

# Valparaiso City Utilities

205 Billings Street  
Valparaiso, Indiana 46383-3699

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*"Water is our Most Valuable Natural Resource"*

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## SPECIFICATIONS AND ENGINEERING REQUIREMENTS FOR THE INSTALLATION OF WATER MAINS AND APPURTENANCES

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**Water Department**

Visit our website at [www.valparaisoutilities.org](http://www.valparaisoutilities.org)

**DEVELOPERS**  
**“BID PROCEDURE FOR WATER MAIN INSTALLATION FOR**  
**VALPARAISO CITY UTILITIES”**

For information on material selection and installation procedures, please refer to Valparaiso City Utilities Construction Specifications.

For cost quoting, the Valparaiso City Utilities understands that any development may ask numerous Contractors for quotes on all facets of their project.

Contractor mobilization represents a major expense; therefore, if a Developer can mobilize only one (1) Contractor to do all of the underground work they can generally see a cost savings.

The Utility understands this and encourages the Developer to get costs of the water main installation from as many Contractors as they are comfortable with.

After a selection of the top one or two Contractors is made, the Developer needs to relay their choice to the Utilities Distribution Manager for approval.

In most cases, the Contractor will be approved, providing that they can show verifiable references of ductile-iron pipe installation, proper proof of insurance, equipment list, and manpower availability, as well as be prepared to guarantee their work for a period of one (1) year after acceptance.

Upon acceptance of the Contractor by both parties, the Contractor shall provide the Utility with their quote to complete the job. At that time, the Utility will add the appropriate costs for fees, inspections, and meters to the quote, and present the quote and a contract to the Developer.

Once the Developer returns the signed contract to the Utility, the Developer – if in good credit standing – is expected to also pay an up-front cost of one-half of the total project cost, with the remaining one-half to be paid at the completion of installation.

With this in place, the Utility will then enter into a contract with the Contractor of choice and said Contractor will be working for, and paid by, the Utility.

Questions or concerns can be directed to the Utilities’ Distribution Manager.

## **DEVELOPERS AND ENGINEERS “PIPE SELECTION”**

Although the Valparaiso City Utilities is predominately a ductile-iron pipe utility, it realizes that there are instances in which other materials may be desired because of deflection, highly corrosive soils, or other physical, special conditions.

In these instances, the engineer is advised to direct the concern to the Utilities Distribution Manager for review.

The engineer may also refer to Sections 02110 and 02235 of the Utilities Construction Specifications.

## TABLE OF CONTENTS

02110	Scope and Intent
02120	Inspection of Work and Materials
02130	Lines and Grades
02140	Temporary Work
02150	Protection of Work and Public
02210	General Specification
02220	Excavation and Backfill
02230	Miscellaneous Pipe and Fittings
02231	Valves
02232	Pipe Installation
02233	Pressure Reducing Valves
02234	Combination Air Relief Valves
02235	Directional Boring
02240	Anchorage
02250	Hydrostatic Testing Procedure
02255	Disinfection
02260	Site Restoration
02270	Service Pipes
02280	Hydrants
02290	Construction Details

# Valparaiso City Utilities – Water Department Specifications

## Technical Division: Specifications and Engineering Requirements for the Installation of Water Mains and Appurtenances

### GENERAL PROVISIONS

#### SECTION 02110 SCOPE AND INTENT

##### A. Description

The work to be done includes the furnishing of all labor, materials, equipment, and services and the performance of all work included for the installation of water mains and appurtenances by the Valparaiso Department of Water Works. Water main shall be ductile iron pipe unless special circumstances require the use of alternate materials.

##### B. Work Included

The Valparaiso City Utilities shall furnish all labor, superintendence, and other means of construction necessary or proper for performing and completing the work. The Valparaiso City Utilities shall perform and complete the work in the manner best calculated to promote rapid construction consistent with safety of life and property, and in strict accordance with this Specification. The Valparaiso City Utilities shall clean up the work area and maintain it during and after construction, and shall do all work and pay all costs incidental thereto. The Valparaiso City Utilities shall repair or restore all structures and property that may be damaged or disturbed during performance of the work.

##### C. Definitions

Under this Specification the following definitions apply:

Department Representative: The person or persons assigned the responsibility, as agent of the Valparaiso City Utilities, to supervise or inspect the installation of water system.

Ductile Iron: Cast ferrous material in which a major part of the carbon content occurs as free carbon in nodules or spheroidal form.

Mechanical Joint: The gasket and bolted joint as detailed in AWWA C111.

Owner: Valparaiso City Utilities, its successors and assigns which will own and operate the completed piping system. Valparaiso City Utilities may designate agents for specific responsibilities in connection with piping projects constructed under this Specification.

Push-On-Joint: The single rubber gasket joint as described in AWWA C111. Joints shall be Tyton™ or Fast Tite.

Compacted select fill material – "B" borrow sand compacted to a minimum 95% standard Proctor density

HDPE – High density polyethylene

#### D. Permits and Fees

The Valparaiso City Utilities or its Contractor or its Developer shall obtain and pay for all required permits and fees. Decision to be made by Distribution Manager.

#### E. Reference of Standards

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

- (1) AWWA C104 — Cement-Mortar Lining for Ductile Iron Pipe and Fittings
- (2) AWWA C105 — Polyethylene Encasement for Ductile Iron Piping
- (3) AWWA C110 — Ductile Iron Fittings, 3 in. through 48 in.
- (4) AWWA C111 — Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
- (5) AWWA C115 — Flanged Ductile Iron Pipe with Threaded Flanges
- (6) AWWA C116- Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings For Water Supply Service
- (6) AWWA C150 — Thickness Design of Ductile Iron Pipe
- (7) AWWA C151 — Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Liquids Molds, for Water or Other Liquids
- (8) AWWA C153 — Ductile Iron Compact Fittings for Water and Other Liquids
- (9) AWWA C500 — Gate Valves
- (10) AWWA C504 — Rubber-Seated Butterfly Valves
- (11) AWWA C509 — Resilient — Seated Gate Valves

- (12) AWWA C550 — Protected Epoxy Interior Coatings for Valves and Hydrants
- (13) AWWA C600 — Installation of Ductile Iron Water Mains and Appurtenances
- (14) AWWA C651 — Disinfecting Water Mains
- (15) AWWA C800 — Underground Service Line Valves and Fittings
- (16) AWWA C906 – Polyethylene Pressure Pipe and Fittings, 4 in. Through 63 in. for Water Distribution and Transmission
- (16) AWWA C20104 — Handbook Occupational Safety and Health Standards for Water Utilities
- (17) AASHTO T-99 — Standard Method of Test for Moisture-Density Relationship for Soils
- (18) Indiana Cross Connection — 327 IAC 8-10, Effective 7/19/85
- (19) "10 State Standard" — Great Lakes Upper Mississippi River Board of State Public Health & Environmental Manager — Recommended Standards for Water Works
- (20) ANSI — The American National Standards Institute

END OF SECTION

**SECTION 02120**  
**INSPECTION OF WORK AND MATERIALS**

A. Inspection of Materials

The Valparaiso City Utilities or its Contractor shall furnish all materials, pipes and appurtenances are subject to inspection at the point of delivery by the Department Representative. Material found defective due to manufacture or damaged in shipment shall be rejected and removed from the job site.

B. Inspection of Work

Work will be inspected daily by the Department Representative.

END OF SECTION

## **SECTION 02130 LINES AND GRADES**

### **A. General**

All work shall be constructed in accordance with the lines and grades shown on "approved" Engineering Plans. The full responsibility for keeping alignment and grade shall rest upon the Valparaiso City Utilities or its Contractor.

Reference marks for lines and grades shall be set by the Developer as the work progresses and will be located to cause as little inconvenience to the prosecution of the work as possible. The Valparaiso City Utilities or its Contractor shall place excavation and other materials so as to cause no inconvenience in the use of the reference marks provided.

### **B. Alignment and Grade**

The water mains shall be laid and maintained to lines and grades established by the plans with fittings and valves at the required locations unless otherwise approved by the Department Representative. Valve operating stems shall be oriented in a manner to allow proper operation.

### **C. Prior Investigation**

Prior to excavation, investigation shall be made to the extent necessary to determine the location of existing underground structures and conflicts. Care should be exercised during excavation to avoid damage to existing structures.

### **D. Clearance**

When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary to provide clearance as required by federal, state, or local regulations.

Water mains shall be installed in accordance with Section 8.6, Separation of Water Mains and Sewers of the "10 State Standard" — Great Lakes Upper Mississippi River Board of State Public Health and Environmental Managers Recommended Standards for Water Works.

The water mains must be protected from contamination by existing sewers. The following construction methods should be followed unless otherwise directed by the Department Representative:

1. Maintain at least a ten (10) foot horizontal (edge to edge) distance from any existing sewers. Installation of the water mains closer to a sewer is acceptable where the water main is laid in a separate trench or on an undisturbed earth shelf located on one

(1) side of the sewer at such an elevation that the bottom of the water main is at least eighteen (18) inches above the top of the sewer.

2. Provide a minimum vertical distance of eighteen (18) inches between the outside of the water main and the outside of the sewer mains. This shall be the case where the water main is either above or below the sewer main. At crossings, one (1) full length of water pipe should be located so both joints will be as far from the sewer mains as possible if polyethylene wrap is not used. Special structural support for the water and sewer mains may be required.
3. Provide at least a ten (10) foot horizontal separation between water mains and forced sewer mains. There shall be an eighteen (18) inch vertical separation at crossings.
4. Locate water mains so that they do not pass through any sewer manholes.
5. When an eighteen (18) inch vertical separation between water mains and sewer mains is not possible a second layer of polyethylene wrap shall be installed on the water main so that a 20 foot length of polyethylene wrap is centered over the sewer main at the crossing.

#### E. Pipe Installation Parallel to Other Utilities

The water main shall not be installed in a location where a parallel electric wire, electric conduit, telephone wire, telephone conduit, or gas main will be installed in the same ditch area. Furthermore, the Department Representative shall approve any deviations. Pipe installation shall be performed as specified and shown in Figure 1.

#### F. Trench Construction and Pipe Cover

The trench shall be excavated to the required alignment, depth and width and in conformance with all federal, state, and local regulations for the protection of the work and personnel.

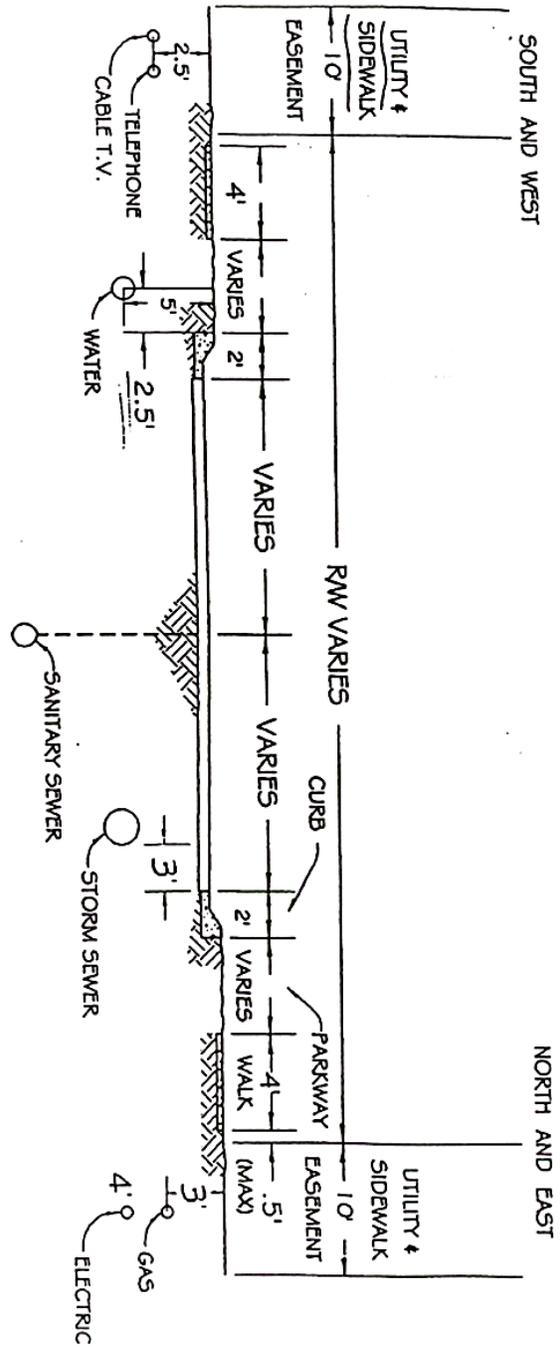
All newly installed or relocated pipe shall normally be laid to a depth of at least 60 inches and no more than 72 inches below proposed finished street pavement grade or proposed finished grade of ground over pipe ditch, whichever is lower, unless otherwise directed by the Department Representative. The measurement will be to the top of the pipe.

END OF SECTION

**UTILITY LAYOUT**  
NOTE: NOT TO SCALE

**FIGURE 1**

**NOTE: Curb Stops (customer shutoff valves) to be placed 2' behind the sidewalk.**



**SECTION 02140  
TEMPORARY WORK**

A. General

All false work, ladder, hoistways, braces, pumping plants, shields roadways, sheeting centering forms, barricades, drains, flumes, and the like, any of which may be needed in the construction of any part of the work and which are not herein described or specified in detail, must be furnished, maintained and removed by the Valparaiso City Utilities or its Contractor. In addition, the Valparaiso City Utilities or its Contractor shall be responsible for the safety and efficiency of such works and for any damage that may result from their failure to form their improper construction, maintenance or operation.

B. Bridges

The Valparaiso City Utilities or its Contractor shall provide suitable temporary bridges at street intersections when necessary for the maintenance of vehicular and pedestrian traffic.

Prior to temporarily cutting off access to driveways, garage or parking areas, Valparaiso City Utilities or its Contractor shall give sufficient notice to affected property owners. Interruptions for use of private driveways shall be kept to a minimum and reopen at the end of each day.

END OF SECTION

**SECTION 02150  
PROTECTION OF WORK AND PUBLIC**

**A. Accident Prevention**

Precautions shall be exercised at all times for the protection of persons and property. Safe work procedures of all applicable laws, building and construction, including, but not limited to, the U.S. Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act and Section 107 of the Contract Work Hours and Safety Standards Act, shall be observed. The U.S. Department of Labor Safety and Health Regulations shall be complied with except where state and local safety standards exceed the federal requirements and except where state safety standards have been approved by the Secretary of Labor in accordance with provisions of the Occupational Safety and Health Act. Also, the City's safety policy shall apply to all work performed.

**B. First Aid**

The Valparaiso City Utilities or its Contractor shall keep upon the site, at each location where work is in progress, a completely equipped first aid kit and shall provide ready access thereto at all times when employees are employed on the work.

**C. Access to Public Services**

Neither the materials excavated nor the materials or plant used in the construction of the work shall be placed so as to prevent free access to all fire hydrants, valves or manholes.

**D. Barriers and Lights**

During the prosecution of the Work, Valparaiso City Utilities or its Contractor shall put up and maintain during the nighttime such barriers and lights as will effectively prevent accidents. Valparaiso City Utilities or its Contractor shall provide suitable barricades, red light, torches, "danger," "caution" or "street closed" signs at all places where the work causes obstructions to the normal traffic or constitutes in any way a hazard to the public.

**E. Noise**

Valparaiso City Utilities or its Contractor shall at all times eliminate noise to the maximum practicable extent. Air compressing plants shall be equipped with silencers and the exhaust of all gasoline motors or other power equipment shall be provided with mufflers. In the vicinity of hospitals and schools, special care shall be used to avoid noise or other nuisances, and Valparaiso City Utilities or its Contractor shall strictly observe all local regulations and ordinances covering such locations.

**F. Notice to be Given**

A notice shall be given by Valparaiso City Utilities or its Contractor to all Municipal Departments, public utility corporations, and property owners whose pipes, poles, tracks, wires or conduits or other structures may be affected by the work in order that they may locate and mark, protect, adjust, remove or rebuild them or take such measures as they may desire to minimize inconvenience. Valparaiso City Utilities or its Contractor shall likewise notify the chiefs of the police and fire departments for the area affected twenty-four hours in advance of the temporary blocking of any street. Valparaiso City Utilities or its Contractor shall give a four (4) hour notice to all affected property owners whenever services are taken out of service.

#### G. Responsibility

Valparaiso City Utilities or its Contractor shall at all times in performance of the work, employ approved methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of public and utility installations and structures. In addition, the Valparaiso City Utilities or its Contractor shall at all times in the performance of the work, avoid unnecessary interference with, or interruption of public and utility services, and shall cooperate fully with the owners thereof to that end.

Valparaiso City Utilities or its Contractor shall be responsible for any damages to structures, pipes, cables, etc. caused during the progress of the Work.

Valparaiso City Utilities Contractor shall provide to the Utility a planned traffic routing to be approved by the Utility.

The Contractor's normal workday limitations shall be 7:00 a.m. to 4:00 p.m., Monday through Friday. The Utility understands that in some cases, the work hours and days need to be adjusted for various reasons, and will consider the schedule for approval on an as-needed basis.

END OF SECTION

## WORKMANSHIP AND MATERIALS

### SECTION 02210 GENERAL SPECIFICATION

#### A. Workmanship

All pipe and appurtenances shall be installed and joined in conformance with this Specification and tested under pressure for defects and leaks in accordance with "Hydrostatic Water Pipeline Test Report" of this Specification.

#### B. Storage

Materials, if stored, shall be kept safe from damage and the interior of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves shall be drained and stored in a manner that will protect them from damage by freezing.

Pipe shall not be stacked higher than shown in Table 1. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated: bell, plain end, etc. At least two rows of timbers shall be placed between tiers and chocks affixed to each end so as to prevent movement.

TABLE 1

Maximum Stacking Heights — Ductile Iron Pipe  
(for 10 or 20 ft. lengths)

Pipe Size (Inches)	Number of (Tiers)
6	13
8	11
12	9
16	7
20	6
24	5
30	4
36	4

Gaskets for mechanical and push-on joints shall be stored out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

Mechanical joint bolts shall be stored in such manner that will assure proper use with respect to types and sizes.

### C. Handling

All fittings, valves and accessories shall be loaded and unloaded in such a manner as to avoid shock or damage. Pipe handled on skidways shall not be rolled nor skidded against pipe already on the ground.

Slings, hooks, or pipe tongs shall be used in such a manner as to prevent damage to the exterior surface or internal lining of the pipe.

END OF SECTION

**SECTION 02220  
EXCAVATION AND BACKFILL**

**A. Clearing and Grubbing**

The Valparaiso City Utilities or its Contractor shall be responsible for all clearing and grubbing work necessary for water main construction. The site of all open cut excavations shall first be cleared of obstructions preparatory to excavation. Clearing includes the removal and disposal of vegetation, trees, stumps, roots and bushes, except those specified to be protected during excavation.

Excavated and other material shall be stored away from the edge of any excavation to prevent falling or sliding back into the excavation and to prevent collapse of the wall of the excavation. Surplus excavated material and excavated material unsuitable for backfilling or embankments shall be disposed of on the site by distributing the material over existing ground surfaces. Excess excavated materials shall be carefully graded to blend into the existing terrain as much as possible. Care shall be taken to maintain existing drainage.

**B. Trenching and Open Cut**

The Valparaiso City Utilities or its Contractor shall be responsible for all excavation work necessary for water main construction. Open cut excavations shall be made to the widths and depths necessary for constructing all structures, pipelines and conduits, and includes the excavation of any material which is necessary to be excavated for any purpose pertinent to the construction of the work. Banks shall be shored or sloped to the angle of repose to prevent slides or cave-ins.

Sheeting for the pipelines shall be driven or placed to a depth below the elevation of the pipe invert. In general, sheeting and bracing above the top of the pipe shall be removed as the excavation is refilled in a manner to avoid the caving in of the bank or disturbance to adjacent areas or structures. Void left by the withdrawal of the sheeting shall be carefully filled by compaction.

Before starting trench excavation, all obstructions, which are to be removed or relocated shall be cleared away. Trees, shrubs, poles, and other structures, which are to be preserved shall be properly braced and protected. Unless shown or specified otherwise, all trees and large shrubs shall be preserved with damage to the root structure held to a minimum.

The open, excavated trench preceding the pipe laying operation and the unfilled trench with pipe in place shall be kept to a minimum length causing the least disturbance. Ladders shall provide means of exit from the trench as required by the applicable safety and health regulations. Trench preparation shall proceed in advance of trench installation not more than 100 feet.

Excavated material shall be placed in a manner that will not obstruct the work nor endanger the workers, and shall be done in compliance with federal, state and/or local regulations.

Removal of pavement and road surfaces shall be a part of the trench excavation and the amount removed shall depend upon the width of trench required for the installation of the pipe and the dimensions of area required for the installation of valves, specials, manholes or other structures. The dimensions of pavement removed shall not exceed the dimensions required for the installation of pipes, valves, specials, manholes and other structures, unless otherwise required as a condition of a permit. Methods, such as sawing, drilling or chipping, may be used to assure the breaking of pavement along straight lines.

The width of the trench at the top of the pipe shall be ample to permit the pipe to be laid and joined properly and the backfill to be placed as specified. Minimum trench widths, as shown in Table 2, shall be used to protect work personnel. Trenches shall be of such extra width, when required, to permit the placement of timber supports, sheeting, bracing and appurtenances.

TABLE 2

Minimum Trench Widths at the Top of the Pipe

Normal Pipe Size (Inches)	Trench Width (Inches)
6	30
8	32
12	36
16	40
20	44
24	48
30	54
36	60

C. Removal of Water

At all times during the excavation period and until completion and acceptance of the work at final inspection, ample means and equipment shall be provided with which to remove promptly and dispose of properly all water entering any excavation or other parts of the work. The excavation shall be kept dry. No water shall be allowed to rise over or come in contact with masonry and concrete until the concrete and mortar have attained a set satisfactory to the Department Representative and, in any event, not sooner than 12 hours after placing the masonry or concrete. Water pumped or drained from the work hereunder shall be disposed of in a safe and suitable manner without damage to adjacent property or paved surfaces or to other work under construction. Water shall not be discharged onto paved surfaces without adequate protection of the surface at the point of

discharge. No water shall be discharged into sanitary sewers. No water containing settleable solids shall be discharged into storm sewers. The Valparaiso City Utilities or its Contractor shall promptly repair any and all damage caused by dewatering the work.

Discharge from any trench dewatering pumps shall be conducted to an approved reservoir, channel or sewer and in compliance with federal, state and/or local regulations.

No water shall be allowed to rise in the trench excavation until sufficient backfill base has been placed to prevent pipe flotation.

#### D. Boring and Casing

In some instances, trees, shrubs, utilities, sidewalks and other obstructions may be encountered, the proximity of which may be a hindrance to open cut excavation. In such cases, Valparaiso City Utilities or its Contractor shall excavate by means of short tunnels in order to protect such obstructions against damage. The short tunnel constructions shall be made by hand, auger or other approved methods and shall be approximately 6 inches larger than the diameter of the pipe bells or other conduit encasement. Such short tunnel work shall be considered incidental to the construction of pipelines or other conduits and all appurtenances.

Pipes to be placed in short tunnels shall be jointed prior to being pulled into position. Pipe shall be pulled into position in a manner, which keeps joints tight.

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

In order to avoid the transfer of earth and live loads to the carrier pipe, the space between the carrier and casing pipes should not be completely filled. The ends of the casing pipe shall be closed so as not to allow any drainage to flow into the casing pipe, or earth to fill the casing pipe. Casing chocks made of stainless steel and neoprene shall be installed at three (3) points on each carrier pipe and each pipe shall be restrained to the other by approved method.

#### E. Unstable Subgrade

If unstable material is exposed at the level of the bottom of the trench excavation, it shall be excavated. The Inspector may require material placed to stabilize the trench bottom with additional select fill material or a crushed stone or gravel mat or to insure firm support for the pipe by other suitable methods.

## F. Backfill

All backfill work shall be done in accordance with INDOT specifications. Where unstable soil has been stabilized per part E of this Section (02220-3) of the Specification, all pipe shall be bedded in well graded, compacted, select fill material. Pipe bedding with select fill material shall extend a minimum of 6 inches below the bottom of the pipe and be carried up to 1 foot over the top of the pipe for the full trench width or as shown or specified. Select fill material shall consist of natural sand, crushed stone, or other granular or similar material, which can be readily and thoroughly compacted. For pipe all select fill pipe bedding shall consist of clean sand.

Select fill shall be placed by hand, in uniform layers not greater than 6 inches in loose thickness, and thoroughly compacted in place per Indiana Department of Highways Specification No. 211.

Trench backfilling work shall be done in such a way as to prevent dropping of material directly on top of any conduit or pipe. In no case shall backfilling material from a bucket be allowed to fall directly on a structure or pipe and, in all cases, the bucket shall be lowered so that the shock of falling earth will not cause damage.

All sand used for backfill shall be clean sand, not lumpy or frozen, and free from rubbish or other material.

Gravel used for backfill shall consist of clean gravel having durable particles graded from fine to coarse in a reasonably uniform combination with no boulders or stones larger than 2 inches in size. It shall be free from deleterious or objectionable materials. It shall not contain excessive amounts of loam and clay and shall not be lumpy or frozen.

Where pipelines or other conduits are placed in short tunnels, the annular space between the outside of the pipe wall and the tunnel wall shall be completely filled with select fill material or suitable job excavated material. Pipelines or conduits in short tunnels shall be suitably supported to permit placing of backfill, which shall be suitably tamped in place.

Existing underground structures, tunnels, conduits and pipes crossing the excavation shall be bedded with compacted select fill material. Bedding material shall be placed under and around each existing underground structure, tunnel, conduit or pipe and shall extend underneath and on each side to a distance equal to the depth of the trench below the structure, tunnel, conduit or pipe.

END OF SECTION

**SECTION 02230  
MISCELLANEOUS PIPE AND FITTINGS**

**A. Plugs and Caps**

All dead ends on new mains shall be closed with plugs or caps suitably restrained to prevent blowing off under test pressure. A valve shall precede the plug or cap and shall be restrained against blowing off.

**B. Fittings**

Pipe fittings shall be Class 150 psi Ductile Iron fittings with Tyton or Fast Tite push-on joints and cement lining as described and manufactured in accordance with ANSI/AWWA C110/A21.10 or C153/A21.53. Pipe and fittings shall be manufactured by United States Pipe and Foundry Company. Fittings sizes 3-inch to 24-inch shall have boltless connections with Tyton joint ends with Field Lok Gaskets. Mechanical joint fittings will not be allowed. Solid sleeves with Mechanical Joint ends are required when ~~used~~ ~~for~~ ~~the~~ ~~Sample~~ Tap Assembly

Sample tap assembly shall be constructed as specified and shown on Figure 2 — "Typical 1" Type "K" Copper Pipe Sample Tap."

**D. Temporary Flush-Out Assembly**

2-inch galvanized steel pipe and fittings, as detailed in the installation of a temporary flushout (Section 02231).

**E. Tapping Sleeves**

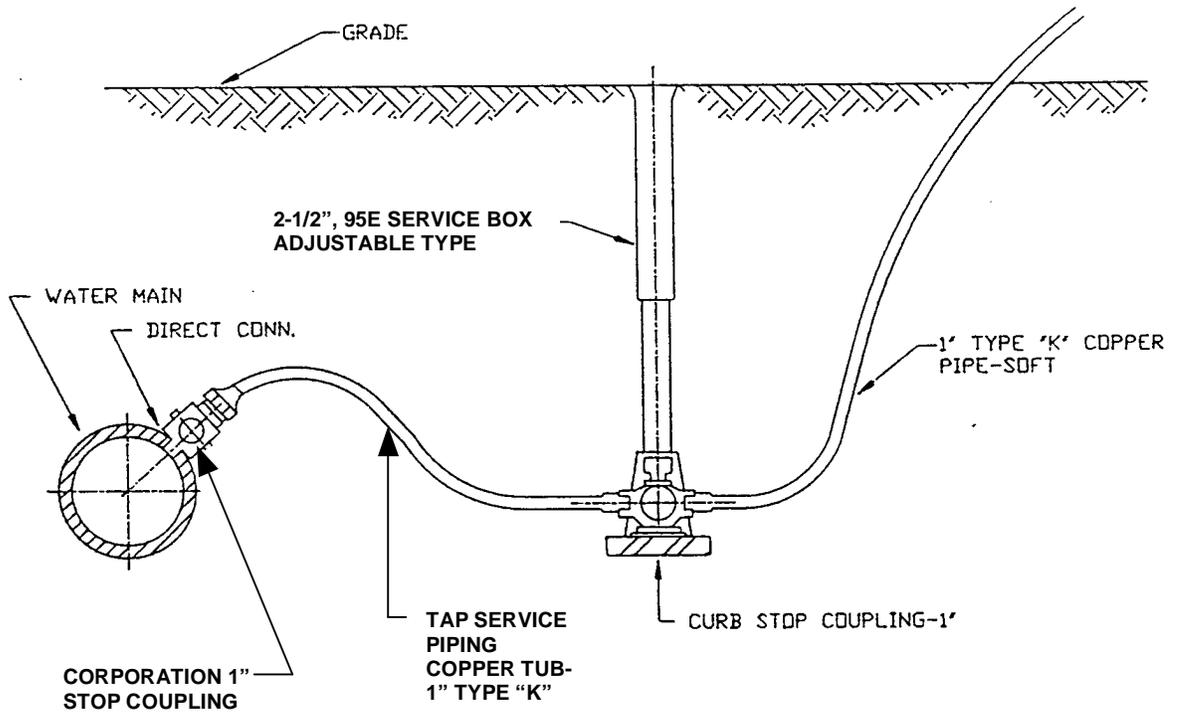
The Valparaiso City Utilities or its Contractor shall provide stainless steel sleeve for tapping existing water main. In addition, the outlet flange shall be a mechanical joint fitting. Furthermore, the Valparaiso City Utilities shall coordinate requirements of tapping sleeves with stainless steel bonnett bolts and other fittings as required.

**F. Connections to Existing System**

The Valparaiso City Utilities or its Contractor shall install all connections to the existing Valparaiso City Utilities system.

END OF SECTION

# CONSTRUCTION STANDARD



TYPICAL 1" TYPE "K" COPPER PIPE SAMPLE TAP

FIGURE 2

## SECTION 02231 VALVES

### A. General

Valves shall be R/S Gate Valves Tyton Joint with Field Lok Gaskets. Valves shall conform to ANSI/AWWA C509. Also, all valves shall have stainless steel nuts and bolts.

All valves shall be opened by turning counter clockwise and closed by turning clockwise. Parts of the valves of the same type and size shall be interchangeable.

All valves shall be carefully erected in their respective positions, free from all distortion and strain, and shall be packed and left in satisfactory operating condition. All valves shall have ends matching the joints in their connecting piping, except where otherwise shown, specified, or required.

Valves in water main, where practical, shall be located in unpaved areas unless shown otherwise on the plans.

Mains shall be drained through drainage branches or flushouts. Drainage branches, flushouts, air vents, and appurtenances shall be provided with valves and shall be located as shown on the plans. Drainage branches or flushout shall not be directly connected to any sewer, submerged in any stream, or be installed in any manner that will permit back siphonage into the distribution system. All dead end mains shall be equipped with suitable flushout and sample tap facilities, as shown in Figures 2 and 3 or, as directed by the Department Representative.

A valve box shall be installed for every valve that has no gearing or operating mechanism or in which the gearing or operating mechanism is fully protected with a gear case. The valve box shall not transmit shock or stress to the valve and shall be centered over the operating nut of the valve, with the box cover flush with the surface of the finished grade or such other level.

A valve vault designed to prevent settling on the pipe shall be provided for every valve that has exposed gearing or operating mechanisms. The operating nut shall be readily accessible for operation through the opening in the valve vault, which shall be set flush with the surface of the finished pavement or such other level as may be specified. Vaults shall be so constructed as to permit minor valve repairs and afford protection to the valve and pipe from impact where they pass through the vault walls.

In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

## B. Flanges

Flanges shall be cast solid and faced accurately at right angles to the axis of the casting. Flanges shall be faced and drilled and shop coated with a rust-preventive compound before shipment.

Dimensions and drillings of flanges shall meet the requirements of ANSI B16.1, 125 pounds. Special drilling shall be provided where required.

Flanges shall not be buried and can only be used in an area open to inspection.

## C. Flushout Valve Assembly

Flushout valve assembly shall be constructed as shown and specified on Figure 3 — "Temporary Flushout Valve Assembly."

## D. Valve and Curb Boxes

The valve boxes shall be adjustable, screw type, and made of cast iron. Valve boxes for 4-inch through 12-inch valves shall have a 5-1/4-inch diameter shaft and consist of a base, bottom section, top section and a lid marked "Water." Curb boxes for 1 inch curb stops shall consist of a bottom section, top section, and lid marked "Water". Curb boxes for curb stops 1-1/2 inch and 2 inch shall consist of a bottom section, top section, enlarged base, and lid marked "Water". Please refer to Section 02290 – Detail B for a Valve/Curb Box Detail.

## E. Resilient Seated Gate Valves

Resilient seated gate valves shall conform to AWWA C509 and shall be furnished with push-on joints.

Valves shall be ductile iron and shall have a non-rising stem.

The gate valve bonnet shall be held together by stainless steel nuts and bolts.

Resilient seats shall be applied in accordance with AWWA C509.

Valve shall be designed for a working pressure of 200 psi.

## F. Butterfly Valves

Butterfly valves shall conform to AWWA C504 and shall be furnished with mechanical joint connections.

Valve shall be ductile iron, valve shaft shall be stainless steel, valve discs shall be ductile iron, and valve seats shall be rubber.

Valve shall be designed for a working pressure of 150 psi, or 250 psi.

#### G. Mechanical Joint Valves for Use in Tapping

Valves shall conform to AWWA C509 and shall be furnished with mechanical joints.

Valves shall be ductile iron and shall have a non-rising stem.

The valve bonnet shall be held together by stainless steel nuts and bolts.

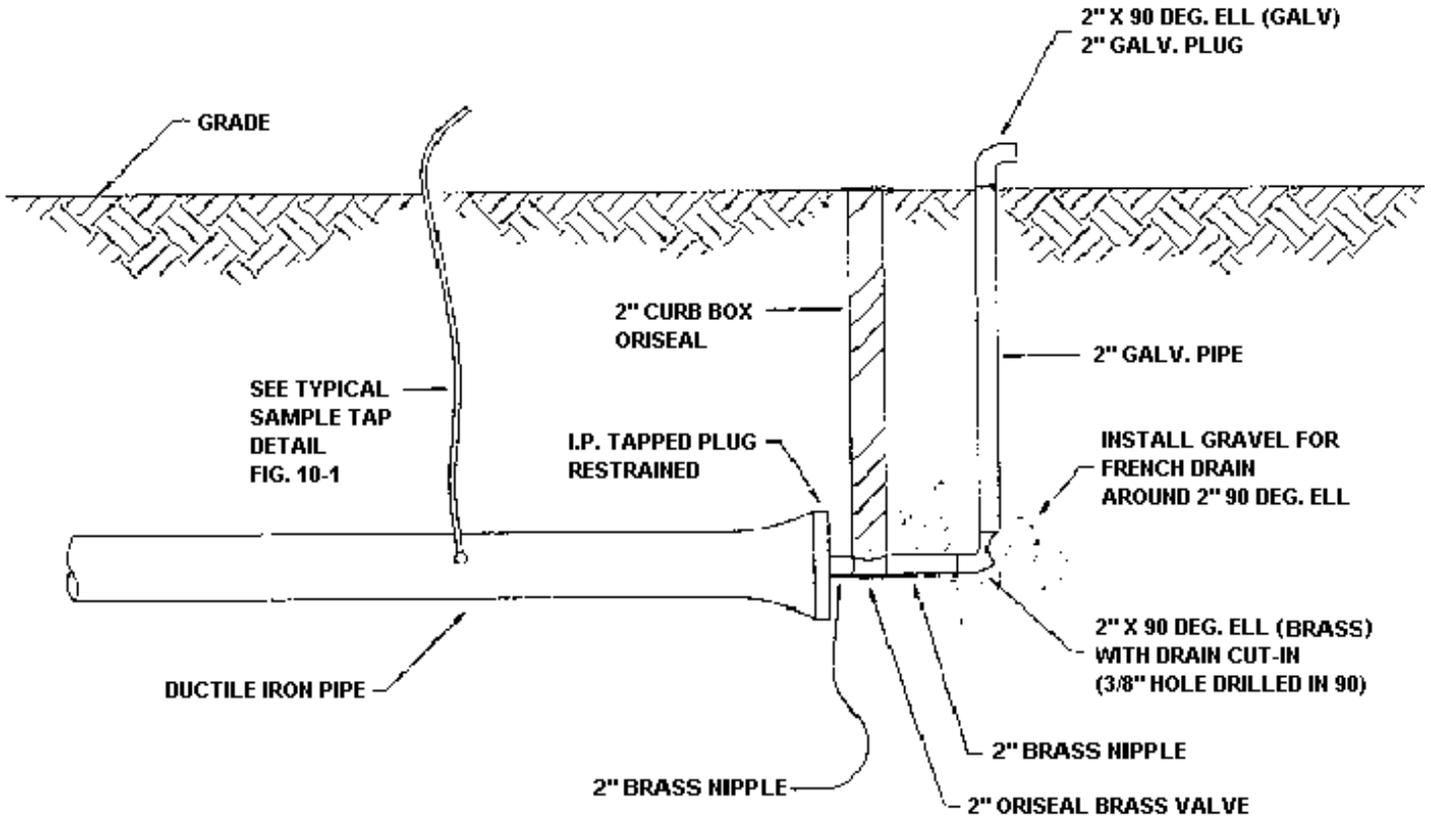
Valve shall be designed for a working pressure of 200 psi.

#### H. Painting and Coating

The outside of ferrous parts of valves shall be painted in accordance to AWWA C500 and AWWA C504. The inside of ferrous parts of valves shall be coated in accordance to AWWA C550.

END OF SECTION

# CONSTRUCTION STANDARD



NOTE: 1-1/2" and 2" curb stops require an enlarged base, 95E curb box.

## TEMPORARY FLUSH-OUT INSTALLATION

### FIGURE 3

## **SECTION 02232 PIPE INSTALLATION**

### **A. General**

The pipe shall be Ductile Iron pipe with Tyton™ or Fast Tite push-on joints and cement lined as described and manufactured in accordance with ANSI/AWWA C151/A21.51. Gaskets must properly match bell configuration. Pipe shall be installed in accordance with manufacturers' recommendations and AWWA C600.

Pipe shall be minimum Pressure Classes as follows: sizes 12-inch and smaller 350, 14-20-inch Pressure Class 250, 24-inch Pressure Class 200 and 30-inch and larger Pressure Class 150. Pipe thickness design shall include a minimum 100 psi for surge allowance.

Proper implements, tools and facilities shall be provided and used for the safe and convenient performance of the work. All pipes, fittings, and valves shall be carefully lowered into the trench in such a manner as to prevent damage to water main materials and protective coatings and linings. The trench shall be dewatered prior to installation of the pipe.

### **B. Inspection of Material**

All pipe fittings, valve, and other appurtenances shall be carefully examined for damage and other defects immediately before installation. Defective materials shall be marked and held for repairs or rejected for replacement by manufacturer.

All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit, or any foreign material before the pipe is installed.

Foreign material including trench water shall be prevented from entering the pipe while it is being placed in the trench. During laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe.

### **C. Obstructions and Clearances**

When an obstruction is encountered, the obstructions shall be removed to provide a clearance of at least 6-inches below and on each side of all pipes, valves and fittings for pipe sizes 24-inches or smaller, and 9-inches for sizes 30-inches and larger. When excavation is completed, a bed of crushed stone or earth free from stones, large clods or frozen earth, shall be placed on the bottom of the trench to the above mentioned depths and leveled and consolidated.

These clearances and bedding procedures shall also be observed for pieces of concrete or masonry and other debris or subterranean structures, such as masonry walls, piers or foundations which may be encountered during excavation.

In all cases, the specified clearances shall be maintained between the bottom of all pipe and appurtenances and any part, projection or point of rock, boulder or stone of sufficient size and placement which could cause a fulcrum point.

Should the trench pass over a sewer or other previous excavation, the trench bottom shall be sufficiently compacted in a manner that will prevent damage to the existing installation.

Underground and surface structures, drains, sewers and other obstructions encountered shall be temporarily supported, adequately protected, and maintained during the progress of the work.

#### D. Laying Conditions

The specified laying condition for ductile iron pipe shall be completed in accordance with AWWA C600, Pipe Installation, Figure 4, Type 2, unless otherwise noted on the plans.

As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.

Push-on Joints shall be assembled as described and illustrated in Figure 5 — "Push-on Joint Assembly" of the Specification.

#### E. Pipe Deflection

Where it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane, or where long radius curves are permitted, the amount of deflection shall not exceed that shown in Table 4 of AWWA C600 for push-on joint pipe. Trenches shall be made wider on curves as referenced in Section W-2.02-AWWA Standard installation specifications Table 5 of these Specifications.

#### F. Pipe Cutting

Cutting pipe for the insertion of valves, fitting or closure pieces shall be done in as neat, workmanlike manner without damage to the pipe or cement-mortar lining.

Ductile iron pipe shall be cut using an abrasive pipe saw or approved device.

Cut ends and rough edges shall be ground smooth and tapered, and for push-on joint connections, the cut end shall be beveled.

#### G. Bulkhead and Plugs

At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Department Representative. The plug

shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation should the trench fill with water.

At the ends of the sections where adjoining pipeline have not been completed, and in connection built into pipelines where adjoining pipeline or structures have not been completed and are not ready to be connected shall be built. Such bulkheads encountered in connecting sewers or structures included in the Contract, or pipelines or structures previously built, shall be removed when they are no longer needed.

#### H. Corrosion Protection

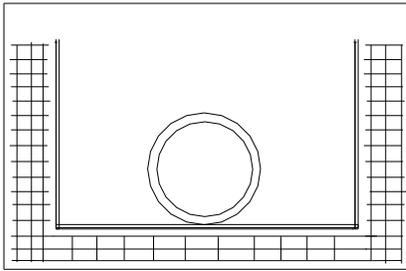
Tie rods, clamps or other components of dissimilar metal shall be protected against corrosion by encasement of the entire assembly with a double layer of 8-mil thick, loose polyethylene film in accordance with AWWA C105.

All pipe, fittings and valves shall have polyethylene encasement installed in accordance with AWWA C105.

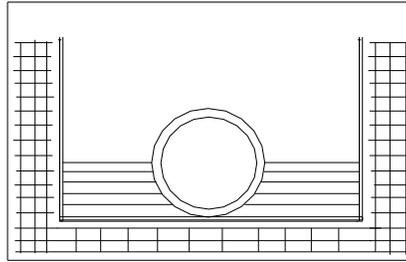
All bolted sleeves and other bolted materials to be installed underground shall have a double layer of loose polyethylene encasement.

END OF SECTION

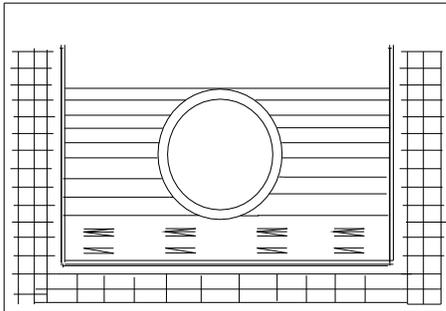
## LAYING CONDITIONS FOR DUCTILE IRON PIPE



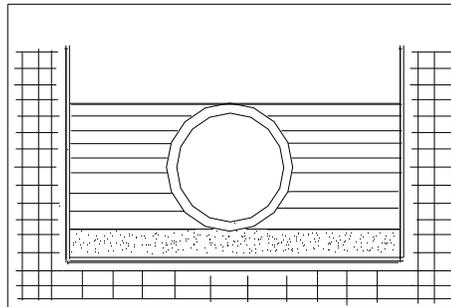
**Type 1\***  
Flat-bottom trench.\*  
Loose backfill.



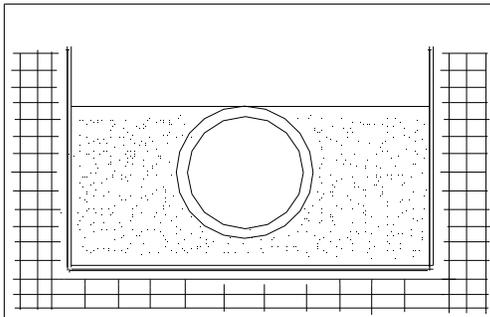
**Type 2**  
Flat-bottom trench.\* Backfill lightly  
consolidated to centerline of pipe.



**Type 3**  
Pipe bedded in 4 in. minimum of loose  
soil. ♦ Backfill lightly consolidated to  
top of pipe.



**Type 4**  
Pipe bedded in sand, gravel, or crushed stone to  
depth of 1/8 pipe diameter, 4 in. minimum. Backfill  
compacted to top of pipe (Approximately 80 percent  
Standard Proctor, AASHTO T-99).



**Type 5**  
Pipe bedded in compacted granular material to  
centerline of pipe. Compacted granular or select  
material to top of pipe (Approximately 90 percent  
Standard Proctor, AASHTO T-99).

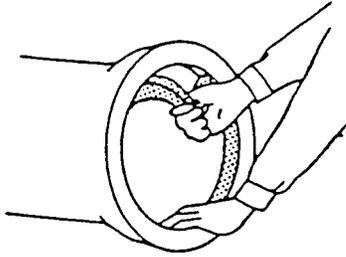
\* For 30-in. and larger pipe, consideration should be given to the use of laying conditions other than type 1.

♦ “Flat-bottom” is defined as undisturbed earth.

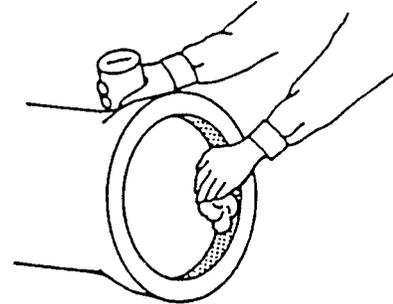
♦ “Loose soil” or “select material” is defined as native soil excavated from the trench, free of rocks, foreign materials, and frozen earth

**FIGURE 4**

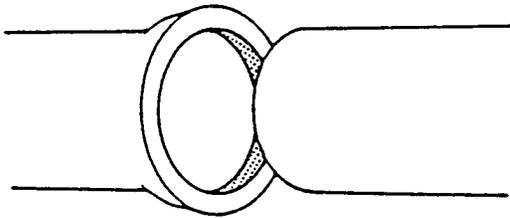
## PUSH-ON-JOINT ASSEMBLY



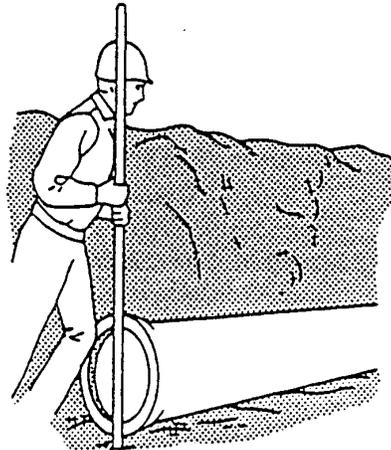
1. Thoroughly clean the groove and the bell socket of the pipe or fitting; also clean the plain end of the mating pipe. Using a gasket of the proper design for the joint to be assembled, make a small loop in the gasket and insert it in the socket, making sure the gasket faces the correct direction and that it is properly seated. Note: In cold weather, it is necessary to warm the gasket to facilitate insertion.



2. Apply lubricant to the gasket and plain end of the pipe in accordance with the pipe manufacturer's recommendations. Lubricant is furnished in sterile cans, and every effort should be made to keep it sterile. In some cases, manufacturer's recommendations on joint lubrication require that the gasket groove not be lubricated; in others, lubrication of the groove is necessary. It is important to follow the pipe manufacturer's instructions in either case.



3. Be sure that the plain end is beveled; square or sharp edges may damage or dislodge the gasket and cause a leak. When pipe is cut in the field, bevel the plain end with a heavy file or grinder to remove all sharp edges. Push the plain end into the bell socket of the mating pipe. Keep the joint straight while pushing. Make deflection after the joint is assembled.



4. Small pipe can be pushed into the bell socket with a long bar. Large pipe requires additional power, such as a jack, lever puller, or backhoe. The supplier may provide a jack or lever puller on a rental basis. A timber header should be used between the pipe and the jack or backhoe bucket to avoid damage to the pipe.

FIGURE 5

**SECTION 02233**  
**PRESSURE REDUCING VALVES**

A. General

The pressure reducing valve shall be a CLA-VAL Model 90-01BY Globe Style Flange Unit. It shall include a "position indicator" Model x101.

B. Inspection of Material

A factory representative shall provide start-up at job site after pressure testing and chlorination have been completed through the bypass.

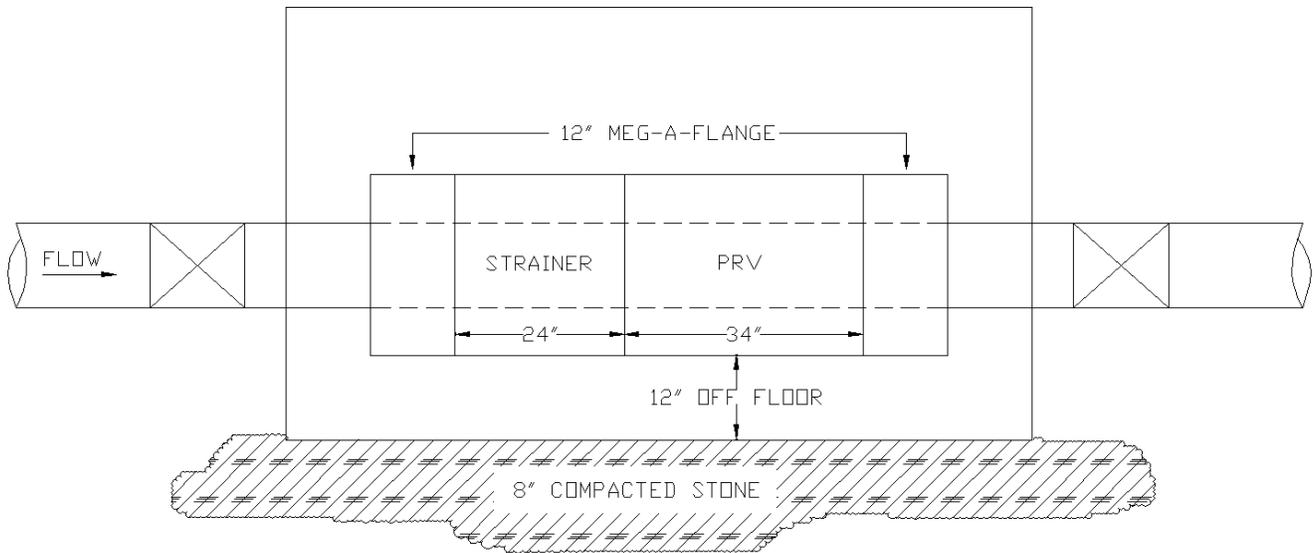
C. Installation

Pressure reducing valves shall be installed in an approved underground, water tight vault. There shall be an external valved bypass around the pressure reducing valve, size approved by the Valparaiso City Utilities.

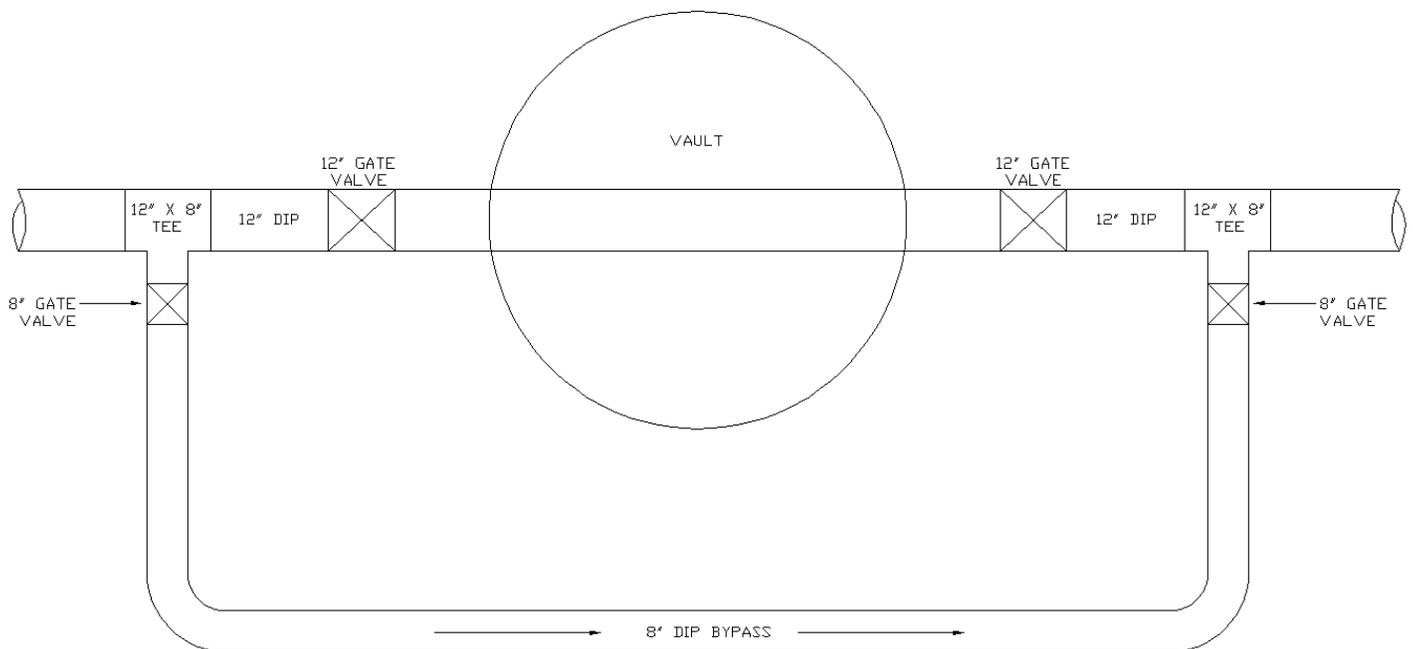
END OF SECTION

# LAYOUT OF PRESSURE REDUCING VALVE

## HORIZONTAL VIEW



## CROSS-SECTIONAL VIEW



8' diameter manhole, with offset entrance lid, precast stairs, waterproofed, to be placed on 8" compacted stone.

**SECTION 02234**  
**COMBINATION AIR RELIEF VALVES**

A. General

The unit shall be a Val-Matic, single body water combination air valve, model number 202C.2.

It shall include optional:

- a) Outlet hood with screen
- b) Bronze ball valve with handle
- c) Inflow preventer

B. Installation

It shall be installed in a 48" eccentric cone manhole with non-corrosive plastic-coated cast iron steps.

Vault shall be water-proofed, bedded on 4" of compacted stone, and concrete slugs poured over pipe at entrance to vault, as depicted in drawing.

END OF SECTION

## SECTION 02234 COMBINATION AIR RELIEF VALVES

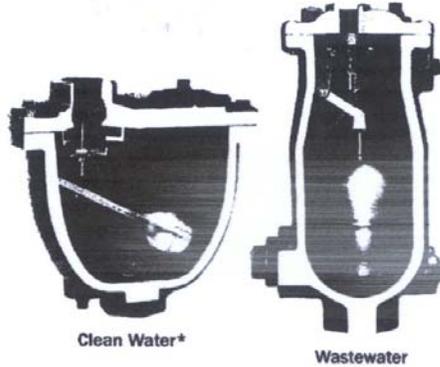
### Combination Air Valves

**Operational Highlights:**

- Provides the functions of both Air Release and Air/Vacuum Valves
- Exhausts large quantities of air at system start-up
- Releases air pockets during system operation
- Provides pipeline vacuum protection

**Product Features:**

- Single body incorporates both features within one valve
  - More compact and economical
- Dual body consists of two independent valves
  - Allows individual maintenance while still protecting the pipeline
  - Wider range of sizing options
- Inlets and outlets are equal to full nominal size
- Unconditionally guaranteed stainless steel floats
- Stainless steel 316 internal trim
- Non-clog design eliminates backwashing
- Exclusive high/low pressure resilient seating



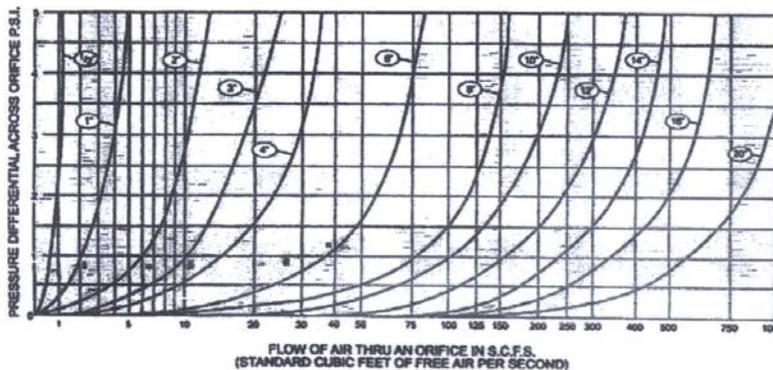
**Optional Accessories:**

- Outlet hood with screen (prevents debris from entering valves)
- Ball, plug and butterfly isolation valves (allows valve maintenance)
- Inflow Preventer on outlet (stops flood water and resulting contamination from entering pipeline)
- Backwash kit (for severe wastewater applications)



MATERIALS OF CONSTRUCTION		
COMPONENT	STANDARD	OPTIONAL
Body and Cover	Cast Iron ASTM A126 Class B Class 125 and 250	Ductile Iron ASTM A536 Grade 65-45-12 Stainless Steel ASTM A351 Grade CF8M
Trim	Type 316 Stainless Steel	
Coating	Universal Alkyd Primer (external)	Non-Stick Fusion Bonded Epoxy (Internal & external)

#### FLOW CAPACITY OF COMBINATION AIR VALVES

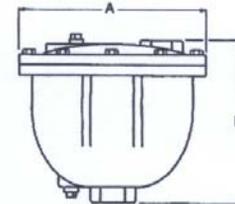


**SECTION 02234  
COMBINATION AIR RELIEF VALVES**

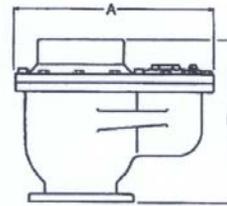
## Combination Air Valves Installation Dimensions

**WATER COMBINATION AIR VALVES (SINGLE BODY)**

Inlet Size	Outlet Size	Model Number	CWP PSI	Orifice Size	Dimensions	
					A	B
1" NPT	1" NPT	201C.2	300	5/64"	11 3/8"	10 1/2"
2" NPT	2" NPT	202C.2	300	3/32"	14"	13"
3" NPT	3" NPT	203C.2	300	3/32"	16"	15"
3" 125lb Fig	3" NPT	203C.14	150	3/32"	16"	16 3/4"
3" 250lb Fig	3" NPT	203C.15	300	3/32"	16"	17 1/4"
4" NPT	4" NPT	204C.2	300	3/32"	18 1/2"	17"
4" 125lb Fig	4" NPT	204C.14	150	3/32"	18 1/2"	19 3/4"
4" 250lb Fig	4" NPT	204C.15	300	3/32"	18 1/2"	20 1/4"
6" 125lb Fig	6" NPT	206C	150	3/8"	21"	20 1/4"
6" 250lb Fig	6" NPT	256C	300	7/32"	21"	20 1/4"
8" 125lb Fig	8" NPT	208C	150	3/8"	25"	23 1/2"
8" 250lb Fig	8" NPT	258C	300	7/32"	25"	23 1/2"



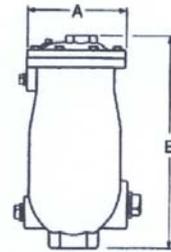
**201C.2 - 204C.15  
Single Body Combination  
Air Valves**



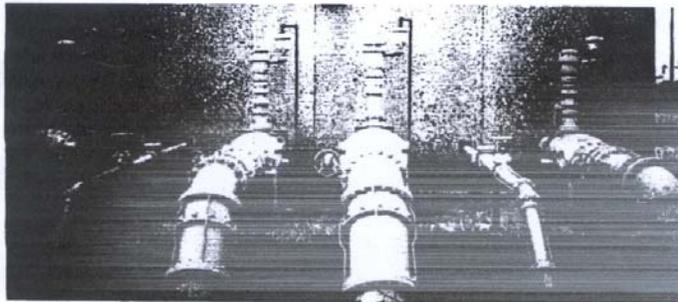
**206C - 258C  
Single Body  
Combination Air Valves**

**WASTEWATER COMBINATION AIR VALVES (SINGLE BODY)**

Inlet Size	Outlet Size	Model Number	CWP PSI	Orifice Size	Dimensions	
					A	B
2" NPT	1" NPT	801A	150	1/8"	14 15/16"	13 1/2"
2" NPT	2" NPT	802A	150	9/64"	9 1/2"	18 1/16"
3" NPT	3" NPT	803A	150	11/64"	11"	23 1/2"
4" NPT	4" NPT	804	150	11/64"	11"	23 1/2"

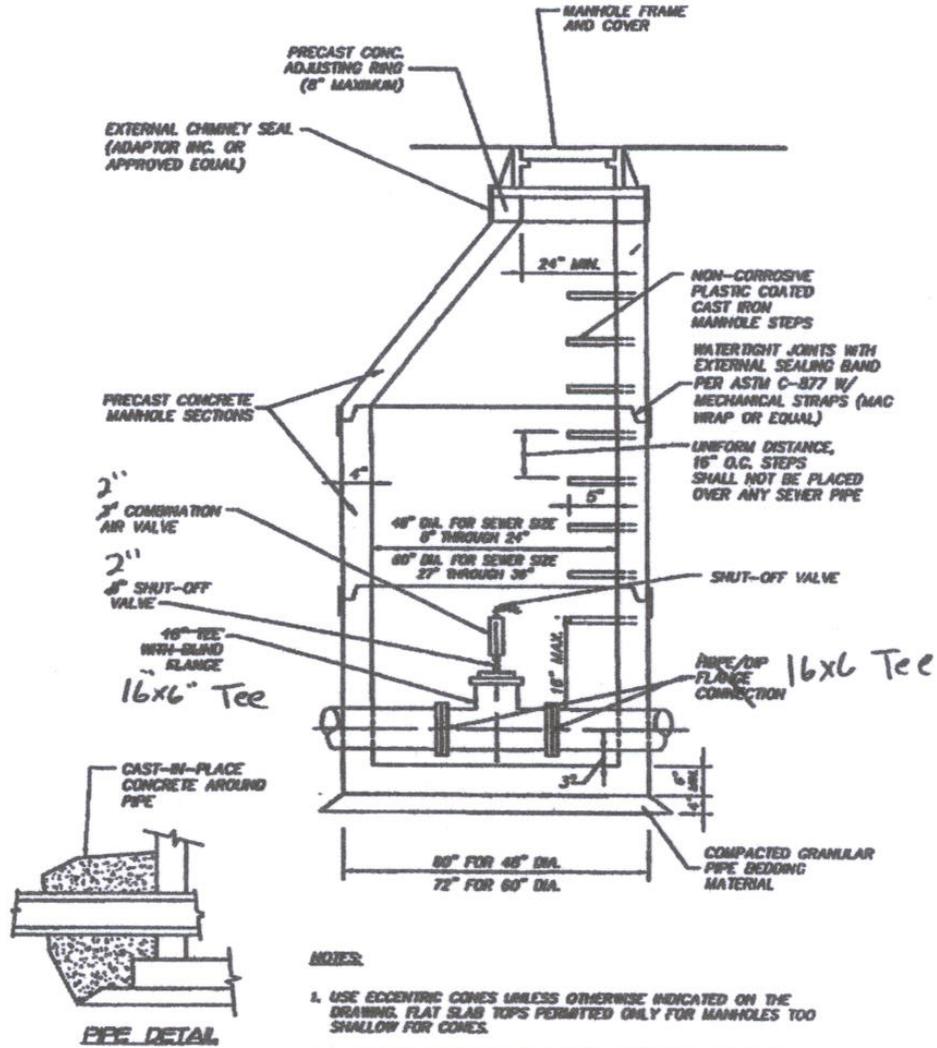


**801A - 804  
Wastewater  
Single Body Combination  
Air Valves**

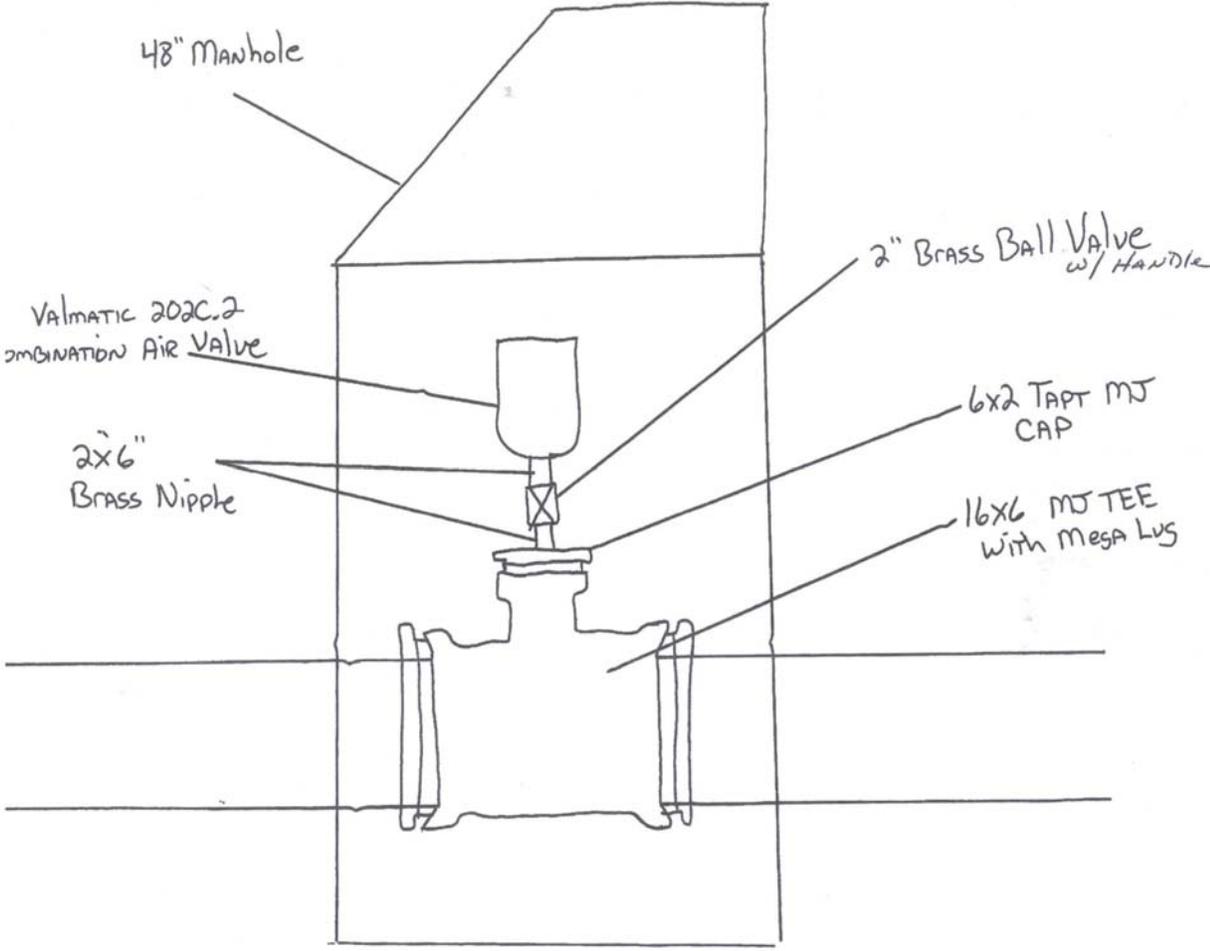


Surge-Suppression Air Valves and Isolation Valves in a pump discharge application.

**SECTION 02234  
COMBINATION AIR RELIEF VALVES**



SECTION 02234  
COMBINATION AIR RELIEF VALVES



## **SECTION 02235 DIRECTIONAL BORING**

### **A. General**

The pipe shall be Ductile Iron pipe with T/R Flex, or superlock, or approved equal restrained joint system with Tyton™ or Fast Tite joint gasket and cement lining as described and manufactured in accordance with ANSI/AWWA C151/A21.51. Gaskets must properly match bell configuration.

Where radius of curvature is less than that achieved by ductile iron pipe, pipe may be HDPE, DR 11, when approved, and in accordance with AWWA C906. HDPE, DR 9 may be required when static pressures exceed 150 psi. Other pipe materials and methods may be considered as specific situations require at the direction and approval of the VCU Distribution Manager.

Proper implements, tools and facilities shall be provided and used for the safe and convenient performance of the work.

The Contractor shall be prepared to attend all meetings and provide any necessary data, reports, information, details, and construction schedules as requested by the Department Representative, including, but not limited to the Manufacturer's Certificate of Compliance certifying compliance with the referenced specifications and standards, certified copies of reports of factory tests, and details of equipment to be used and drilling fluid to be used.

All work shall be done in a careful, workmanlike manner to the satisfaction of the Department Representative and Owner.

### **B. Pipe Handling and Inspection**

Pipe handling and installation shall be in accordance with manufacturers' recommendations and appropriate AWWA standards and manuals of practice, including M 41 & M 55.

All materials furnished by the Contractor shall be delivered and distributed at the site by the Contractor. All pipe, fittings, valves, and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

Pipe shall be handled in such a way that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair shall be made by the Contractor at its expense in a manner satisfactory to the Department Representative.

Proper implements, tools, and facilities satisfactory to the Department Representative shall be provided and used by the Contractor for the safe and convenient performance of the work.

If damage occurs to any pipe, fitting, valve, or water main accessories in handling or in installation, the damage shall be immediately brought to the VCU Distribution Manager's attention. The VCU Distribution Manager may reject any of the damaged items.

All lumps, blisters and excess coating shall be removed from the bell-and-spigot end of each pipe, and the outside of the spigot and the inside of the bell shall be wire brushed and wiped clean, dry and free from oil and grease before the pipe is laid.

### C. Pipe Installation

At times when pipe installation is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Department Representative.

The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or coatings and so as to leave a smooth end at right angles to the axis of the pipe. Flame cutting of pipe by means of an oxyacetylene torch shall not be allowed.

Whenever it is necessary to join ductile iron pipe with pipe of dissimilar metal, a method of insulating against the passage of electrical current shall be provided and shall be approved by the VCU Distribution Manager.

There is only one nominal dimension of the spigot outside diameter for each size of push-on joint pipe. Similar dimensions of the lead joint bell-and-spigot pipe may vary with the class of pipe for each size in existing lines. Therefore, care should be taken that the outside diameter of the existing line is the same as the outside diameter of the push-on joint pipe being installed; otherwise a special adapter to join the two lines may be necessary.

All pipe joints shall be thrust restrained using T/R Flex pipe, or superlock, or approved equal.

All ductile iron pipe installed by directional boring shall be double polyethylene encased. Each piece of pipe shall be encased with an 8-mil linear low-density polyethylene film first and a 4-mil high-density, cross-laminated polyethylene film over the 8-mil polyethylene.

Where HDPE or other plastic pipe is installed in the open cut condition it shall be installed in compacted select fill material. All HDPE or plastic pipe installations shall have two continuous different colored #8 copper tracer wires. The continuity of these wires shall be field verified prior to project final acceptance.

### D. Surface and Subsurface Conditions

The contractor shall verify the location of all known and unknown utilities and structures by test pitting prior to any boring. These utilities and structures include underground utilities such as, but not limited to storm drains, electric cables, water mains, sewer lines,

septic systems, gas lines, telephone lines, fiber optic lines, cable television lines, wells, and field drain tiles. These utilities and structure also include above ground utilities such as, but not limited to electric and telephone poles, buildings, trees, and existing road signs.

#### E. Experience

The Contractor shall demonstrate experience and expertise in trenchless excavation methods by providing a list of six utility references for whom similar work has been performed prior to commencing any work. These references shall include a name and telephone number for contact so Owner/Department Representative may verify claims.

The Contractor shall also provide documentation showing successful completion of at least 50,000 lineal feet of directional boring or shall obtain the services of an experienced directional boring subcontractor to supervise the installation prior to commencing any work. Conventional trenching shall not to be considered as applicable experience.

All supervisory personnel shall be adequately trained and shall have at least four years' experience in directional boring. The Contractor shall also submit the names and resumes of all supervisory field personnel for review by the Department Representative prior to commencing any work.

#### F. Directional Boring System Requirements

The system shall be remotely steerable and permit electronic monitoring of tunnel depth and location. The system shall be able to control the depth and direction of the pipe and must be accurate to a window of  $\pm 2$  inches.

The system will utilize a fluid-cutting process, using a drilling fluid such as bentonite and/or a polymer. This fluid shall be totally inert and contain no risk to the environment.

The drilling fluid shall remain in the tunnel to increase the stability of the tunnel and to provide a lubricant to reduce frictional drag when the pipe is installed.

The spoils shall be recovered by use of a vacuum system mounted on a vehicle for removal of the spoils. Spoils are not to be discharged into sewers or storm drains. The Contractor is responsible for disposal of all spoil material in accordance with all federal, state and local requirements.

#### G. Safety Requirements

Mechanical, pneumatic or water-jetting methods shall not to be acceptable due to the risk of surface subsidence and damage.

Upon completion of boring and pipe installation, the Contractor shall remove all spoils from all starting and termination pits. The pits shall to be restored to their original condition.

Because directional boring may to be performed while existing buried electrical cable is energized, the following safety requirements shall to be met:

1. All drilling equipment must have a permanent, inherent alarm system capable of detecting an electrical current. The ground system shall to be equipped with an audible alarm to warn the operator when the drill head nears electrified cable within a safe operating distance.
2. All crews shall to be provided with grounded safety mats, heavy gauge ground cables with connectors, hot boots and gloves.
3. All supervisor personnel shall to be adequately trained and have direct supervisory experience in directional boring. Refer to paragraph 3.3.C.

END OF SECTION

**SECTION 02236  
AUTO FLUSHERS**

Auto Flushers shall be installed on all dead end City of Valparaiso water mains at the direction of Valparaiso City Utilities (VCU) Water Department. The cost and installation of the auto flushing units shall be the sole responsibility of the Developer and incorporated into the design plans by the Developer's engineer. Approved auto flushing units shall become part of the Valparaiso water distribution system and will be operated and maintained by the VCU upon acceptance of the project.

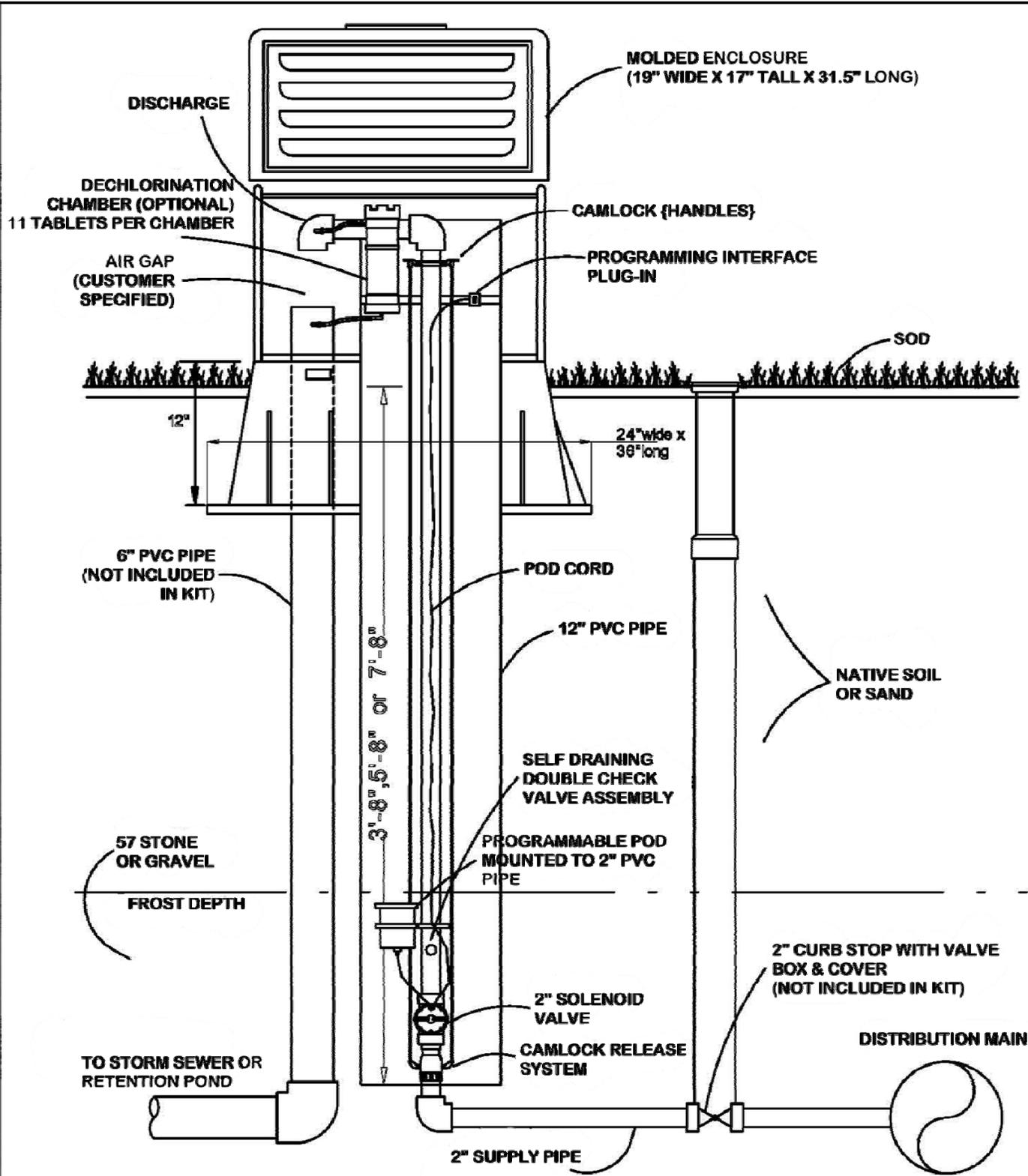
Each automatic flushing device shall be of free-standing design, self draining, non-freezing and all above ground components shall be contained within a low profile weather resistant locking cover similar in appearance to other utility boxes. Each automatic flushing device shall utilize a 2" connection and provide a 2" solenoid valve with a stand-alone valve controller that has a minimum of 9 possible flushing cycles per day operating with a 9 volt battery and have sealed electrical components. Each flushing device will have an approved sampling tap for bacteriological sampling as well as provide dechlorination of the flushed water. The discharge shall maintain a minimum of a 4 inch air gap between the flushing unit and the discharge pipe.

The attached exhibit illustrates a typical installation diagram. The typical depth of bury is 5 feet so the automatic valve and drain are located below the frost depth. The automatic flusher shall be connected to the water main through a 2" supply line and a 2" curb stop with valve box and cover.

**Valparaiso City Utilities approved Manufacturers and Models**

- A. Kupferle Model 9800 Automatic flushing device with optional dechlorination basket. Kupferle Foundry Company; St. Louis, MO
  
- B. Hydro-Guard Model HG-4 Longneck Automatic Flushing System with optional sampling point and dechlorination system. (Handheld programmer is not necessary). Environmental Enhancement and Technologies HydroGuard; Naples, Florida.

END OF SECTION



**TYPICAL INSTALL**  
**HYDRO-GUARD® HG-4 STANDARD**

**SECTION 02240  
ANCHORAGE**

I. DESIGN

A. Push-On Joints

All restrained joints by ductile iron pipe and fittings sizes 4-inch to 24-inch in diameter shall be boltless restrained utilizing Field Lok™ or Fast Grip gaskets or approved equal. All gaskets shall be Tyton or Fast Tite joint in design with corrosion resistant stainless steel locking teeth vulcanized into the rubber. All restraining gaskets sizes 4-inches to 12-inches in diameter shall be functional for 350 psi operating pressure with a 2:1 safety factor and allowed for complete joint deflection of 5 degrees. All restraining gaskets sizes 14-inch to 24-inch in diameter shall be functional for 250 psi operating pressure with a 2:1 safety factor and allowed for complete joint deflection of 3 degrees.

RESTRAINED PIPE LENGTH  
(FEET)

PIPE SIZE (INCHES)	TEE* BRANCH	90 ELBOW	45 ELBOW	22 ½ ELBOW	11 ¼ ELBOW	DEAD ENDS
4	0	15	6	3	2	20
6	9	22	9	4	2	28
8	18	27	11	5	3	37
10	25	33	14	7	3	44
12	33	39	16	8	4	52
14	41	44	18	9	4	60
16	48	50	21	10	5	68
18	56	55	23	11	5	75
20	63	61	25	12	6	82
24	77	71	29	14	7	96
30	97	86	36	17	8	116
36	116	100	41	20	10	135

\* One full length (18') of pipe on both sides of branch shall be restrained.

Lengths in table include factors for the use of polyethylene wrapped ductile iron pipe.

B. Thrust Blocking

Reaction blocking shall be designed for a minimum internal pipe pressure of 150 psi pounds per square inch. The blocking shall be kept clear of the entire bell configuration of any adjacent joint and shall be at least as large as is necessary to restrain the fittings from movement.

All plugs, caps, tee, bends, and 16" valves or larger, unless otherwise specified, shall be provided with reaction backing, or suitably restrained by attaching metal rods, clamps, or restrained joints as shown or specified by VCU Supervision. Field Lok™ gasket system or approved equal shall prevail for concrete blocking for 4" through 12" pipe.

For typical thrust block design and installations see Figure 6 of this Specification.

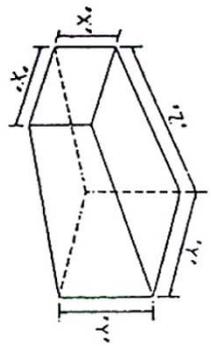
Backing shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on the ground in each instance shall be that calculated by using Figure 6. The backing shall, unless otherwise shown or directed, be so located as to contain the resultant thrust force and so that the pipe and fitting joints will be accessible for repair.

Concrete shall consist of an aggregate not to exceed 1 inch with the slump of the concrete when placed not to exceed 3 inches, and have a crushing strength of not less than 2000 psi in 28 days. Admixtures shall not be used except under strict methods of control.

Reinforcement bars shall be of deformed type and shall be billet or rail steel complying with ASTM Specifications A615. All bars shall be bent cold. Before being installed in final position, all metal reinforcements shall be free from mud, clay, ice, grease, oil, loose rust and scale, and other coatings, which would reduce or destroy the bond. Metal reinforcement shall be accurately positioned as to location and size, as called for on drawings.

END OF SECTION

# THRUST BLOCKING

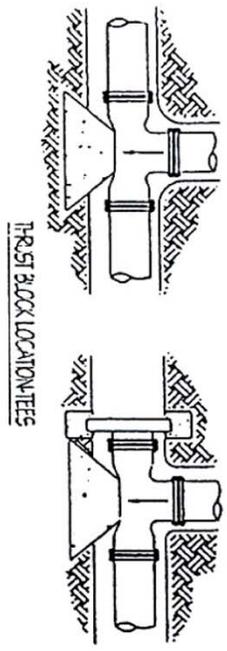


NOTE:

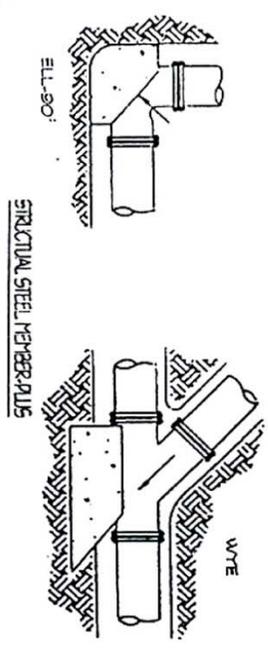
Concrete shall be kept a sufficient distance from joints for removal of all joint accessories including bolts, and shall be of a mix not leaner than 1 part cement to 2 1/2 parts sand and 5 parts stone and having a compressive strength of not less than 2000 psi after 28 days.

Polyethylene installed between fitting and the trust

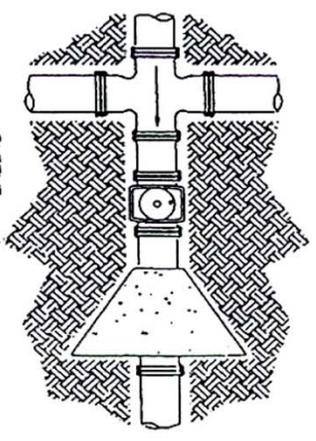
PIPE SIZE:	BEND:	THRUST @ CAPACITY:	BEARING CAPACITY:	REQ'D AREA SQ. FT.:	SIZE OF CONC BUTTRESS:	YDS. OF CONC.:
6'	90°	6400#	1000 PSF	6.40	$X=2'6"$ $Y=3'0"$ $Z=3'0"$	0.80
	45°	3500#		3.50	$3'0"$ $2'6"$ $2'6"$	0.47
	11.25°	900#		0.90	$1'0"$ $1'6"$ $2'0"$	0.12
8'	90°	11,500#	1000 PSF	11.50	$X=3'0"$ $Y=3'6"$ $Z=4'0"$	1.54
	45°	6200#		6.20	$1'6"$ $3'0"$ $4'0"$	0.84
	11.25°	3200#		3.20	$1'6"$ $2'3"$ $3'3"$	0.43
12'	90°	26,000#	1000 PSF	26.00	$X=4'0"$ $Y=5'0"$ $Z=4'0"$	3.50
	45°	15,000#		15.00	$3'0"$ $4'3"$ $4'0"$	2.02
	11.25°	7100#		7.10	$2'0"$ $3'3"$ $2'6"$	0.96
16'	90°	42,000#	1000 PSF	42.00	$X=4'0"$ $Y=7'0"$ $Z=4'6"$	5.65
	45°	25,000#		25.00	$3'9"$ $5'6"$ $4'0"$	3.36
	11.25°	13,000#		13.00	$3'0"$ $4'0"$ $3'9"$	1.75
20'	90°	65,000#	1000 PSF	65.00	$X=6'8"$ $Y=8'6"$ $Z=4'3"$	8.73
	45°	38,000#		38.00	$5'0"$ $6'6"$ $4'3"$	5.10
	11.25°	19,000#		19.00	$3'0"$ $5'0"$ $4'0"$	2.56
36'	90°	200,000#	1000 PSF	200.00	$X=8'0"$ $Y=16'0"$ $Z=7'3"$	26.90
	45°	130,000#		130.00	$5'0"$ $12'0"$ $5'6"$	17.50
	11.25°	60,000#		60.00	$4'0"$ $8'6"$ $5'0"$	8.20
				29.00		3.70



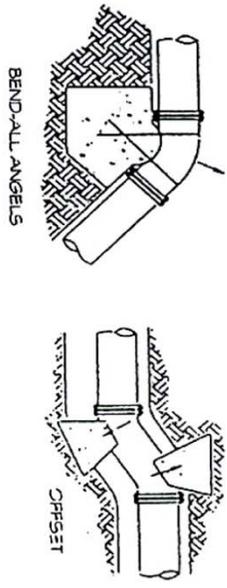
THRUST BLOCK LOCATIONS



STRUCTURAL STEEL MEMBERS



SLEEVE



BEND-ALL ANGELS

OFFSET

FIGURE 6

**SECTION 02250  
HYDROSTATIC TESTING PROCEDURE**

**A. Water Test for Ductile Iron Pipe**

All new water pipeline construction shall be hydrostatically tested in accordance with Hydrostatic Testing, AWWA C600.

The test pressure shall not be less than 150 psi at the highest point. Along the test section, the test pressure shall not exceed pipe or thrust-restraint design pressure, shall be of at least 2 hour duration, and shall not vary by more than 5 psi for the duration of the test.

Before testing, all air shall be expelled and all caps, plugs and fittings shall be properly braced. Air is expelled by opening a fire hydrant or air release vents or corporation cocks at the high points of the line. Once all the air is released, the valves between the existing distribution system and the pipe to be tested are closed. Pressure is then applied to the portion of the pipeline being tested by means of a hand or motor driven pump.

The pipeline shall be pressurized to 150 psi and held at this test pressure for at least two (2) hours duration, with the leakage and pressure recordings being conducted simultaneously. Any make-up water shall be carefully measured by a meter or by pumping the water from a vessel of known volume. After every five (5) psi drop (in the event the psi drop should occur) the pressure shall be returned to 150 psi and leakage recorded.

**B. Leakage**

Allowable make up water formula:  $L = \frac{SD\sqrt{P}}{133,200}$ , where L = allowable leakage in gallons per hour; S = length of pipe tested, in feet; D = nominal diameter of the pipe, in inches; and P = average test pressure during the leakage test, in pounds per square inch gauge. (revised allowable make up water formula divisor is 148,000)

Allowable Leakage Table per 1000 feet of pipeline in gph at a test pressure of 150 psi.

TABLE 3

Pipe Size-in.	4	6	8	10	12	16	20	24	30	36	42
Leakage-gph	0.33	0.50	0.66	0.83	0.99	1.32	1.66	1.99	2.48	2.98	3.48

**C. Documentation**

Each Hydrostatic Test shall be documented using the following format:

## HYDROSTATIC WATER PIPELINE TEST REPORT

Date \_\_\_\_\_ Tester \_\_\_\_\_

Project Name \_\_\_\_\_

Location \_\_\_\_\_

Pipe Diameter \_\_\_\_\_ Pipe Length \_\_\_\_\_ Pipe Material \_\_\_\_\_

Meter Number & Size \_\_\_\_\_ Meter Reading \_\_\_\_\_

Allowable Leakage (for two hour test period) \_\_\_\_\_

Test Start Time \_\_\_\_\_ Test Ending Time \_\_\_\_\_

Test Pressure Used \_\_\_\_\_ Leakage Recorded \_\_\_\_\_

Test Analysis (U-unsatisfactory S-satisfactory) \_\_\_\_\_

Sketch of pipe layout being tested (include fittings, caps, and plugs, etc. in the sketch) to be noted below or to be attached.

END OF SECTION

## **SECTION 02255 DISINFECTION**

### **A. General**

All mains shall be disinfected in accordance with AWWA C651 "Standard for Disinfecting Water Mains" supplemented by the following procedures:

As the pipe is placed in the ground, care shall be taken to keep dirt and debris out of the pipe. After the pipe has been installed the main is to be filled very slowly with water. At a point near the end of each section of the pipeline, a 1" copper sample tap shall be installed for taking water samples. (see Figure 2 of this Specification). Once the pipe work is complete, a solution of chlorine to 100 ppm shall be pumped through the pipe. A slow flow of water will carry the chlorine solution to the end of the pipe and discharge through a flushout or hydrant. A residual of 100 ppm shall be obtained and left in the main for a 24-hour period in order to obtain proper disinfection.

At the end of 24 hours the main shall again be sampled. A chlorine residual of at least 50 ppm at that time is required. The main may then be flushed so that all the treated water has been eliminated from the main. (see Figure 3 of this Specification for a temporary flushout installation).

After the main has been flushed, a sample of water shall be taken for bacteriological examination by the Valparaiso City Utilities' laboratory. The laboratory shall test for the presence of the coliform group of organisms by the membrane filter or multiple tube technique. A second water sample shall be taken 24 hours after the first. If both water samples are determined safe by the laboratory supervisor, the main may be placed in service. If the first or second water sample shows contamination or if the chlorine residuals are not adequate, the main shall be reflushed and/or rechlorinated and the above procedure repeated until tests indicate the main has been properly disinfected.

END OF SECTION

**SECTION 02260  
SITE RESTORATION**

A. Backfill

The top 6 inches of areas to be landscaped shall be backfilled with topsoil from the site.

B. Finish Grading

Finish grading shall be performed in accordance with the completed contour elevations and grades shown and made to blend into conformation with remaining natural ground surfaces. All finished grading surfaces shall be left smooth and firm to drain. Finish grades shall be brought to elevations within plus or minus 0.10 foot of elevations or contours shown.

Grading outside of building or structure lines shall be performed in a manner to prevent accumulation of water within the area. Where necessary or where shown, finish grading shall be extended to insure that water will be carried to drainage ditches, and the site area smooth and free from depressions holding water.

C. Restoration

Any fence or part thereof that is damaged or removed during the course of the work shall be replaced or repaired by the Valparaiso City Utilities or its Contractor and shall be left in as good a condition as before the starting of the work. The manner in which the fence is repaired or replaced and the materials used in such work shall be subject to the approval of the Department Representative.

Lawn areas shall be left in as good condition as before the starting of the work. Seeding shall restore the area where sod has been removed.

All properties including, but not limited to pavement, curbs, gutters, ditches, lawns, fences, and that have been disturbed shall be restored as nearly as practical to their original condition.

END OF SECTION

## **SECTION 02270 SERVICE PIPES**

### **A. Description**

The Valparaiso City Utilities or its Contractor shall install a service line from the water main to terminate 2' behind the sidewalk. The size of the line will be determined by the customer's usage. The minimum size line is 1-inch. All service line material shall be copper Type "K" soft temper, or ductile iron cement lined. The use of plastic for the customer's lines is not allowed.

### **B. Corporation Stops for Service Fittings**

All 1-inch corporation stops shall be in accordance with the latest revisions of the AWWA C800 standard.

The only corporation stops, which will be accepted for use in connection with water service installation, is Ford FB 1000-4Q – Compression.

### **C. Curb Stops for Service Fittings**

All 1-inch curb stops shall be in accordance with the latest revisions of AWWA C800 standard.

The only curb stop, which will be accepted for use in connection with water service installation, is Ford B44-444 – Q Compression.

### **D. Service Installation**

Service lines shall be installed as shown on plans. No tap shall be hooked-up to customer service line until the main passes the pressure leakage test and has been successfully disinfected.

The main shall be tapped and a corporation stop installed between 10 and 12 o'clock on the pipe circumference. Polyethylene encasement shall be properly cut and repaired.

Service lines shall be installed with the same depth of cover as specified for mains and shall be laid with no unnecessary bends.

On all new construction services, the curb box will be located two feet (2') behind the sidewalk.

### **E. Service Connection Details**

No copper services less than 1-inch will be allowed under any circumstances. For any services greater than 1-inch, the Valparaiso City Utilities shall use the construction details in Section 02290 – Detail C or be direct tapped if so approved by VCU

distribution.

For 6-inch domestic and fire services, a hydrant tee shall be used and it shall be directly connected to the gate valve.

For 4 and 8-inch services, a nipple shall be connected to the tee and then connected to the gate valve.

#### F. Indiana Plumbing Rules

The service line shall be spaced from sewer or drain lines to maintain spacing as required by the Indiana Plumbing Rules and Regulations.

#### G. Separate Building Service Lines

Each separate building shall have its own service line.

#### H. Curb Stop Ownership

The curb stop is the property of the Valparaiso City Utilities and shall not be operated by the customer.

#### I. Meters

Valparaiso City Utilities will be responsible for the purchase and installation of meters. Meter yokes will be purchased by the Valparaiso City Utilities and installed by others.

END OF SECTION

## **SECTION 02280 HYDRANTS**

### **A. Description**

Hydrants shall be Mueller Super Centerian or Kennedy Gaurdian K 81-D with a Mechanical Joint Shoe. Hydrants are to be manufactured in accordance to ANSI/AWWA C5.

Hydrants shall conform to the following specifications:

- (1) Hydrants shall have a 5-1/4" Main Valve Opening.
- (2) Hydrants shall have BRONZE Seat Ring & Sub-Seat.
- (3) Hydrants shall have Two (2) 2-1/2" Hose Nozzles (National Standard Threads).
- (4) Hydrants shall have One (1) 4-1/2" Pumper Nozzle (National Standard Threads).
- (5) Hydrants shall have 1-1/2" Pentagon Operating Nuts.
- (6) Hydrants shall Open Left.
- (7) Hydrants shall have a 6" Mechanical Joint Shoe, which shall be held together by stainless steel nuts and bolts.
- (8) Hydrants shall be painted OSHA Safety Yellow.
- (9) On water mains 12" and larger, the M-94 hydrant shall be a double-pumper hydrant.

### **B. Installation**

Examination of Material:

All hydrants shall be inspected for direction of opening, nozzle threading, operating-nut and cap-nut dimensions, tightness of pressure-containing bolting, cleanliness of inlet elbow, handling damage and cracks.

Placement:

All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb, with pumper nozzle facing the curb.

Hydrants shall be set to the established grade, with the centerline of the lowest nozzle at least 12 inches above the ground. Traffic model hydrants shall be installed such that the breakaway flange shall be installed no less than 2 inches, nor more than 6 inches above established grade.

Each hydrant shall be connected to the main with a 6-inch or larger diameter branch controlled by an independent valve. The valve shall be restrained to allow shutoff when the hydrant is to be removed.

When a dry-barrel hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing pea gravel or clean lime stone mixed with coarse sand from the bottom of the trench to at least 6 inches above the drain-port opening in the

hydrant and to a distance of 1 foot around the elbow. Where groundwater rises above the drain port or when the hydrant is located within 8 feet of a sanitary sewer main, the drain port shall be plugged and water pumped from a hydrant when freezing may occur.

When a dry-barrel hydrant with an open drain port is set in clay or other impervious soil, a drainage pit 2 feet by 2 feet by 2 feet shall be excavated below each hydrant. The drainage pit shall be filled with coarse gravel or crushed stone mixed with coarse sand under and around the elbow of the hydrant and to a level of 6 inches above the drain port.

**Corrosion Protection:**

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

**Location:**

Hydrants shall be located as shown on the plans or as directed by the owner. No hydrant shall be located in access of 10 feet from the curb or no closer than 2 feet to curb.

**Protection:**

In the case of hydrants that are intended to fail at the ground line joint upon vehicle impact (traffic hydrants), specified care must be taken to provide adequate soil resistance to avoid transmitting shock movement to the lower barrel and inlet connection. In loose or poor load-bearing soil, this may be accomplished by pouring a concrete collar approximately 6 inches thick to a diameter of 2 feet at or near the ground line around the hydrant barrel.

**Additional Information:**

Any additional information regarding installation of hydrants can be found in AWWA Manual M17.

**Hydrant Detail:**

Please refer to Section 02290 – Detail “A” for a Hydrant Detail.

END OF SECTION

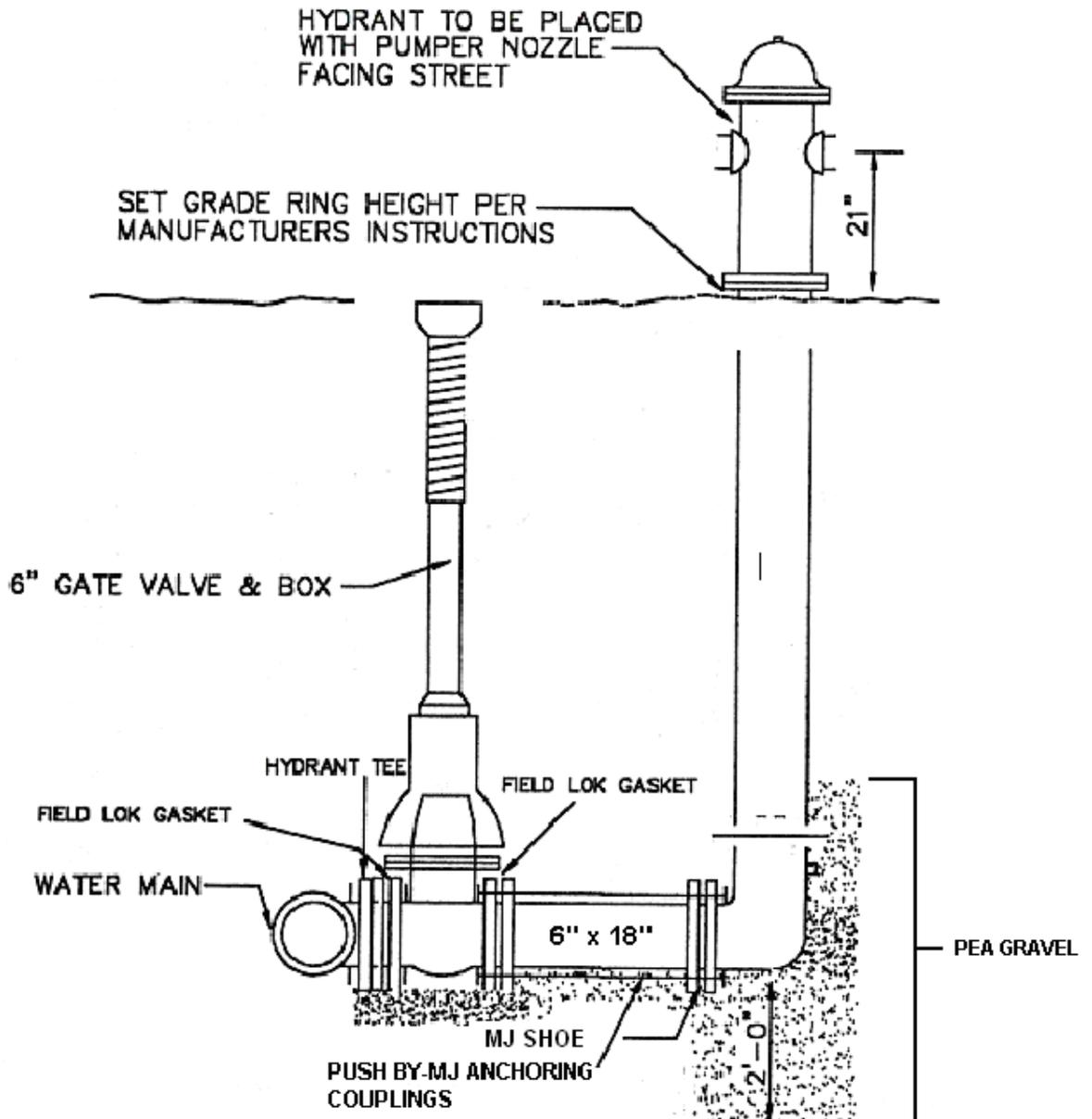
**SECTION 02290  
CONSTRUCTION DETAILS**

Detail A: Hydrant Detail

Detail B: Valve/Curb Box Detail

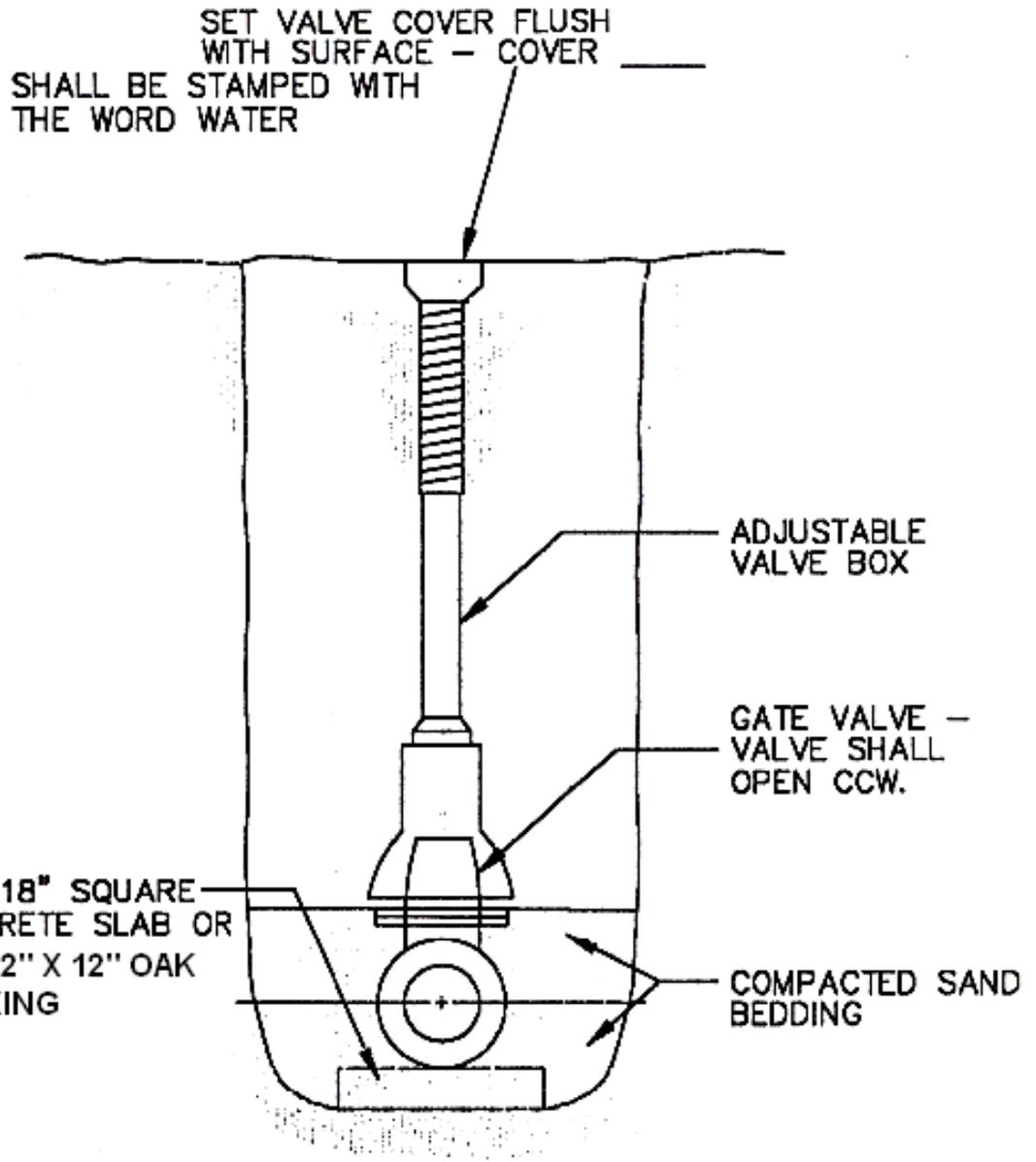
Detail C: Trench Detail

END OF SECTION



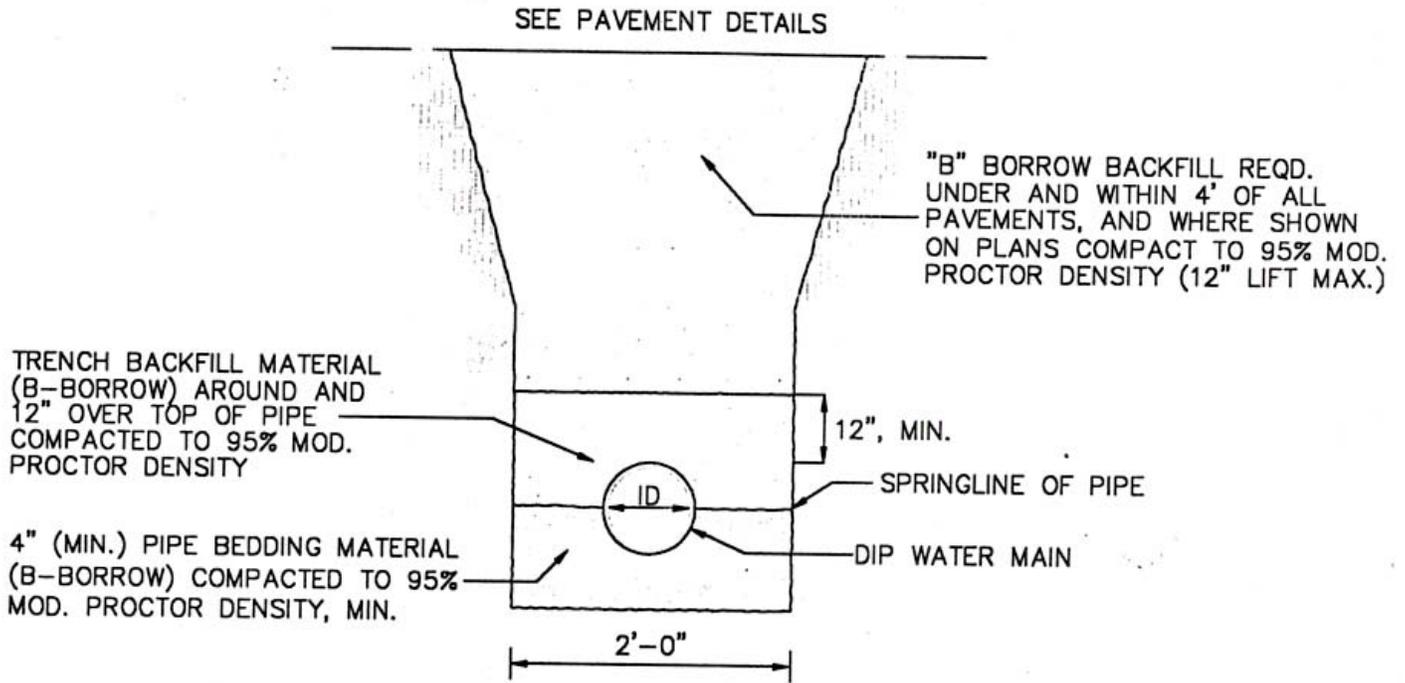
**NOTE:** Hydrants shall be Mueller Super Centerian or Kennedy Gaurdian K 81-D with a Mechanical Joint Shoe.

**DETAIL A - HYDRANT DETAIL**  
(NOT TO SCALE)

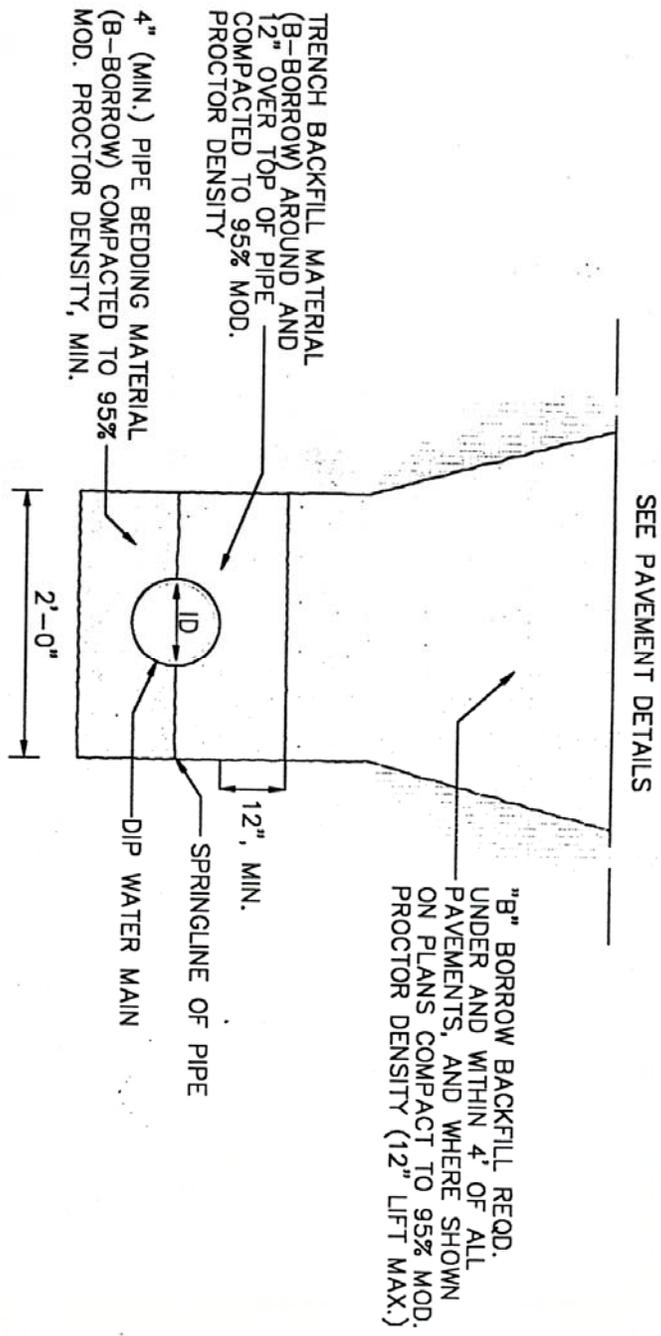


**NOTE:** FOR 1.5 AND 2-INCH SERVICES, AN FIP X FIP CURB STOP SHALL BE USED AND IT SHALL BE CONNECTED TO AN ENLARGED CURB BOX BASE AND THEN THE ENLARGED CURB BOX BASE SHALL BE CONNECTED TO THE CURB BOX.

**DETAIL B – VALVE / CURB BOX DETAIL**  
(NOT TO SCALE)



**DETAIL C – SERVICE CONNECTION DETAIL**  
(NOT TO SCALE)



**DETAIL D – TYPICAL TRENCH DETAIL**  
(NOT TO SCALE)

VCU SPECIFICATIONS AND ENGINEERING REQUIREMENTS FOR THE INSTALLATION  
OF WATER MAINS AND APPURTENANCES

**ADDENDUM**  
**PVC PIPE FOR WATER MAINS AND SERVICES**

PART 1 - PRODUCTS

1.1 PIPE AND FITTINGS

A. General:

1. No foreign-manufactured pipe shall be allowed. All pipe restraints shall be produced solely in the United States.
2. All materials shall be certified for conformance with ANSI/NSF Standard 61.

B. Pipe:

1. Polyvinyl Chloride Pipe (PVC):
  - a. All PVC pipe shall be PVC 1120 pressure pipe made from clean, virgin class 12454 PVC compound conforming to resin specification ASTM D1784 with outside dimensions of cast iron pipe and shall conform to all applicable requirements of ASTM D1784 and D2241. The PVC compounds shall be treated or certified suitable for potable water products by the National Sanitation Foundation (NSF) Testing Laboratory (NSF Standard No. 61). All PVC pipe shall be blue in color.
  - b. In accordance with the latest edition of AWWA C900.
  - c. All PVC pipe shall have a dimension ration (DR) of 14 (305 psi pressure class per C900). In no case shall PVC pipe with a wall thickness less than DR 14 be permitted. PVC pipe pressure classes were increased in the lates revision of AWWA C900; however, VCU does not allow pipe in its system to be fully subject to the revised Pressure Class pressures in AWWA C900 latest revision. DR 14 shall not be subjected to working pressures exceeding 200 psi.
  - d. Minimum pipe stiffness (F/dY) at 5% deflection shall be as follows when tested in accordance with D2241:
    - i. DR 14 pipe: 914 psi for all sizes
  - e. The pipe shall be designed to pass a quick burst test pressure of 985 psi (DR 14 pipe) applied in 60 to 70 seconds when tested in accordance with ASTM D1599, as referenced in ASTM 2241.
  - f. Standard laying lengths shall be 20-feet. Random lengths of not more than 15% of the total footage of each size may be shipped in lieu of the standard lengths. Reruns of reclaimed material shall not be accepted.
  - g. Acceptable manufacturers shall be JM Eagle, Inc., North American Pipe Corporation, Diamond Plastics Corporation, Northern Pipe Products, Sanderson Pipe, and Vulcan Plastics, a Division of Consolidated Pipe & Supply Company, Inc., or approved equal.
2. Copper Service Pipe
  - a. See VCU Specification Section 02270 "Service Pipes"
3. PVC Service Pipe
  - a. HDPE – PEX DR 9, 200 PSI. Shall be copper tube size and blue in color.
  - b. Stiffener shall be used at every compression joint.

C. Joints:

1. PVC Pipe:

- a. The pipe shall have bell and spigot ends with push-on, O-ring rubber gasket, compression type joints conforming to the requirements of ASTM 2672 and AWWA C111 standards for rubber joints.

D. Fittings:

1. General
  - a. All fittings shall be ductile iron pipe regardless of mainline pipe.
2. PVC Pipe
  - a. Fittings shall be coated on the outside with either asphaltic coating in accordance with AWWA C110 and the fittings shall be lined inside with either cement-mortar and asphaltic seal coating in accordance with AWWA C105.
  - b. All fittings shall have mechanical joint bell ends conforming to AWWA C111 unless otherwise noted on the drawings.
  - c. Restrained joints shall be used for all connections to valves and fittings and all connections shall be restrained mechanical joint type using retainer glands.
  - d. Restraining gaskets with integral stainless steel locking segments (including MJ Field-Lok gaskets) are not permitted on valves or fittings.
  - e. Non-restrained mechanical and push-on joints are not allowed for connections to valves, hydrants, or fittings.
  - f. All fittings shall have polyethylene encasement conforming to ANSI/AWWA C105/A21.5 Standards.
3. Connections to Existing Pipes
  - a. Restrained joint solid sleeves shall be used when connecting plain end to plain end pipe in accordance with ductile iron pipe specifications.

## PART 3 - EXECUTION

### 3.1 HANDLING

- A. Handle pipe accessories so as to ensure delivery to the trench in sound, undamaged condition:
  1. Carry pipe into position; do not drag.
  2. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.
  3. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall not be used.
  4. Any section of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture is visible, shall be marked as rejected and removed at once from the work.
- B. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during laying operations by plugging or other method approved by the Engineer.
- C. Before installation, inspect each piece of pipe and each fitting for defects:
  1. Material found to be defective before or after laying: Replace with sound material meeting the specified requirements and without additional cost to the Owner.
- D. Rubber gaskets: Store in a cool, dark place until just prior to time of installation.

### 3.2 PIPE CUTTING

- A. Cut pipe neatly and without damage to pipe.
- B. Unless otherwise recommended by the pipe manufacturer, and authorized by the Engineer, cut pipe with mechanical cutter only.

1. Use wheel cutters when practical.
2. Cut plastic pipe square and remove all burrs.

### 3.3 JOINT DEFLECTION

- A. Plastic pipe: unless a lesser amount is recommended by the pipe manufacturer, maximum allowable deflections from a straight line or grade, or offsets, will be five (5) degrees.

### 3.4 PLACING AND LAYING

A. Plastic Pipe:

1. Position pipe and fittings in trench in a manner that identifying marks will be readily visible for inspection.
2. Cutting and jointing:
  - a. Protect against abrasions from serrated holding devices.
  - b. Remove burrs and glosses from surfaces to be jointed, use abrasive paper, file or steel wool.
  - c. Remove dirt, dust and moisture by wiping clean with chemical cleaner or dry cloth.
3. Align pipe system components without strain.
4. Support piping at intervals of not more than four (4) feet, at end, branch fittings, and in change of direction or elevation.
5. Support plastic pipe in trenches with a three (3) inch layer of sand. Allow no rocks, debris or potentially damaging substances within six (6) inches of plastic pipe or trenches.
6. Protect pipe from damage when assembling ("pushing home") pipe joints. Wood or other suitable (non-metallic) material consistent with the pipe manufacturer's recommendations shall be used as a cushion while pushing home the pipe. Avoid metal to plastic contact. Neither deflection of PVC pipe joints nor bending of PVC pipe are permitted. All angles shall be made with proper fittings.
7. Provide an electrically continuous type TW insulated number ten (10) tracer wire in the trench along the pipe, fastened to the pipe at twenty (20) foot intervals and terminating above ground with a twelve (12) inch lead taped around each riser.

- B. Tapping: A tapping sleeve or tapping saddle shall be used for all taps on PVC pipe. Tapping sleeves and tapping saddles shall be approved by the VCU Collections and Distribution Manager prior to construction.

- C. Connections: Use specials and fittings to suit the actual conditions where connections are made between new work and existing mains. Use only those specials and fittings approved by the VCU.

D. Sleeves:

1. Where pipe passes through walls of valve pits or structures, provide cast iron wall sleeves.
2. Fill annular space between walls and sleeves with rich cement mortar.
3. Fill annular space between pipe and sleeves with mastic.

### 3.5 TRACING WIRE

- A. All PVC water main and services shall be installed with tracing wire.

1. Tracing wire shall be Copperhead #10 solid copper wire.
2. Tracing wire shall be laid/drilled with the pipe and shall be brought to ground level at each hydrant and valve box. Provide two tracing wires for HDD installation.
  - a. The wire(s) shall be connected to the loop below the steamer cap at hydrants and be attached to the barrel at regular intervals not to exceed two (2) feet.

- b. The wire(s) shall be drawn through a ½ inch diameter hole to be cut in the valve box riser and knotted to keep at ground level. The wire(s) shall be attached to the riser at regular intervals not to exceed two (2) feet.
3. Tracing wire shall be installed for all PVC water services.
4. All tracing wire shall be tested to confirm it conducts prior to acceptance.

### 3.14 TESTING AND INSPECTING

#### A. Pressure Testing:

- a. All pressure and leakage tests shall conform with AWWA Standards (latest edition) and VCU Specification Section 02250 "Hydrostatic Testing Procedure".

#### G. Disinfection:

1. Before acceptance of the potable water system, disinfect each unit of completed water supply, distribution and service line in accordance with AWWA C651, latest edition.
2. Perform all tests and disinfection required by VCU Specification Section 02255 "Disinfection".
3. Furnish two copies of a Certificate of Disinfection to the VCU.
4. The method of chlorination shall be in accordance with AWWA C651, Section 4.4, (continuous feed method), unless approved otherwise in advance by the Engineer

END OF SECTION