DUPLEX PUMP SEWER LIFT STATION & VALVE BOX – PLAN

1  
WWC-109



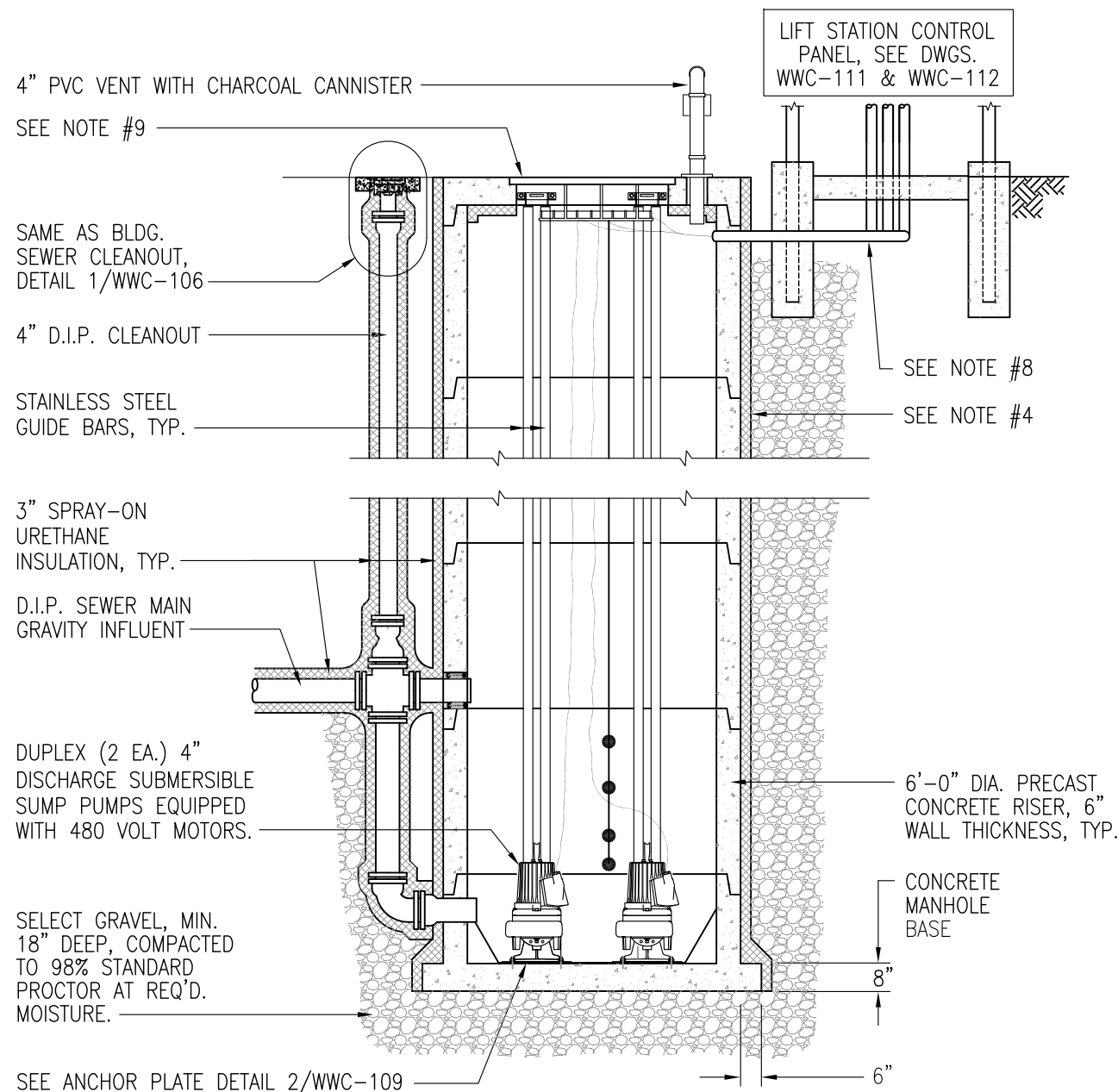
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LIFT STATION & VALVE BOX PLAN  
DESIGN & CONSTRUCTION STANDARDS  
DIRECT BURY WASTEWATER COLLECTION SYSTEM

Drawing No.  
**WWC-109**  
Previous: UES-DD-S201  
15 SEPT 2009





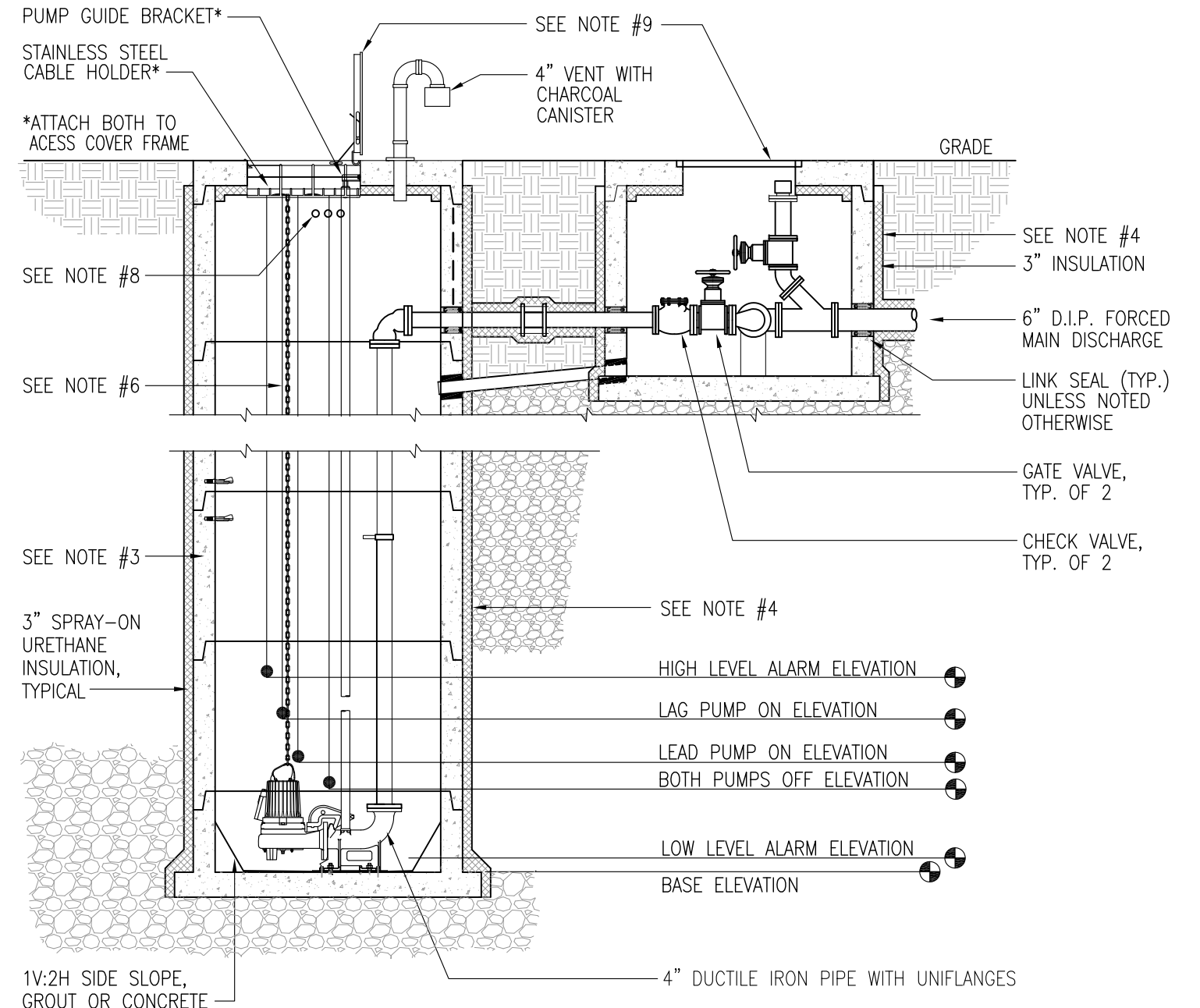
## DUPLEX PUMP LIFT STATION – SECTION A

REBAR REINFORCEMENT NOT SHOWN FOR CLARITY

A  
WWC-110

### NOTES:

1. MASTIC GASKETS ALL BARREL JOINTS.
2. NO REBAR TO EXTEND INTO PIPE OR CONDUIT OPENINGS.
3. MANHOLE SHALL RECEIVE 3 LAYERS OF 6 MIL. POLYETHYLENE ALL AROUND BETWEEN BACKFILL & INSULATION.
4. BACKFILL UNDER MANHOLE WITH COMPACTION OF 98% STANDARD PROCTOR AT REQUIRED MOISTURE CONTENT.
5. ALL PRECAST MANHOLE SECTIONS SHALL CONFORM TO ASTM-478.



## DUPLEX PUMP LIFT STATION & VALVE BOX – SECTION B

REBAR REINFORCEMENT AND CONTROL PANEL NOT SHOWN FOR CLARITY

B  
WWC-110

6. STAINLESS STEEL LIFT CHAIN ATTACHED TO HATCH FRAME.
7. CONCRETE 3,500 PSI MINIMUM WALLS & BOTTOM.
8. PROVIDE THREE (3) SEPARATE 2" SCH. 80 PVC CONDUITS FROM CONTROL PANEL FOR PUMPS AND FLOAT WIRING.
9. ALUMINUM ACCESS HATCH SHALL BE FRNISHED BY DOYON UTILITIES FOR INSTALLATION IN LIFT STATION & VALVE BOX CONCRETE LIDS.

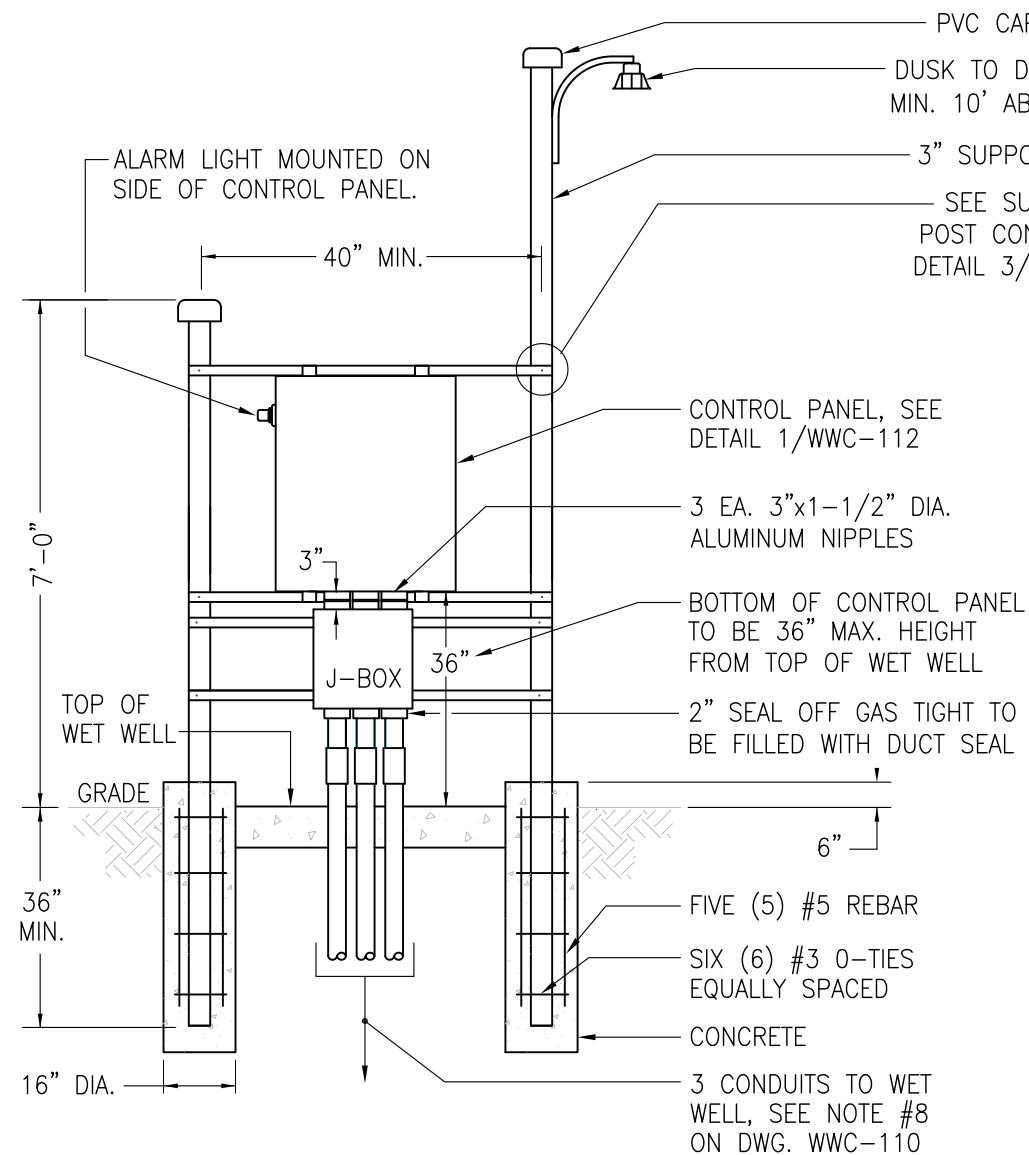


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LIFT STATION & VALVE BOX SECTIONS  
DESIGN & CONSTRUCTION STANDARDS  
DIRECT BURY WASTEWATER COLLECTION SYSTEM

Drawing No.  
**WWC-110**  
Previous: UES-DD-S202  
15 SEPT 2009



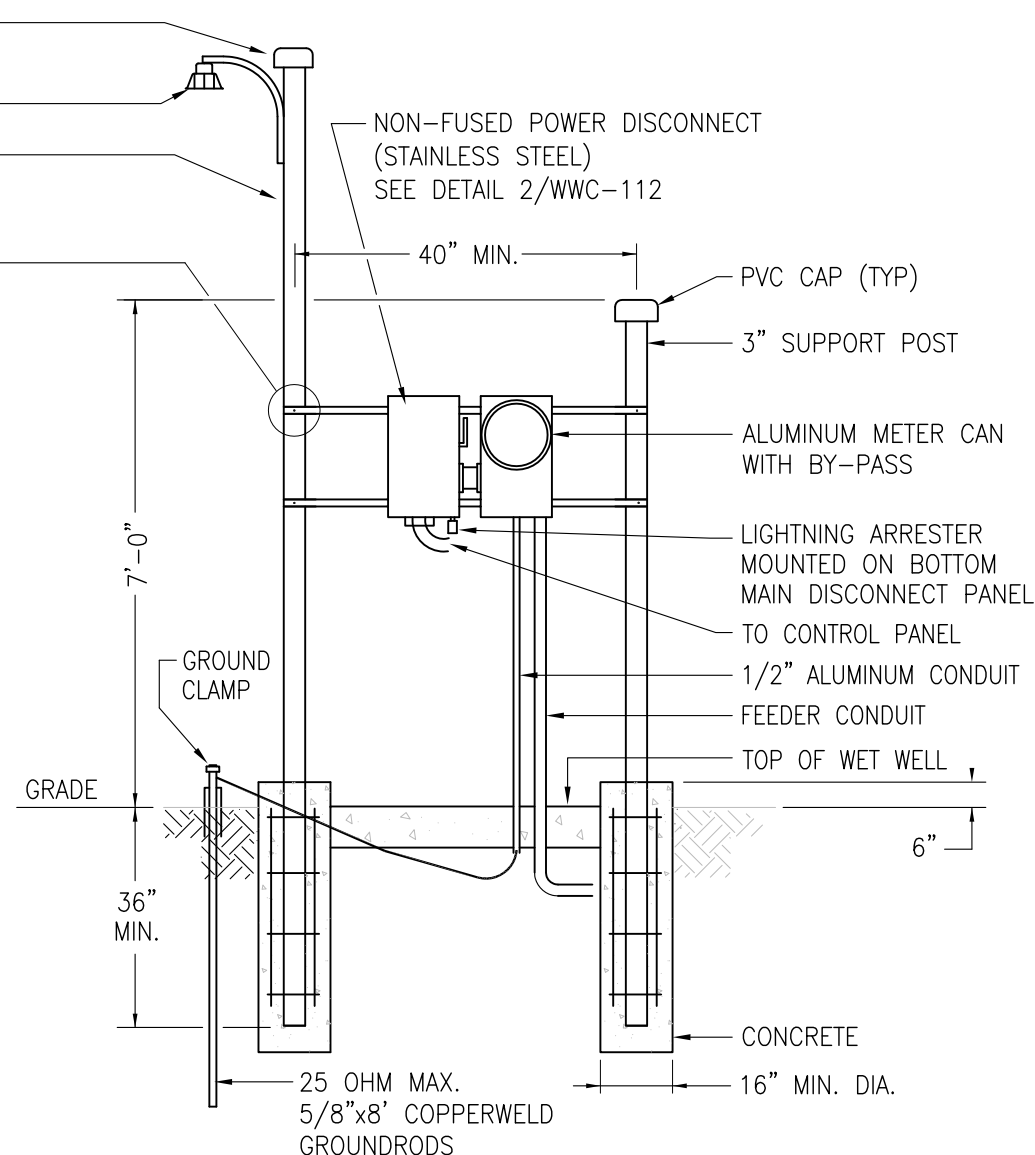
LIFT STATION CONTROL PANEL DETAIL

1

WWC-111

NOTES:

1. DRAWING IS SHOWN FOR 460 VOLT POWER SUPPLY.
2. WHEN TWO (2) SEPARATE CONDUCTOR-TYPE MOTORS ARE USED, CONDUIT SHALL BE INCREASED TO ACCORDINGLY.
3. POWER SUPPLY TO THE LIFT STATION SHALL BE 3 PHASE 4 WIRE FROM A 3 PHASE SOURCE ONLY.
4. ALL UNISTRUT SHALL BE STAINLESS STEEL BOLT THRU 3" POST.
5. ALL MOUNTING BOLTS, NUTS, TO BE STAINLESS STEEL.
6. DO NOT USE UNISTRUT CLAMPS TO MOUNT UNISTRUT TO SUPPORT POST.



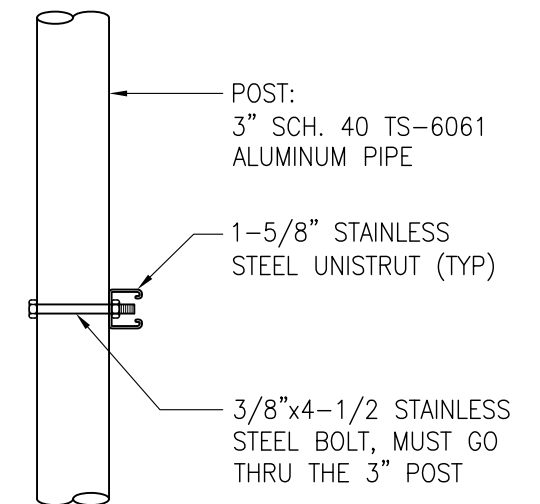
METER & DISCONNECT DETAIL

2

WWC-111

NOTES:

1. DRAWING IS SHOWN FOR 460 VOLT POWER SUPPLY.
2. WHEN TWO (2) SEPARATE CONDUCTOR-TYPE MOTORS ARE USED, CONDUIT SHALL BE INCREASED TO ACCORDINGLY.
3. POWER SUPPLY TO THE LIFT STATION SHALL BE 3 PHASE 4 WIRE FROM A 3 PHASE SOURCE ONLY.
4. ALL UNISTRUT SHALL BE STAINLESS STEEL BOLT THRU 3" POST.
5. ALL MOUNTING BOLTS, NUTS, TO BE STAINLESS STEEL.
6. DO NOT USE UNISTRUT CLAMPS TO MOUNT UNISTRUT TO SUPPORT POST.



SUPPORT POST CONNECTION DETAIL

3

WWC-111



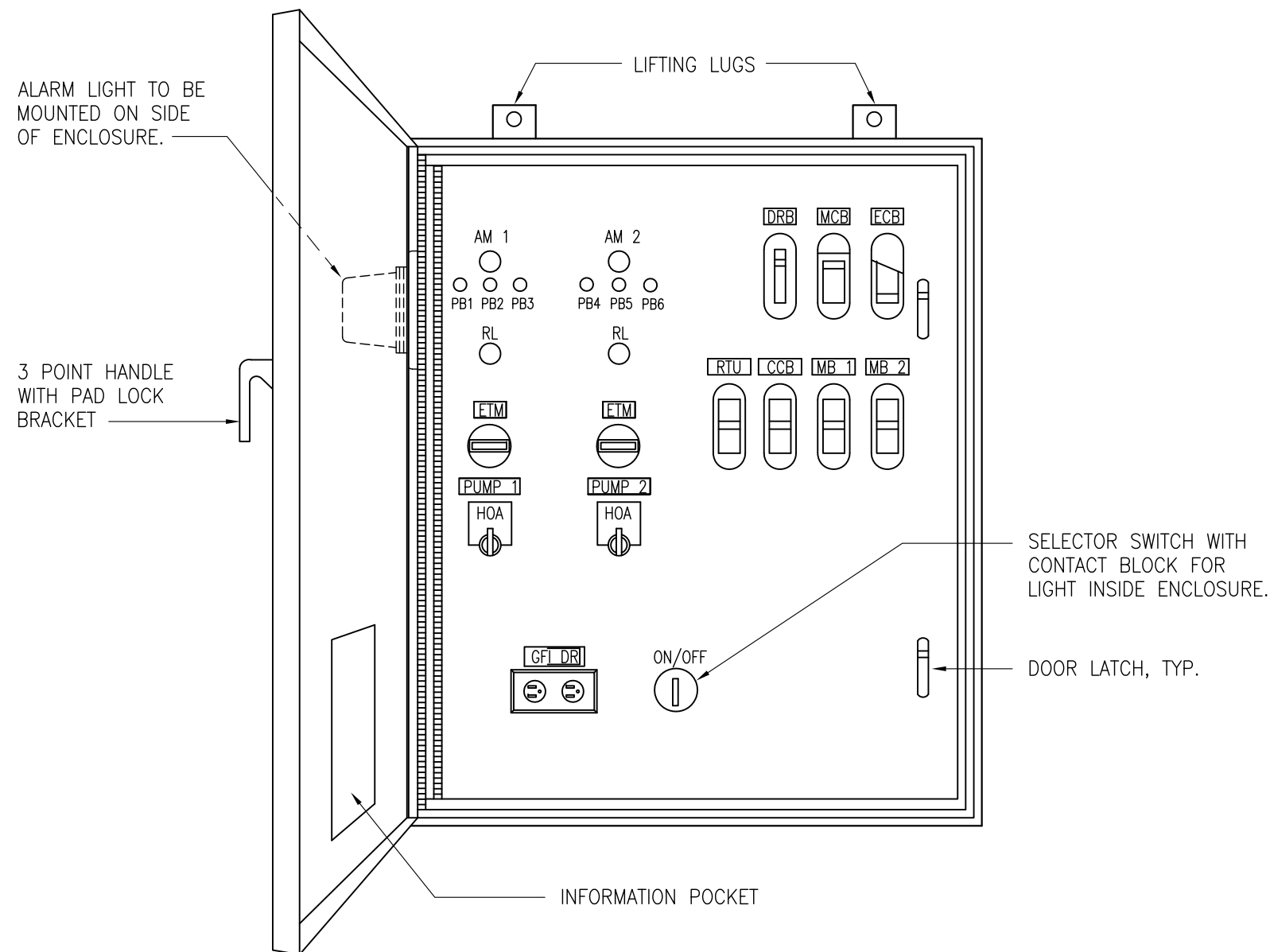
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LIFT STATION CONTROL PANEL DETAILS, SHEET 1 of 2  
DESIGN & CONSTRUCTION STANDARDS  
DIRECT BURY WASTEWATER COLLECTION SYSTEM

Drawing No. WWC-111  
Previous: UES-DD-S203  
15 SEPT 2009



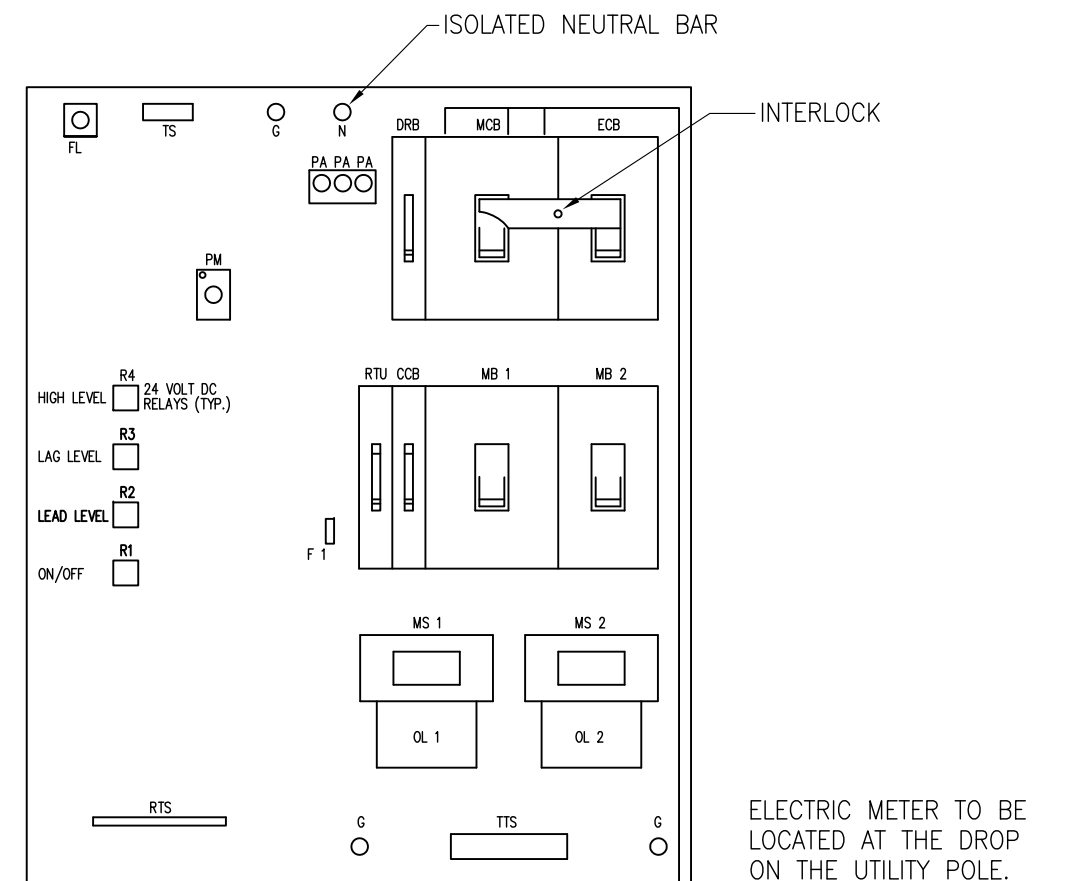


#### NOTES

1. OUTER BOX SIZE SHALL BE A MINIMUM OF \_\_"W x \_\_"H x \_\_"D OR AS APPROVED BY DOYON UTILITIES.
2. USE 3/8" STAINLESS STEEL BOLTS FOR ATTACHMENT TO PROPERLY SIZED STAINLESS STEEL UNI-STRUT MOUNTING BRACKETS.
3. TOTAL ASSEMBLY MUST BE UL CERTIFIED AND LABELED.

CONTROL PANEL DETAIL

1  
WWC-112



#### NOTES

1. NEMA 1 PANEL FOR BREAKERS AND 480V DISCONNECT.
2. MAIN CIRCUIT TRANSFORMER REQUIRED FOR 480 VOLT SUPPLY ONLY.
3. MAIN POWER FROM DISCONNECT WILL BE BROUGHT IN ON RIGHT SIDE OF CONTROL PANEL TO MCB.

DISCONNECT PANEL DETAIL

2  
WWC-112

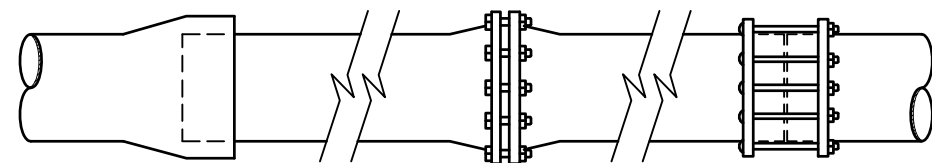


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LIFT STATION CONTROL PANEL DETAILS, SHEET 2 of 2  
DESIGN & CONSTRUCTION STANDARDS  
DIRECT BURY WASTEWATER COLLECTION SYSTEM

Drawing No.  
**WWC-112**  
Previous: UES-DD-S204  
30 JUL 2009



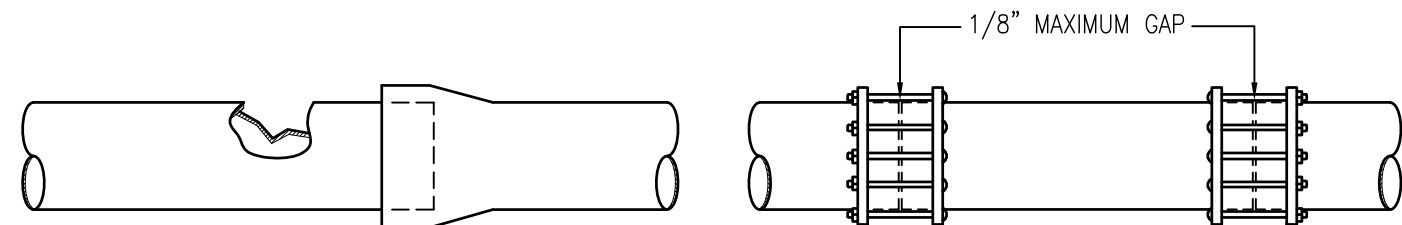
PUSH-ON JOINT      MECHANICAL JOINT      DRESSER COUPLING

### DUCTILE IRON PIPE

NOTE: SEWER MAINS AND SERVICES SHALL BE INSULATED WITH URETHANE FOAM, MINIMUM 3" THICKNESS.

## TYPICAL PIPE CONNECTIONS

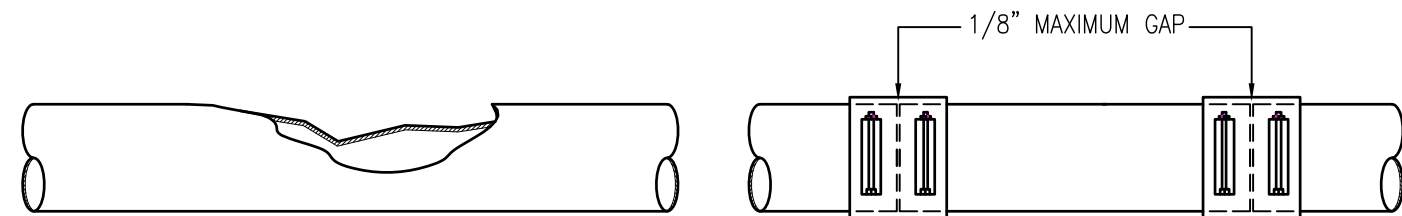
1  
WWC-201



DAMAGED

REPAIRED

FOR PIPE DAMAGED NEAR PUSH-ON OR HUB AND SPIGOT TYPE JOINT: CUT OFF DAMAGED SECTION AND BELL OF UNDAMAGED PIPE PERPENDICULAR TO PIPE AXIS. INSERT SAME TYPE AND DIAMETER OF PIPE. USE FULL CIRCLE CLAMP LEAVING A MAXIMUM 1/8" GAP BETWEEN PIPES (DRESSER 62 OR 263), OR FLEXIBLE COUPLING (DRESSER 253). FLEXIBLE COUPLING SHOWN.



DAMAGED

REPAIRED

FOR PIPE DAMAGED NEAR THE MIDDLE OF THE SECTION: REMOVE DAMAGED SECTION, MAKING CUTS PERPENDICULAR TO THE PIPE AXIS. INSERT SAME TYPE AND DIAMETER OF PIPE, LEAVING A MAXIMUM 1/8" GAP BETWEEN PIPES. USE A FULL CIRCLE CLAMP (ROCKWELL 256 OR EQUAL), OR FLEXIBLE COUPLING (ROCKWELL 433 OR EQUAL). FULL CIRCLE CLAMP SHOWN.

## TYPICAL PIPE REPAIRS

2  
WWC-201

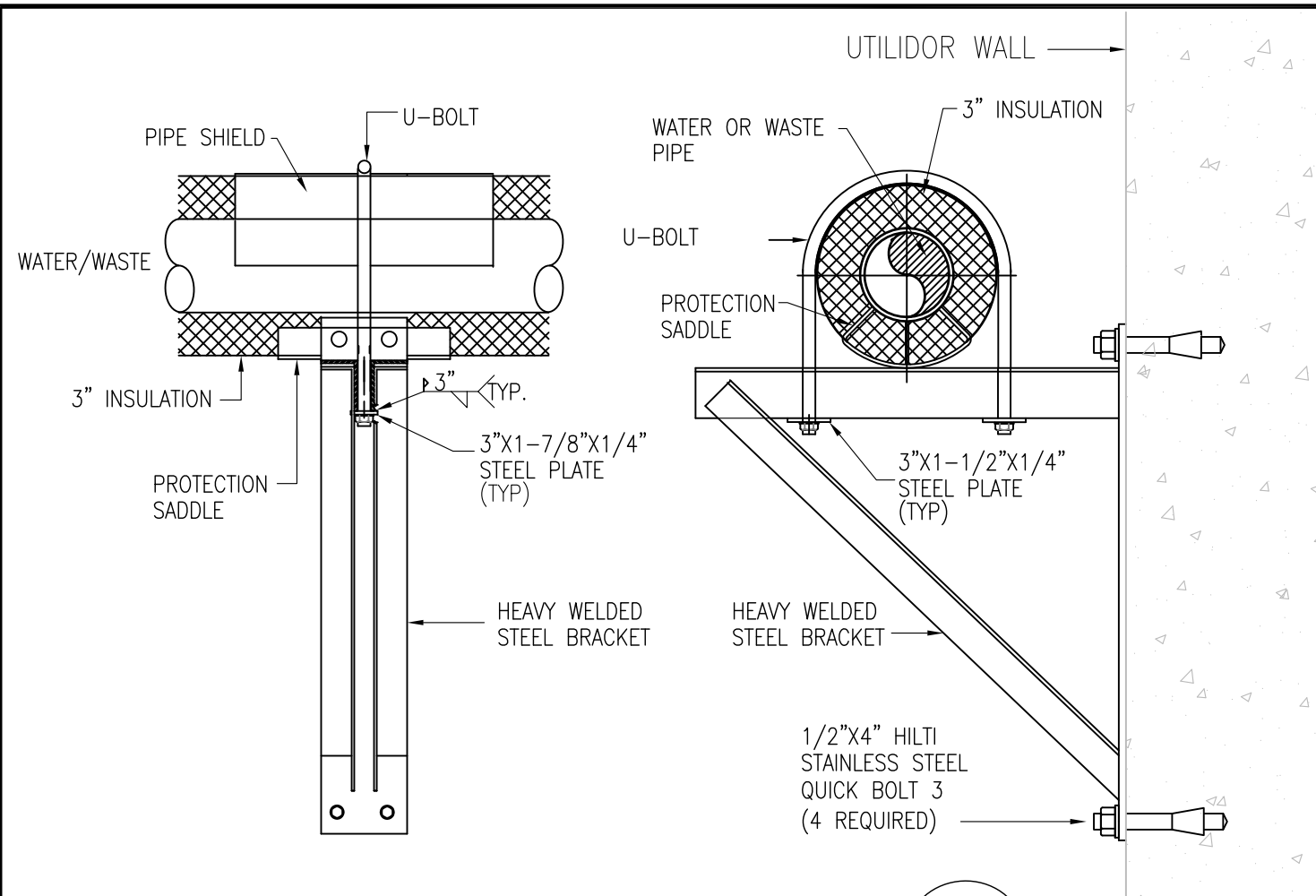


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TYPICAL PIPE CONNECTIONS AND REPAIRS  
DESIGN & CONSTRUCTION STANDARDS  
UTILIDOR WASTEWATER COLLECTION SYSTEM

Drawing No.  
**WWC-201**  
Previous: UES-DD-S001  
30 JUL 2009



PIPE SUPPORT DETAIL 1  
WWC-202

DIMENSIONS:

| PIPE SIZE | GUIDE SIZE * | ②              |         |             | ③   |     | ①   | ⑤         |
|-----------|--------------|----------------|---------|-------------|-----|-----|-----|-----------|
|           |              | STRUCTURAL TEE | A       | B HOLE DIA. | C   | D   | E   | BOLT SIZE |
| 2"        | C            | WT5x19.5       | 7-7/8"  | 5/8"        | 15" | 10" | 6"  | 1/2"Øx2"  |
| 3"        | C            | WT5x19.5       | 7-7/8"  | 5/8"        | 15" | 10" | 6"  | 1/2"Øx2"  |
| 4"        | C            | WT5x19.5       | 7-7/8"  | 5/8"        | 15" | 10" | 6"  | 1/2"Øx2"  |
| 6"        | E            | WT5x19.5       | 9-3/4"  | 3/4"        | 15" | 10" | 8"  | 5/8"Øx2"  |
| 8"        | E            | WT5x19.5       | 9-3/4"  | 3/4"        | 15" | 10" | 8"  | 5/8"Øx2"  |
| 10"       | F            | WT6x25         | 14-1/8" | 1"          | 15" | 12" | 8"  | 3/4"Øx2"  |
| 12"       | F            | WT6x25         | 14-1/8" | 1"          | 15" | 12" | 8"  | 3/4"Øx2"  |
| 14"       | G            | WT6x25         | 15-7/8" | 1"          | 15" | 12" | 8"  | 3/4"Øx2"  |
| 16"       | G            | WT6x25         | 15-7/8" | 1"          | 15" | 12" | 8"  | 3/4"Øx2"  |
| 18"       | H            | WT8x44         | 16-3/8" | 1"          | 18" | 14" | 10" | 3/4"Øx2"  |
| 20"       | H            | WT8x44         | 16-3/8" | 1"          | 18" | 14" | 10" | 3/4"Øx2"  |
| 24"       | J            | WT8x44         | 17-1/8" | 1"          | 18" | 14" | 10" | 3/4"Øx2"  |

\*GUIDE SIZE BASED ON STEAM PIPE DIAMETER PLUS 3" THICK INSULATION

(DETAIL NOT COMPLETE)

PIPE ANCHOR DETAIL 2  
WWC-202

NOTES:

- ITEMS ② AND ③ ARE TO BE SANDBLASTED AND PAINTED AFTER FABRICATION.
- PROVIDE SLOTTED BOLT HOLES LONGITUDINALLY FOR 1" HORIZONTAL ADJUSTMENT ON PIPE GUIDE SUPPORT PRIOR TO GALVANIZING.
- PIPE GUIDE SIZE NUMBER IS DETERMINED BY DIAMETER OF PIPE AND THICKNESS OF INSULATION.
- TOUCH-UP PAINT REQUIRED FOR AREAS DAMAGED DURING INSTALLATION.

MATERIAL LIST:

| ITEM | DESCRIPTION                                                                                   |
|------|-----------------------------------------------------------------------------------------------|
| ①    | ANVIL FIG. 256 PIPE GUIDE                                                                     |
| ②    | STRUCTURAL TEE. SEE TABLE THIS SHEET.                                                         |
| ③    | 1/2" THICK STEEL WALL PLATE. SEE TABLE THIS SHEET.                                            |
| ④    | 1/2"Øx4" HILTI STAINLESS STEEL QUICK BOLT 3.                                                  |
| ⑤    | STAINLESS STEEL MOUNTING BOLT, WASHERS AND NUT (TYPICAL OF 4). SEE TABLE THIS SHEET FOR SIZE. |



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Date: 30 APR 2010  
Scale: NONE  
Designed By: CDH  
Drawn By: MMC/GSF  
Checked By: NEM

PIPE SUPPORT & ANCHOR IN UTILILIDOR  
DESIGN & CONSTRUCTION STANDARDS  
UTILIDOR WASTEWATER COLLECTION SYSTEM

Drawing No.  
**WWC-202**  
Previous: UES-DD-S002  
01 JUL 2009