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Missouri Public Service Commission

CERTIFICATION

I, Diann Warner, City Clerk of the City of Osage Beach, Missouri, do hereby certify that the following is a complete, true and correct copy of the Water System Design Guidelines, on file in the office of the City Clerk and approved on January 20, 2005 at a duly called meeting by the Board of Aldermen of the City of Osage Beach, Missouri, a fourth class municipality duly organized and existing under the laws of the State of Missouri. Said guidelines have not been amended nor rescinded.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed the Seal of the City, this 9th day of March 2007.

Diann Warner

Diann Warner, City Clerk

FR Exhibit No. 113

Case No(s). WC-2006-0082 et al

Date 3-30-07 Rptr ff

(Revised 26 OCT 2004-JCB)

OVERVIEW

The City of Osage Beach is authorized to construct, operate, and maintain a water system to serve the inhabitants, business establishments, and infrastructure needs of the city by Title VII Utilities of the City Code. The city water system is operated under license of the Missouri Department of Natural Resources (MDNR), Drinking Water Division as authorized under 10 CSR 60-3 and 10 CSR –10 of the Missouri Safe Drinking Water Act and the Missouri Public Drinking Water Regulations. The purpose of this guideline is to establish design policy and guidance for the design and construction of the city water system.

The design, construction, and operation of the city water system will conform to the requirements of the MDNR regulations, standards, and policies, the City of Osage Beach Design Guideline, and the applicable provisions of the International Plumbing Code and the International Building Code and with reference to requirements of the International Fire Code and the recommendations of the Insurance Services Organization (ISO)

REFERENCED CITY ORINANCES

Chapter 400.110 Subdivision Regulations
Chapter 410.130 Contents (Location and design of water mains and appurtenances)
Chapter 410.190 Design Standards
Chapter 410.320 Waterlines
Chapter 505.010 Fire Protection Code
Chapter 705 Waterworks

GOALS AND OBJECTIVES

The basic goal of the City of Osage Beach is to provide an efficient, cost effective water system to supply the fire protection and drinking water needs of the city. This guideline will establish the basic parameters, design criterion, and material requirements for the system. The system will be designed to meet all of the appropriate standards for domestic water supply and to achieve a reasonable fire protection capability. The fire protection requirements will be developed in conjunction with the Osage Beach Fire Protection District.

OVERALL WATER SYSTEM STANDARDS AND CRITERION

The initial water system was designed by Archer Engineers offices in Lee Summit and Springfield, Missouri. A Water Master Plan was developed that establishes the basic requirement for the system. Essentially Osage Beach has two separate water systems, one on each side of the Grand Glaize Bridge. Basic requirements for the supply system are as follows:

EAST SIDE SYSTEM

	1999	2019	Ultimate
Average Daily Demand, gpd	433,000	845,000	1,015,000
Fire Fighting Demand, gpd	240,000	240,000	240,000
Required Storage, gpd	673,000	1,085,000	1,291,000
Available Storage:			
Columbia College, gpd	500,000		
Parkview Bay, gpd	150,000		
Bluff Tower, gpd (Future)		800,000	1,300,000
Required Water Supply, gpm	451	880	1,094
Water Supply Available:			
Columbia College No. 1, gpm	250	250	250
Columbia College No. 2, gpm	550	550	550
Passover Well No. 1, gpm	260*	260*	260*
Bluff No 1, gpm (Future)		500	500
Bluff No. 2, gpm (Future)			500
Total Available, gpm	800	1,300	1,800

*limited Service Area

WESTSIDE SYSTEM

	1999	2019	Ultimate
Average Daily Demand, gpd	992,000	1,563,000	1,840,000
Fire Fighting Demand, gpd	240,000	240,000	240,000
Required Storage, gpd	1,232,000	1,803,000	2,089,000
Available Storage:			
Woodland Tower, gpd	(150,000)*	0	0
Swiss Village Tower, gpd	1,500,000	1,500,000	1,500,000
Future, gpd		800,000	800,000
Total Available	1,500,000	2,300,000	2,300,000
*Out of service – remove from service			
Water Supply Available:			
Swiss Village Well No. 1, gpm	550	550	550
Swiss Village Well No. 2, gpm	550	550	550
Woodland Cove Well, gpm	OTS*	0	0
Future Wells, gpm		1,000	1,000
Total Available, gpm	1,100	2,100	2,100

*OTS = Out of Service

The master plan requires chlorination and fluoridation of the water system. No further treatment is proposed at this time. The system will be added to and/or modified as necessary to assure full compliance with MDNR Regulations.

WATER DISTRIBUTION – BASIC DESIGN CRITERION

A. Fire Demand and Supply

1. Industrial, commercial, and multi-unit residential structures:

   a. Provide not less that 2000 gpm at a residual pressure of 20 psi at each building site.
   b. Provide two fire hydrants within 300 feet of each structure.
   c. Provide one hydrant within 125 feet of each fire main entrance into the structure.
   d. Provide fire main service to each structure with indicating type valve at the water main. Minimum size fire service line is four inches.
   e. Minimum static pressure at each structure shall be 35 psi.

2. Residential and Undeveloped

   a. Provide not less than 1000 gpm at a residual pressure of 20 psi.
   b. Provide not less than one fire hydrant within 300 feet.
   c. In the case of a structure or residence that is not connected to city water a fire hydrant must be available within 850 feet.
   d. In undeveloped areas a fire hydrant shall be installed every 600 feet.

B. Fire Main Connections to Structures

1. Where required by the Osage Beach Fire District, NFPA and/or International Plumbing Code a fire main shall be extended into each building as a separate fire main. This entrance main shall be only for fire protection system use. No meters or valves are allowed between main and the building except for an indicating shut-off valve at the main. Shut-off valves installed on fire mains shall be of the indicating type that clearly shows if the valve is open or closed.

C. Water Distribution Mains

1. Water distribution mains shall be looped to the maximum extend feasible.
2. The MDNR standard for a minimum size main is eight inches. The city standard allows for six inch mains in residential areas where a fire flow of 1000 gpm at a residual pressure of 20 psi can be maintained.

3. The minimum size main allowable for domestic residential service is two inches so long as the main is less than 600 feet long, serves less than ten residences and fire protection is available within 300 ft.
4. The minimum static pressure for domestic service shall not be less than 35 psi.
5. A fire hydrant or blow-off valve shall be installed at the end of all water mains.
6. The maximum design flow velocity shall be 8 fps.
7. An isolation valve shall be installed at not less than every 1250 feet and:

    a. At each branch main with one valve on the downstream main and one on the branch main.
    b. At loop connections on each leg of the connecting loop.

    Isolation valves shall be of the same nominal size as the main in which they are installed.

DOMESTIC SUPPLY CONNECTIONS AND METER POLICY

A. General Requirements for Customer Service Lines

1. City meter assemblies for single family residents and all 5/8 in. meter installations will not have a city owned backflow device installed.
2. Industrial and commercial connections and all meter installations of 1 in and larger shall have a city owned dual check device installed. This backflow device is exclusive of and specifically not intended for use in lieu of backflow devices required by the customer's use.
3. Materials used for customer service lines shall conform to materials specified herein.
4. All domestic services shall be metered.
5. Meters shall be sized in accordance with the following unless specifically directed otherwise by the City Engineer:

Meter size	Meter Demand	Requirements
5/8"x 3/4"	1 to 20 gpm	Single family residence with 2-1/2 baths, small commercial offices or retail establishements. Maximum continous flow 10 gpm.
1"	3 to 50 gpm	Large residences, swimming pools, lawn irrigation for lawns less than 6000 SF, apartments and condos with less than 10 units, motels of less than 15 units, small to

		medium restaurants, commercial uses with maximum continuous demand less than 25 gpm.
1-1/2"	5 to 100 gpm	Apartments and condos of less than 30 units, motels of less than 35 units, commercial uses with maximum continuous demand of less than 50 gpm.
2"	8 to 160 gpm	Apartments and condo of less than 60 units, hotels with less than 70 units, commercial uses with maximum continuous demand less than 80 gpm.
3"	4 to 320 gpm	Commercial applications with continuous demand of less than 160 gpm
4"	6 to 500 gpm	Commercial use less than 250 gpm continuous flow (Compound Meter)
	10 to 1200 gpm	Municipal Use Only (Turbine Meter)
6"	20 to 2500 gpm	Municipal Use Only (Turbine Meter)

B. Meter Connection Policy

1. Single Family Residential, and small commercial connections

   a. Each individually owned residence or business shall be connected through one meter and receive one billing. Generally single family residences and small businesses will be setup with a 5/8 inch meter. Individual owners shall confer with the City Engineer to determine appropriate size to meet their requirements.
   b. Billing will be at the established monthly rate based upon water usage.

2. Multi-Family Residential Units

   a. The general rule shall be one property, one billing. Multi-family residential units are billed on the basis of the number of units times the basic monthly rate plus the water usage over the base amount.
   b. All multi-unit residential buildings that require a separate fire main and sprinkler system shall be constructed with a separate metered domestic supply line and a non-metered fire main entrance. The meter shall be sized to meet the demand requirements of the individual building. On properties with more than one building, each building shall be metered separately

3. Duplex Residential Units – Multiple Single Family Rental Units on one Property

   a. The general rule is one owner of the property one meter. If there are multiple duplex or single family units on one property and individual fire service mains are not required to any of the buildings then the one owner – one meter rule applies. The billing shall be at the established monthly rate per unit plus the gallons used over 1000 gal. per unit billed at the established rate per 1000 gal.
   b. In the case where each unit is individually owned then each unit shall be individually billed and metered. This specifically intended for duplex and single family cluster homes only.

4. All Non-Residential Properties with Fire Sprinkler Systems

   a. At all locations where the structures require a separate fire main to the building each building shall have a separate, metered, domestic supply main.
   b. One commercial property with multiple overnight lodging units (a motel or hotel) not requiring fire mains shall be metered by one-meter assembly and billed on the water use.
   c. One commercial property with multiple commercial units without fire mains, with individual tenants, may be metered with one meter, or individually, as mutually determined by the owner and the City Engineer.
   d. One property with mixed residential long term, overnight rental, and commercial enterprises, may be metered on one-meter assembly, or multiple meters, as determined by the City Engineer. Billing will be on a water use basis.
   e. Where there are multiple buildings on one property that require fire main services, each building's domestic supply will be metered. All meters will be billed to the property owner.

C. Fire Main Connections

1. Fire main connections are required for all sprinkled buildings and structures. The owner/developer shall submit appropriate drawings and computations by a Registered Professional Engineer for approval. The owner/developer shall furnish all valves, fittings, and incidentals required to make the connection and shall employ a city approved contractor to perform the work.
2. Indicating shut-off valves shall be installed at the fire main connection to the water main.

D. City Ordinance 98.41 - Owner Furnished Backflow Preventer Assembly

1. Owner furnished backflow assemblies shall be licensed, furnished, installed, and maintained by the owner at the locations specified in City Code 705.470. Most of these will be for lawn sprinkler systems and the like.
Note: These units are required in addition to any dual check assembly installed by the city at the meter installation.

MATERIALS FOR WATERLINES AND APPURTENANCES

A. Water Mains

1. Mains four inches and larger:

a. Ductile Iron Pipe, AWWA C150 and C151, Class 350

1) Cement mortar lined per AWWA C104
2) Joints:
a) For buried pipe: push-on joints per AWWA C111
b) For exposed or interior: Flanged joints

b. PVC, AWWA C900 or C905, DR 14, Class 200

1) Joints shall be push-on type rubber gasket

2. Mains 1-1/2 inches to three inches:

a. PVC, ASTM 2241, SDR 21, Class 200

1) Joints shall be push-on type with rubber gasket

b. Schedule 40 PVC

1) Joints shall be solvent welded

B. Water Meter Service Lines and City Service Lines two inch and less

1. HDPE AWWA C901, PE 3408, IDR 7, Class 200 for I.D. pipe, or DR 9, Class 200 for O.D. pipe.

C. Water Service Lines from meter to building (Privately Owned Lines Only)

1. These lines shall conform to the requirements of the International Plumbing Code.
2. Materials may be of the owner choice.

D. Water Fittings and Adapters Ductile Iron and PVC

1. 4 inches and Larger:

a. Fittings:

1) Ductile iron fittings, cement mortar lined, conforming to AWWA C150 or C151.
2) All buried or flooded locations shall use mechanical joint pipe and fittings.
3) Flanged fittings shall be provided for flanged pipe (above ground installations only). Faces shall be coated with rust Protective coating.
4) Cement mortar lined pipe and fittings shall be coated with coal tar epoxy paint a minimum thickness of 24 mils.

b. Flanged Coupling Adapters:

1) Shall be Ford 193, Smith-Blair 913, Rockwell 913, or approved equal.
2) Bolts shall be Stainless Steel, Type 216.
3) Minimum rated operating pressure to match the line in which installed.

c. Joint Restraints:

1) Shall be Ford Style FR, Uni-Flange 1300 Series, or approved equal.
2) Approved concrete thrust blocks required.

2. For pipe 1-1/2 inches to 3 inches:

a. Fittings:

1) For ASTM 2241, SDR 21, Class 200 fittings shall be approved by the City Engineer.
2) PVC Schedule 40 shall have PVC Schedule 80 fittings.

b. Coupling Adapters:

1) Ford Style FC or approved equal

3. For PE Pipe – 2 inches or less:

a. Shall be Ford CTS Pack Joint Couplings for PE Pipe rated at the same pressure class as the pipe in which they are to be installed, or approved equal.

E. Waterline Valves and Valve Boxes (for Valve 2 in. and larger):

1. Shall be iron body, non-rising stem, resilient wedge, gate valves with stainless steel bolts, and shall be epoxy paint coated.
2. Valves shall be by Mueller, Clow, or M&H, or approved equal
3. Valve Boxes shall be cast iron bonnet, PVC riser, with cast iron top and cover marked "water".
4. Check Valves shall be similar and equal to Clow Valve Company horizontal swing check valves for 2 inch through 12 inch valves.

F. Fire Hydrants

1. Fire hydrants shall be Mueller Super Centurion 250 or Clow Medallion with 4-1/2 inch pumper inlet, and two 2-1/2 hose connections. Hydrants shall be fully compatible with the requirements of the Osage Beach Fire Protection District.
2. Fire hydrants shall be painted red with epoxy coating as approved by the City Engineer.

G. Blow-Off Assembly

1. Post Hydrants shall be non-freezing, self draining type with a minimum 36" cover to the main. Hydrants shall be furnished with a 2" FIP inlet, a NOT-Turning operating rod, and shall open to the left. All working parts shall be Bronze-to-Bronze design. The outlet shall also be Bronze and be 2 ½" NST. Hydrants shall be lockable to prevent unauthorized use.
2. Hydrant shall be as manufactured by Kupferle Foundry Co., St. Louis, MO, or approved equal.

H. Water Meter Assemblies:

1. 5/8 and 1 in. Residential Meters:

a. Tapping saddle shall be Ford Brass Saddles Style S90, min. 1 inch.
b. Corporation Stop shall be Ford or Ford Ballcorp F(B)1000 Series, with pack joint for PE pipe.
c. Meter Setter shall Be Ford 70 Series Coppersetter, tandem yoke, with lockable angle valve, spreader bar, and CTS pack joint. *Do not place dual check assembly on residential service lines.*
d. Meter Vault shall be ADS N-12 corrugated plastic of appropriate size (min. 20 in.), with Ford Wabash lid cover with Clay & Bailey extension ring.

2. 1, 1-1/2, and 2 in. Meters for Commercial or Multi-family Residential Use:
   a. Tapping saddle shall be Ford Brass Saddles Style S90, min. 1 inch for 1 inch meters and 2 inch for all larger.
   b. Corporation Stop shall be Ford or Ford Ballcorp F(B)1000 Series, with pack joint for PE pipe.
   c. Meter Setter shall Be Ford 70 Series Coppersetter, tandem yoke, with lockable angle valve, spreader bar, dual check assembly, and CTS pack joint.
   Do not place dual check assembly on single family residential service lines.
   d. Meter Vault shall be ADS N-12 corrugated plastic of appropriate size (min. 20 in.), with Ford Wabash lid cover with Clay & Bailey extension ring.

3. Meter larger than two inch.

   a. Tap, valves, fittings, and meter service line shall be not less than 2 in. and shall be equal to or one size larger than the building service line. The meter, pressure reducing valve, and dual check backflow assembly may be one size smaller that the meter service line (i.e. 4 in. tap, 4 in. gate valve, 4 in. meter service line, 3 in. meter, 3 in. PRV, 3 in. dual check assembly, 4 in stub-out for building service line).
   b. Tapping sleeve shall be Ford Style FAST, stainless steel flange.
   c. Gate Valve shall be as specified above.
   d. Fittings and flanged coupling adapters as specified above.
   e. Pressure Reducing Valve shall be CLA-VAL Series 690, ductile iron body, pressure class 250.
   f. Back-flow Assemblies shall be CLA-VAL Model DC7L dual check valves, Class 250.

WATERLINE AND APPURTENANCE INSTALLATION REQUIREMENTS

A. Waterline Installation

1. The minimum depth of cover is 36 in. above the top of the pipe.

2. The maximum depth of cover for waterlines is eight (8) ft. unless specifically authorized in writing by the City Engineer.

3. Green or Blue minimum four inch wide marking tape marked "waterline below" shall installed twelve inches above all waterlines.

4. No. 12 solid copper toning wire shall be installed three inches above all city owned waterlines and shall be extended to all valves, hydrants, metersets, and terminus points.

5. Bedding shall be installed around the pipe from 6 inches below to 12 inches above the pipe. Bedding shall be nominal ½ inch minus crushed rock conforming to MoDOT Section 1004, Grade D, Chat, or pea-gravel, or Osage River Sand. Any material used shall have a PI of six or less.

6. Waterlines shall be separated by a minimum of 18 inches vertically and 10 feet horizontally from sanitary/storm sewer lines or sanitary/sewer sewer line appurtenances unless:

   a. At crossings the water or sewer has an encasement to a point ten feet on either side of the sewer/water line crossing as appropriate. No joints shall occur in either the water or sewer line within the 20 ft. area. The encasement may be a free draining sleeve or an impervious concrete encasement a minimum of 12 in. thick.
   b. For parallel lines closer than ten feet, exceptions can be made with prior approval of the City Engineer. Generally, this will require a separate trench with water main 18 inches above the sewer, or a benched trench with water 18 inches above the sewer or the waterline must be above and encased in a free draining sleeve drained to daylight.

7. Primary power lines of 480 volts or higher shall not be placed in the same trench with any other utility. See Section 6 Road Cuts, Utility Trenches, and Excavation.

8. Secondary power may be installed in an offset trench with water lines. See Section 6 Road Cuts, Utility Trenches, and Excavation.

B. Valve Locations

1. To the maximum extent practicable locate isolation and shut-off valve outside of roadways and paved surfaces.
2. When valves must be located within roadways and paved surfaces a cast or ductile iron valve box with valve box cover marked "water". The box shall be flush with the pavement to ¼ in. below the finished pavement surface. The cover shall be set in a minimum 6 in. deep by 18 in. square concrete pad.

C. Water Meter Locations

1. As a general case water meters will be located on the customer's property immediately inside the property line from the city roadway or platted roadway property line.
2. Meters will be set in traffic type boxes only with prior written consent of the City Engineer. If property owners require that the meter box be placed in a location where a traffic type box is required they will be required to pay for the additional cost of the traffic type box and, if necessary, the remote location of the meter antenna.

D. Installation of Meter Assembly:

1. Residential and commercial hookup – 5/8 inch through 1 inch:
   a. The City will furnish the water tap, valve cock, meter service line, meter, pressure-reducing valve, and meter pit and install all parts except the meter pit.
   b. The owner must provide and install the residential service line.
   c. The owner shall expose the water main, accomplish all necessary excavation, backfill and cleanup. City personnel or a designated contractor will make the tap. The owner shall connect the residential service line to the meter set and install the city furnished meter pit.
   d. The meter installation shall be as detailed in the attached Typical Meter Installation Detail.

2. Residential and commercial hookup – 1-1/2 inch and 2 inch:

   a. The Owner shall furnish and install the tap, meter service line, meterset, lockable shut-off valve, dual check assembly, pressure reducing valve, and the tandem meter setter, and meter vault
   b. The City will furnish the water meter and transponder.
   c. The meter installation shall be in accordance with the attached Typical Meter Installation for 1-1/2 and 2 inch Meters.

3. Domestic Service Connections 2-1/2 inch and larger:

   a. These are considered as custom installation with the technical requirements varying for each installation. The owner shall provide construction drawings by a Registered Professional Engineer for approval. The owner shall furnish and install all materials and appurtenances for a complete and operable service connection.

4. Water Meter Installations for New Subdivisions or Multi-Structure Installations:

a. The owner/developer shall submit full and complete working drawings for the construction of the water system within the development. Such system shall be in full accord with the City of Osage Beach Design Guideline and Missouri Department of Natural Resources requirements designed by a Registered Professional Engineer and approved by the City Engineer.
b. All materials used shall be as specified by the city.
c. The owner/developer shall make all connections and furnish all materials except water meters and radio-read transponders that will be furnished by the city.
d. The owner/developer shall assure that all meter assemblies are fully compatible with the city furnished meters and make all modifications necessary to facilitate installation.
e. Meter installations shall conform to the City of Osage Beach Typical Meter Installation Details.

E. Fire Hydrant Locations

1. Fire hydrants shall be located ten feet from the edge of pavement or immediately inside the property owners land per the easement which ever shall be the farthest from the edge of pavement. Hydrant and auxiliary valve should both be outside the roadway ditch areas.
2. Fire hydrants shall be located such that a clear work area a minimum of five feet in diameter exists around the hydrant.
3. All fire hydrant locations must be immediately accessible by fire vehicle.
4. Fire hydrants shall be installed with the 4-1/2 in pumper outlet toward the street or access point.
5. Fire hydrants shall be installed such that finish grade is between three inches below and level with the hydrant base ring.

WATERLINE INSPECTION AND TESTING FOR ACCEPTANCE

A. Inspections:

1. As a part of the platting and permitting process the developer/owner shall submit full and complete engineering drawings sealed by a Registered Professional Engineer in the State of Missouri. The design and materials specified shall conform to the requirements of the City of Osage Beach Design Guidelines. Such drawings shall be reviewed and approved by the City Engineer prior to any onsite construction.
2. During the progress of the work each utility line shall be inspected by the Engineering Department prior to trench backfill.

B. Water Main Leakage Tests

1. All water mains constructed by or for the City of Osage Beach shall be tested for leakage to the standards specified herein before they shall be accepted for service. A representative of the City shall be present during all testing.
2. Testing shall be by hydraulic means only. Air or vacuum tests will not be accepted.
3. Testing procedure is as follows:
   a. Upon completion of the water main it shall be cleaned and all dirt, trash, debris, and deleterious materials removed from the line.
   b. Filled to capacity and all extraneous air removed.
   c. Pressurize to 75 psi above normal working pressure at the test location and hold for a period of not less than two hours.
   d. At the end of the testing period the line shall be refilled with water and the amount of water to refill the line shall be measured and recorded.
   e. The amount of water to refill the line must be less than the maximum allowable leakage. The maximum allowable leakage shall be computed thusly:

$$Q_{Loss} = SDP^{1/2} / 133000$$

Where:

Q_{Loss} = Maximum allowable leakage
S = Length of the section tested in feet
D = Diameter of the pipe in inches
P = Test Pressure, PSI

C. Cleanup, Chlorination, and Bacteriological Testing

1. Prior to final acceptance and after pressure testing of the waterline the contractor/owner shall:

   a. Thoroughly flush all sediment, debris, and deleterious materials out of the line.
   b. Fill the line with chlorinated water, chlorinated to not less than 50 ppm, and let stand for 24 hours.
   c. At the end of 24 hours the line shall be thoroughly flushed and refilled with chlorinated water, chlorinated to 200 ppm and allowed to stand for three hours.
   d. The line shall then be thoroughly flushed and bacteriological samples taken. Samples shall be forwarded to a certified laboratory for testing. Upon receipt of passing test results, and with the authorization of the City the line may be placed in service.

Prior to placing the waterline in service the City Representative shall be presented with certified pressure test results, certified passing biological test results, and written certification that the waterline and appurtenances have been constructed in accordance with MDNR and City of Osage Beach standards.

D. Privately Owned Systems

1. Privately owned water mains within subdivisions where the mains are to remain the property of, and be maintained, by the subdivision owner and connected to the City of Osage Beach water system shall be tested as specified herein. Building service lines between the water meter and the building shall be tested in accordance with the International Plumbing Code and as accepted by the Department of Public Works at the time the meter is activated.
2. A written certification of waterline test completion is required.

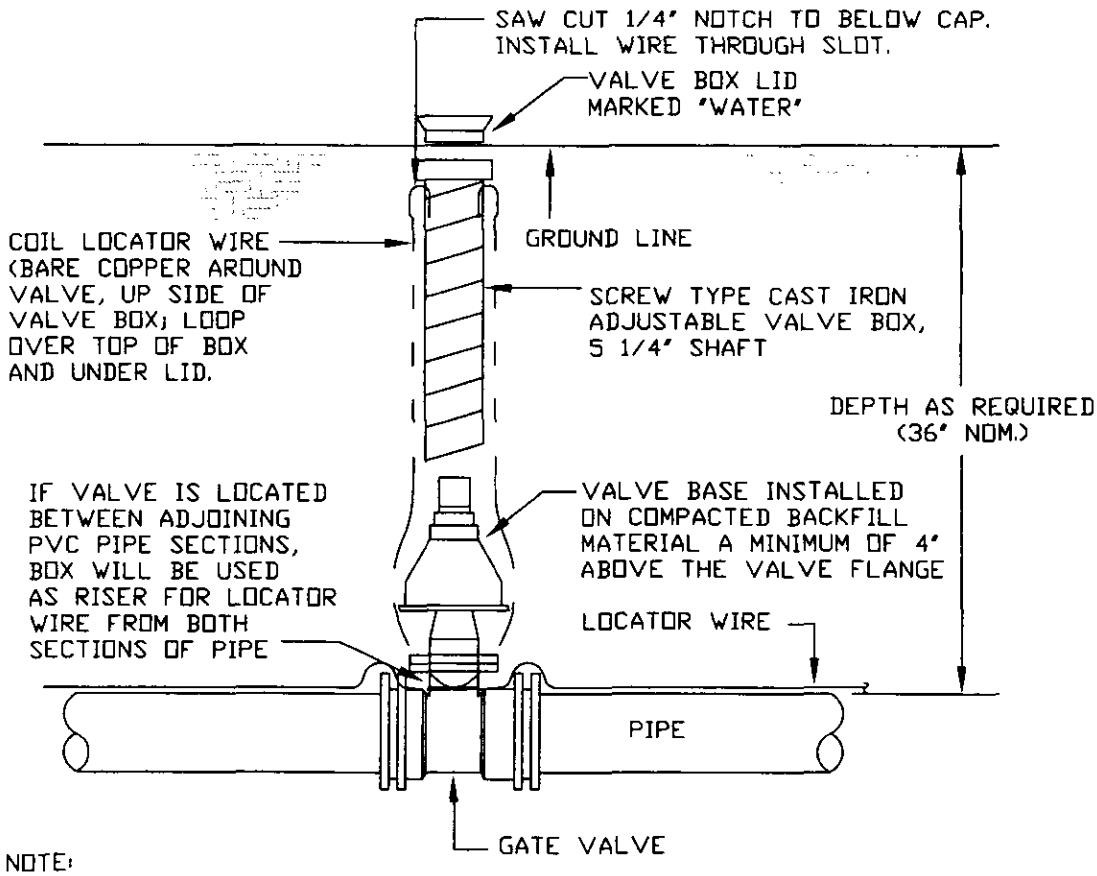
AS CONSTRUCTED DRAWINGS AND MAINTENANCE DOCUMENTS

The Developer/Contractor shall provide the City Engineering Department with not less than two full sized "As Constructed" drawings certified as being correct record drawings by a Registered Professional Engineer or Land Surveyor. If fire pumps, specialized standby equipment, etc. are to be turned over the City two full sets of operational and maintenance data for each pump or system shall be provided to the City Engineer.

WATERLINE AND APPURTENANCES CONSTRUCTION DETAIL DRAWINGS

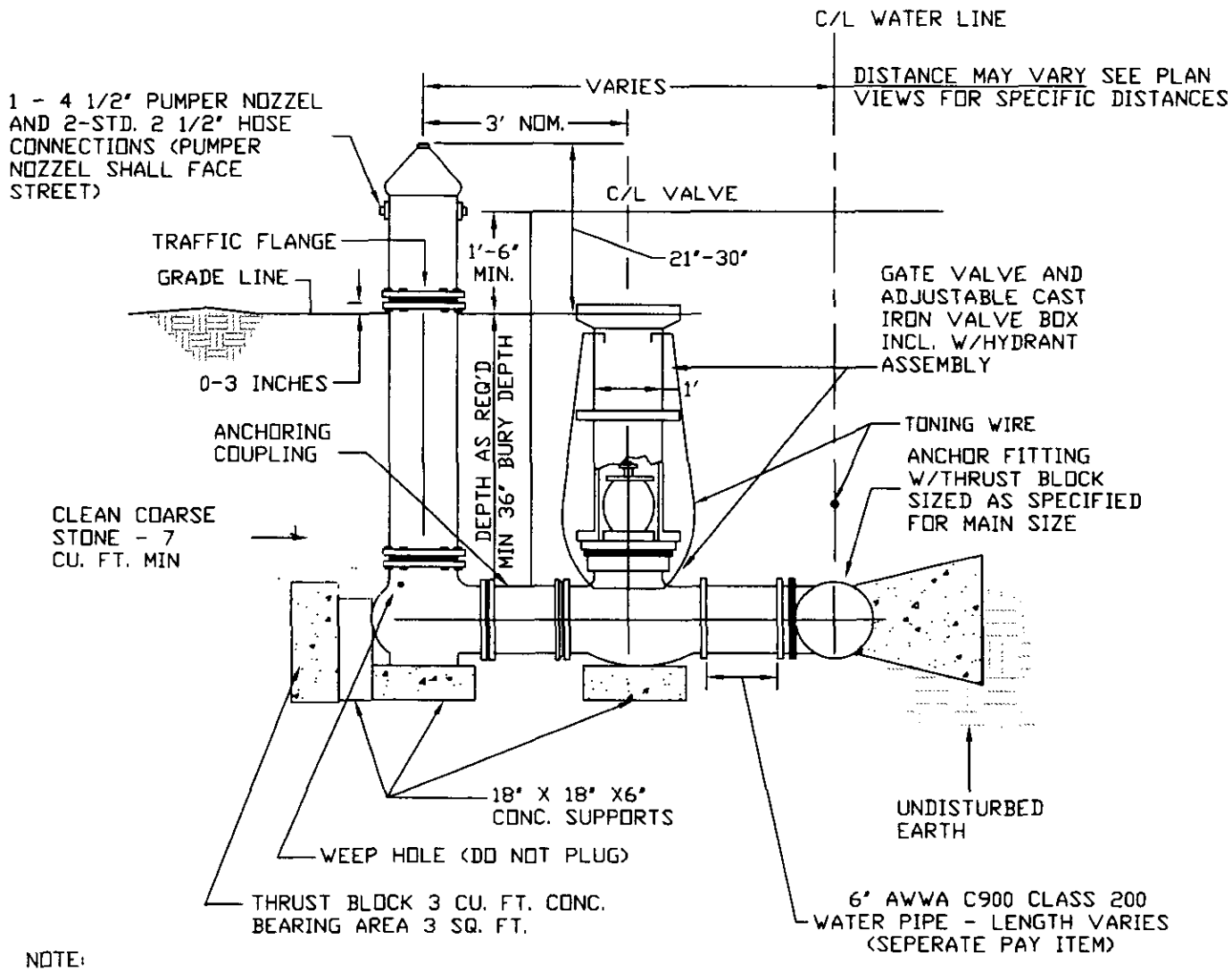
Construction details and sketches are attached.

END



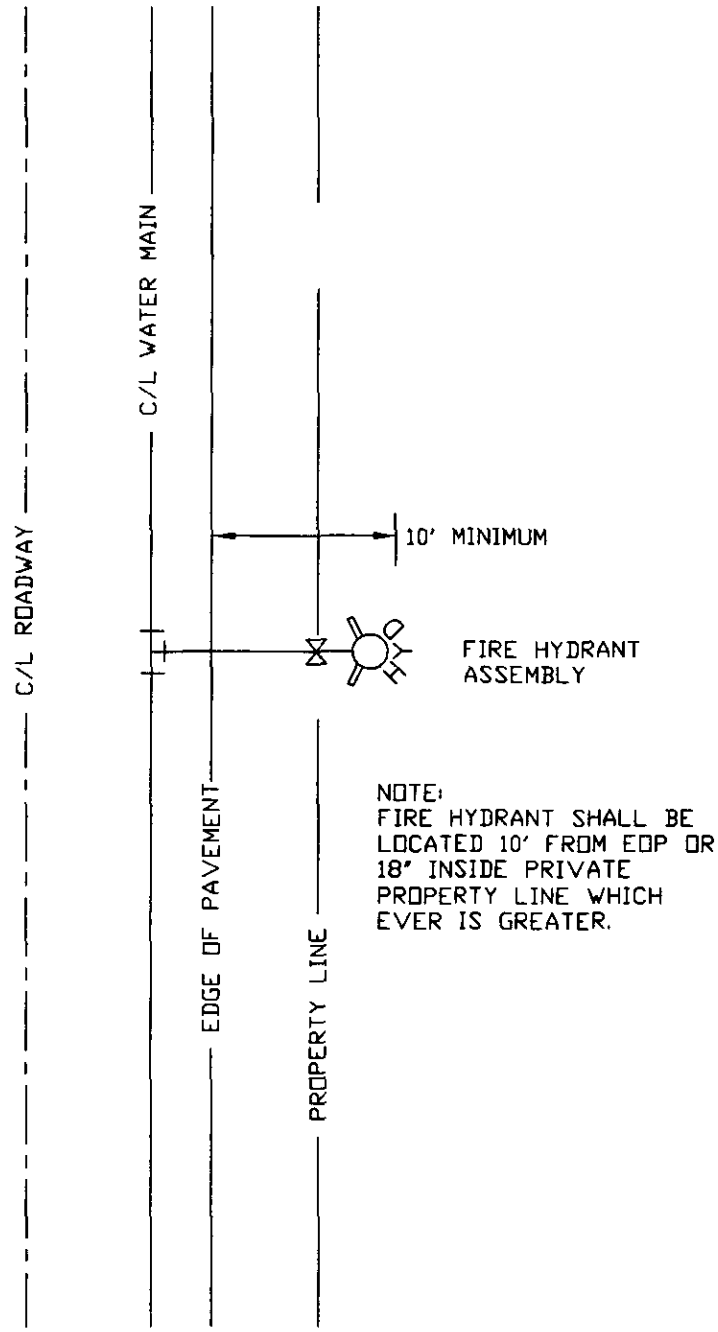
NOTE:
6" PVC PIPE WITH CAST IRON OR ALUMINUM CAP AND LID MAY BE SUBSTITUTED FOR SCREW TYPE CAST IRON VALVE BOX IN OUT OF TRAFFIC AREAS.

Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL GATE VALVE INSTALLATION NOT TO SCALE	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: jb		Drawing No: II-1



NOTE:
RETAINER GLANDS REQUIRED ON ALL FITTINGS. RESTRAINED JOINTS SHALL BE REQUIRED WHERE INDICATED OR DICTATED BY AVAILABLE SPACE OR UNSUITABLE SOIL CONDITIONS.

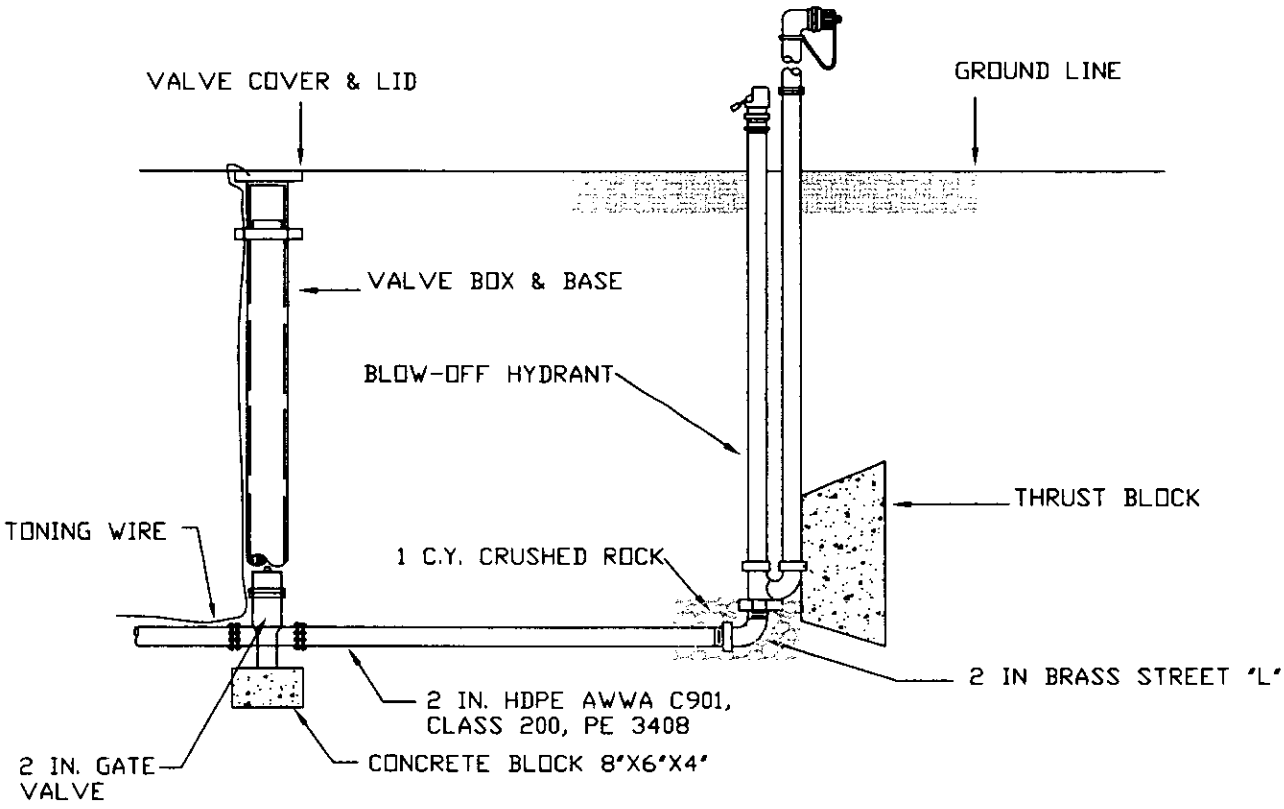
Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL FIRE HYDRANT NOT TO SCALE	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: jb		Drawing No: II-2



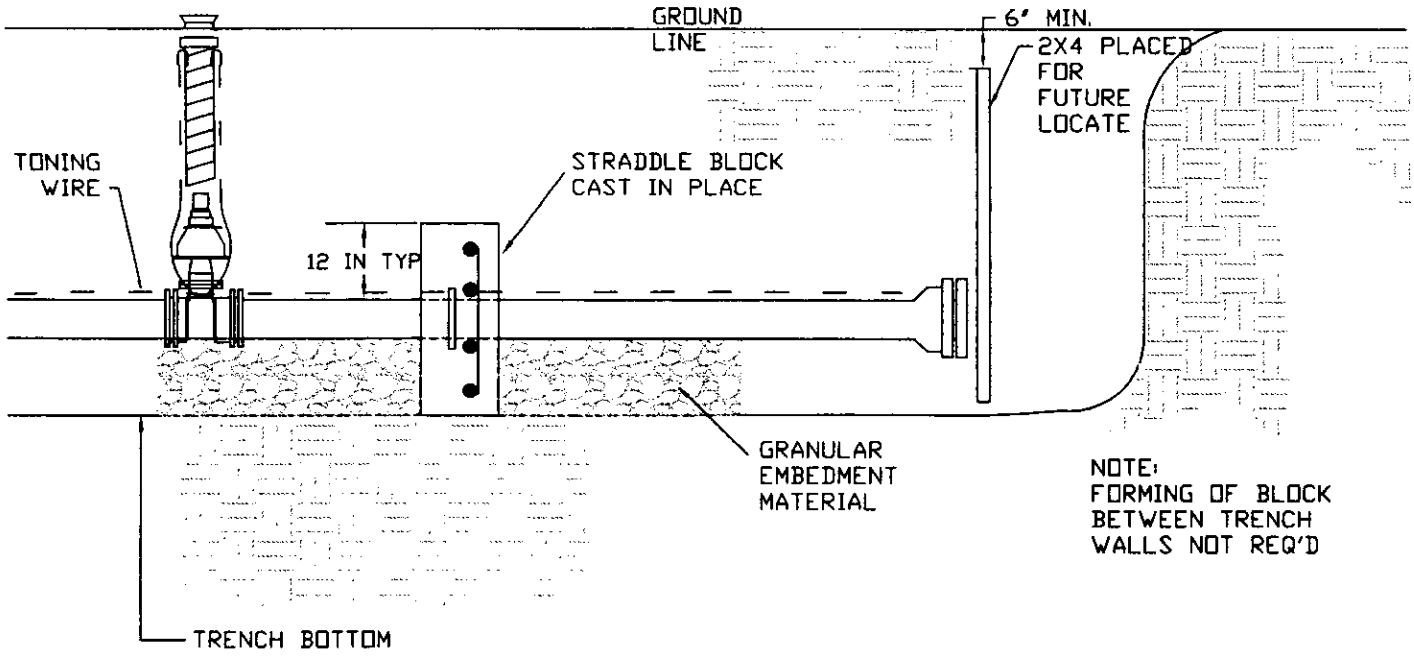
NOTE:
FIRE HYDRANT SHALL BE LOCATED 10' FROM EOP OR 18" INSIDE PRIVATE PROPERTY LINE WHICH EVER IS GREATER.

Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL FIRE HYDRANT LOCATION NOT TO SCALE	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: jb		Drawing No: II-3

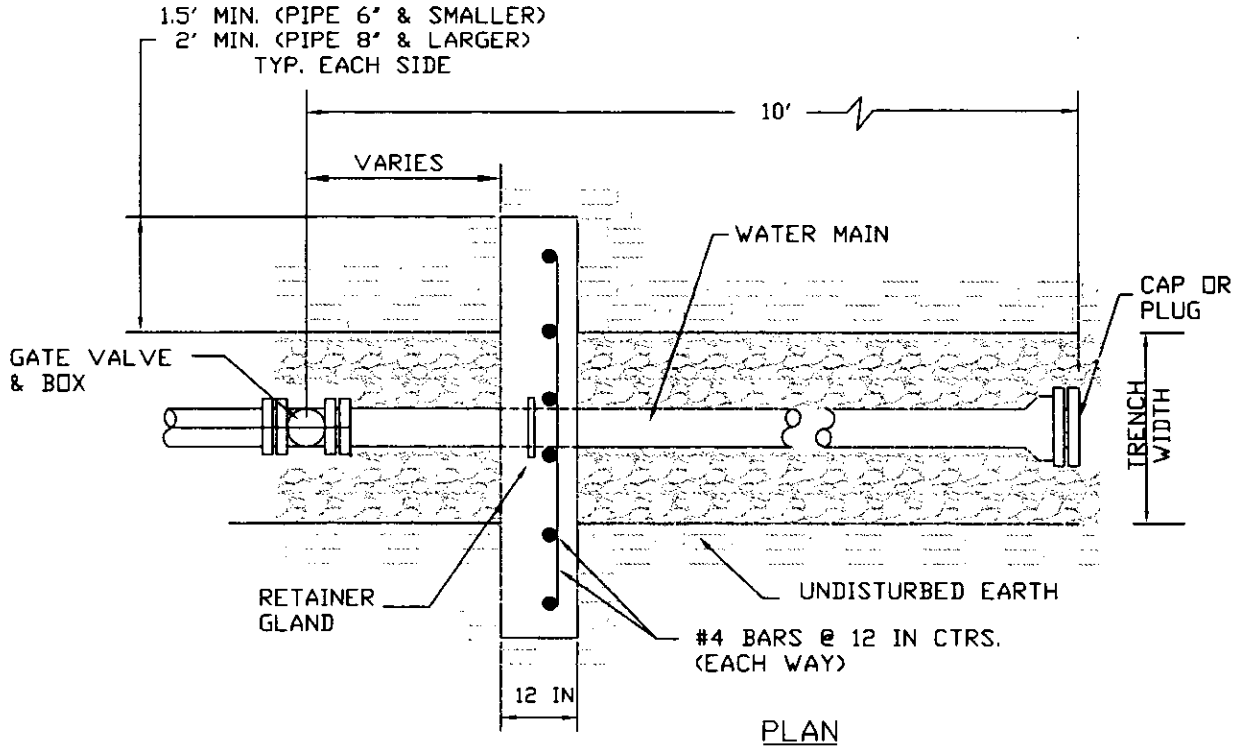
NOTE:
CONTRACTOR SHALL FIELD VERIFY WITH
ENGINEER DIRECTION OF BLOW OFF HYDRANT.



Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL BLOWOFF ASSEMBLY NOT TO SCALE	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: jb		Drawing No: II-4

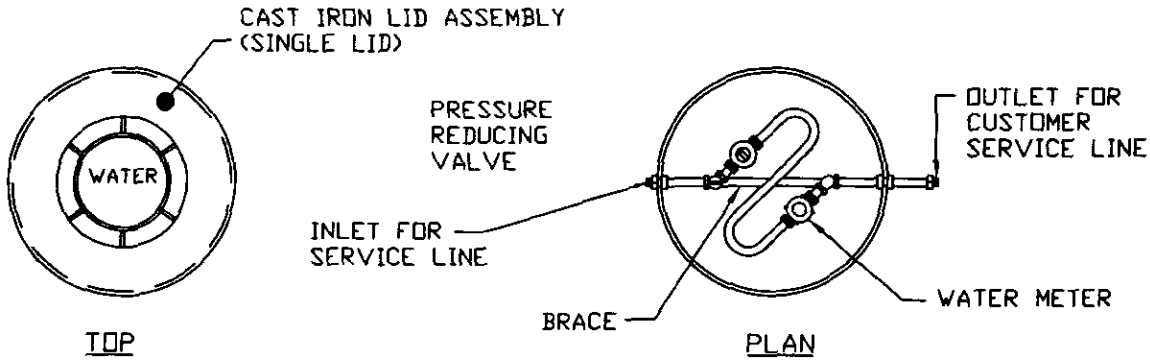


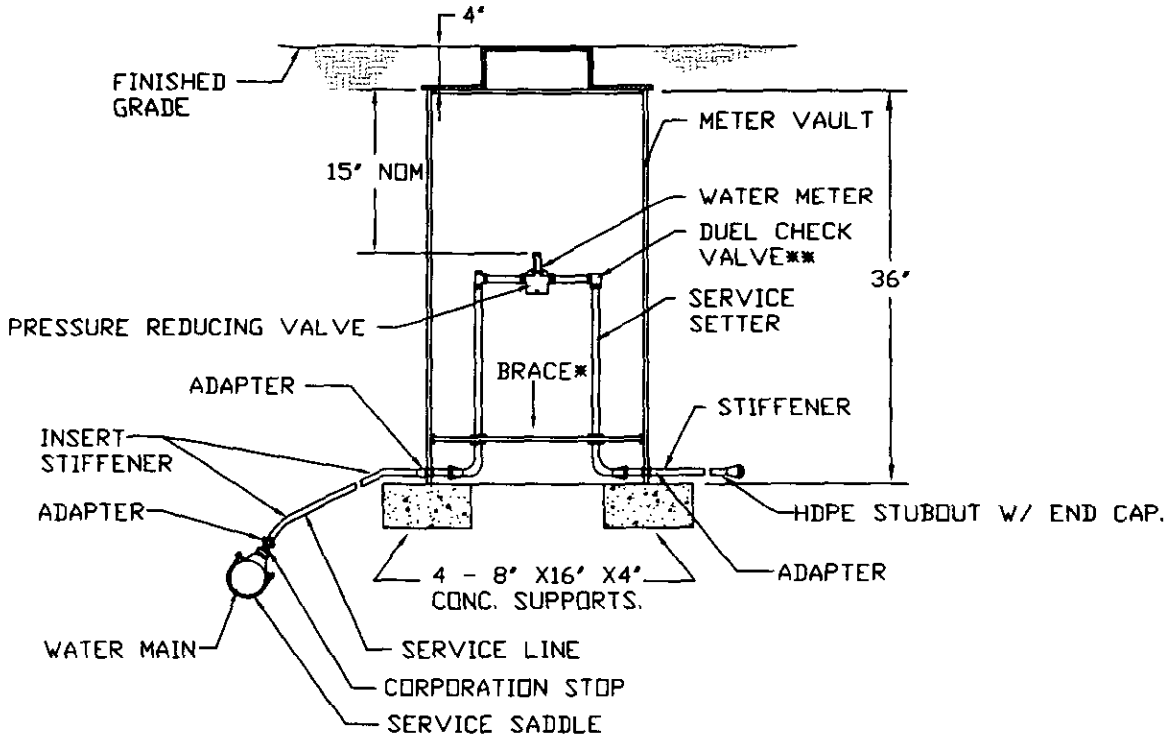
ELEVATION



PLAN

Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL WATER LINE TERMINATION NOT TO SCALE	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: jb		Drawing No: II-5



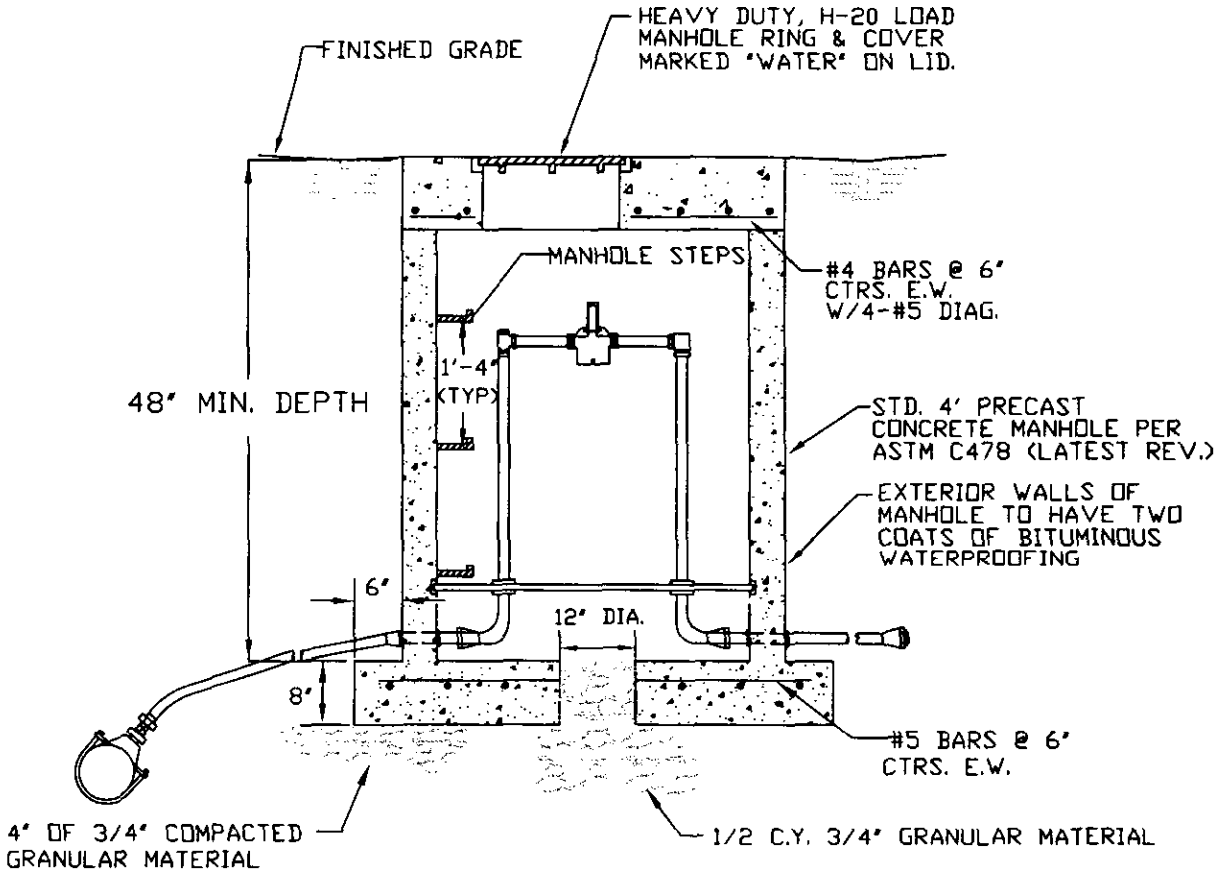


ELEVATION

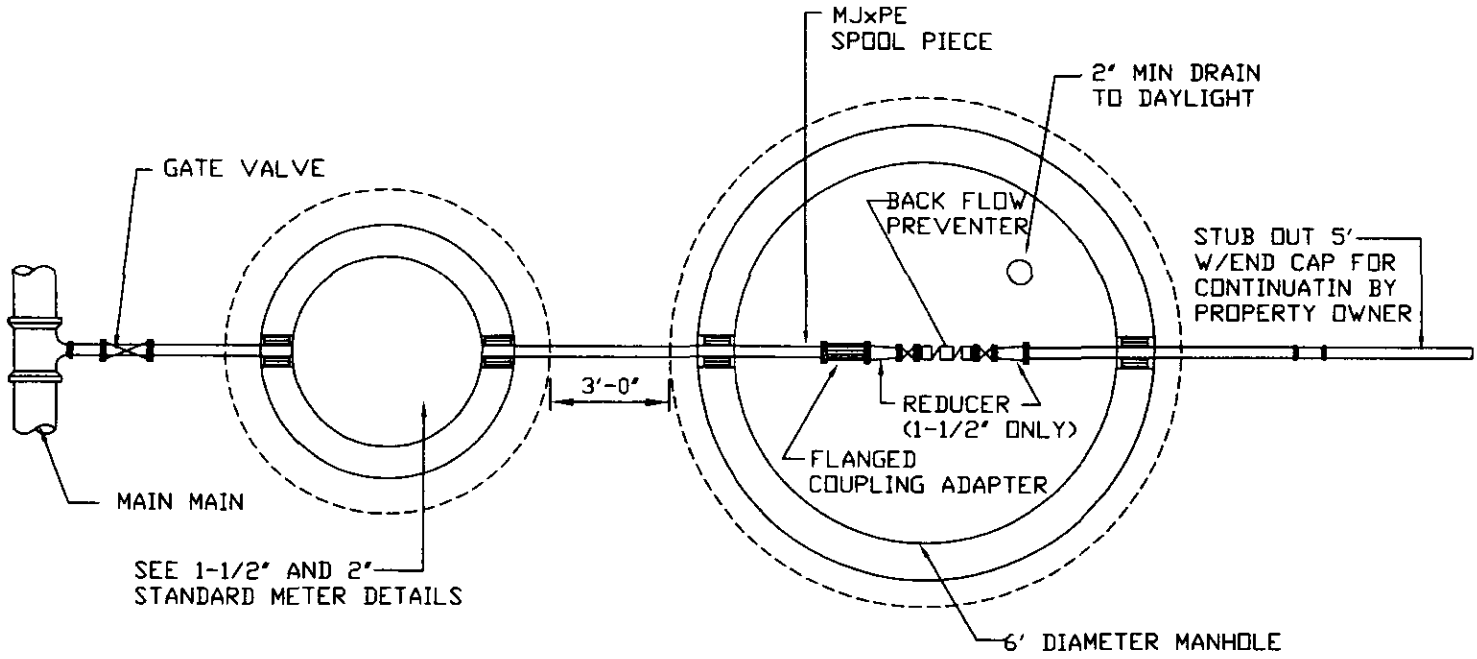
NOTES: *BRACE TO BE PART OF PREFABRICATED METER WELL.
**NOT TO BE PLACED ON RESIDENTIAL LINES

NOT TO SCALE

Date Revised: OCTOBER, 2004	CITY OF OSAGE BEACH TYPICAL DETAIL TYPICAL TANDEM METER SETTING SIDEWALK OR LAWN 5/8"x3/4", 1", 1-1/2" OR 2" METERS	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: JB		Drawing No.: II-6



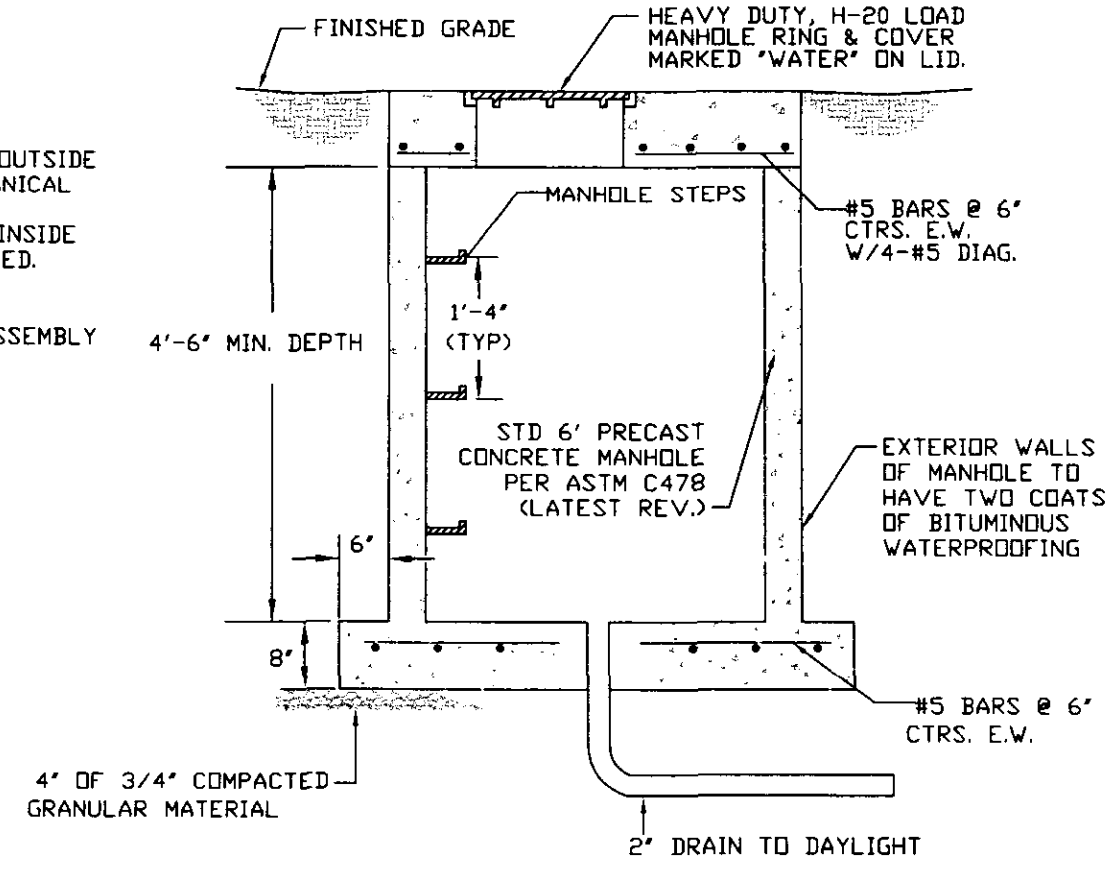
Date Revised: OCTOBER, 2004	CITY OF OSAGE BEACH TYPICAL DETAIL METER VAULT DRIVEWAY OR PARKING AREA NOT TO SCALE	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: JB		Drawing No.: II-7



PLAN VIEW (TOP REMOVED)

ES:

1. ALL PIPE AND FITTINGS OUTSIDE VAULTS SHALL BE MECHANICAL JOINT.
2. ALL PIPE AND FITTINGS INSIDE VAULTS SHALL BE FLANGED.
3. PROVIDE ADEQUATE PIPE SUPPORT AS REQUIRED.
4. BACKFLOW PREVENTER ASSEMBLY MIN. OF 12" OFF FLOOR.

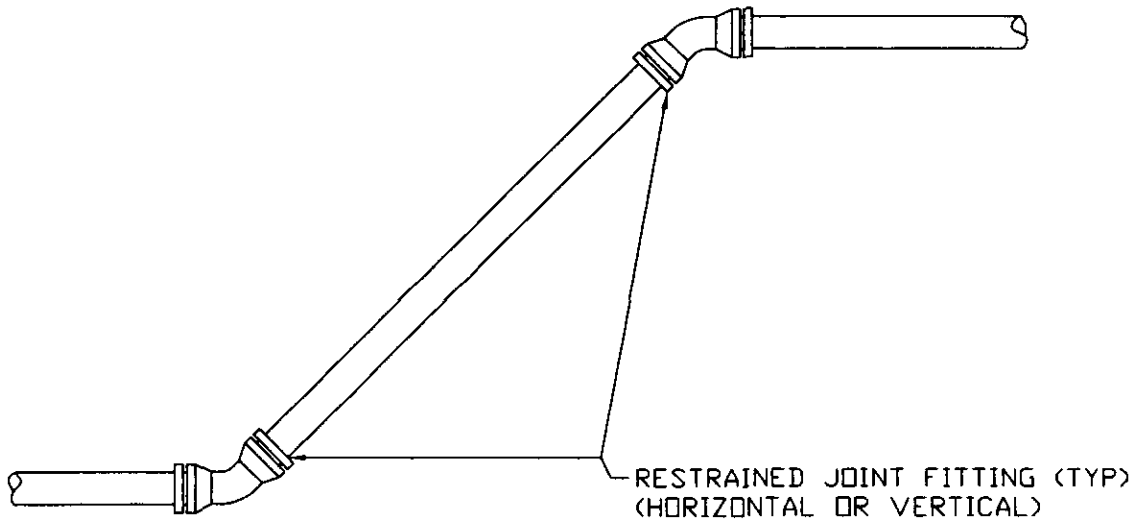


BACKFLOW PREVENTER ELEVATION

Date Revised: OCTOBER, 2004	CITY OF OSAGE BEACH TYPICAL DETAIL 1½" TO 2" METER, PRESSURE REDUCING VALVE WITH BACKFLOW PREVENTER NOT TO SCALE	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: JB		Drawing No.: II-8

SCHEDULE (6" THROUGH 12" PIPE)

90° BEND - 60 LF EACH SIDE OF FITTING
45° BEND - 30 LF EACH SIDE OF FITTING
22.5° BEND - 20 LF EACH SIDE OF FITTING
11.25° BEND - 10 LF EACH SIDE OF FITTING



NOTE:
LENGTHS SHOWN ARE BASED ON DIP WITH POLYETHYLENE ENCASEMENT. ADJUST AS REQUIRED FOR OTHER PIPE MATERIALS.

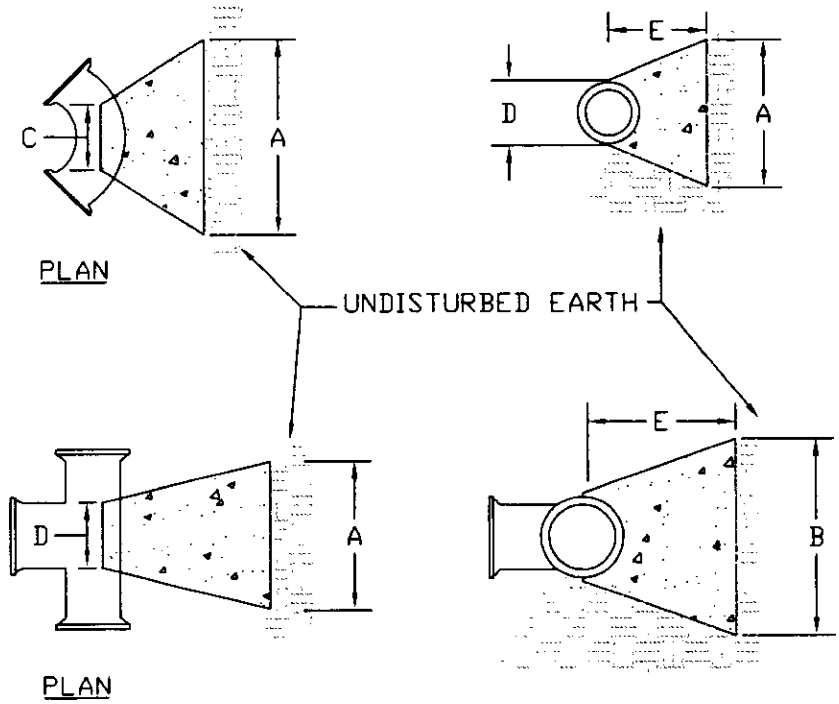
Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL RESTRAINED JOINT PIPE NOT TO SCALE	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: jb		Drawing No: II-9

PIPE SIZE CHART

PIPE SIZE	FITTING	DISTANCE IN INCHES				
		A	B	C	D	E
4" AND SMALLER	11.25 & 22.5°	9	9	8	8	6
	45 DEGREE	18	9	8	8	12
	90 DEGREE	21	12	8	8	12
	TEE/PLUG	15	12	8	8	12
6"	11.25 & 22.5°	12	12	8	10	12
	45 DEGREE	27	12	8	10	12
	90 DEGREE	33	18	8	10	12
	TEE/PLUG	24	18	8	10	12
8"	11.25 & 22.5°	18	15	8	10	12
	45 DEGREE	33	15	8	10	18
	90 DEGREE	42	24	8	10	18
	TEE/PLUG	30	24	8	10	18
10" & 12"	11.25 & 22.5°	27	24	12	12	18
	45 DEGREE	51	24	12	12	24
	90 DEGREE	63	36	12	12	30
	TEE/PLUG	45	36	12	12	24
14" & 16"	11.25 & 22.5°	33	33	12	16	18
	45 DEGREE	69	33	12	16	30
	90 DEGREE	84	48	12	16	36
	TEE/PLUG	60	48	12	16	30

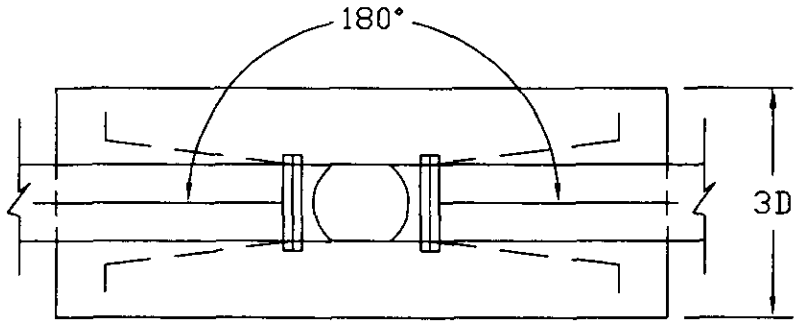
NOTES:

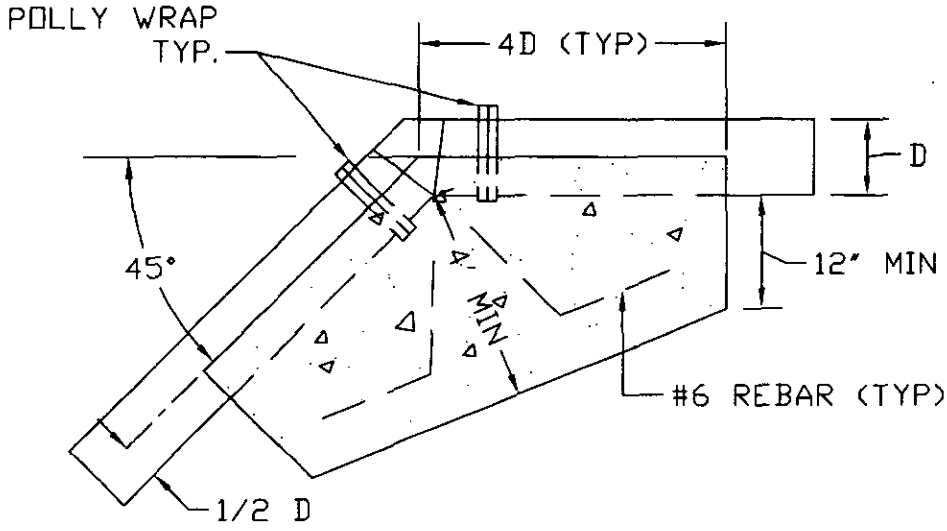
1. THRUST BLOCKS ARE BASED ON A WORKING PRESSURE OF 200 P.S.I. PLUS 0% SURGE & 2000 P.S.F. ALLOWABLE SOIL BEARING PRESSURE.
2. FOR PIPE SIZES NOT SHOWN USE DIMENSIONS FOR NEXT LARGER SIZE.
3. USE 3/8" PLYWOOD SEPARATOR BETWEEN BLOCKS AND PLUGS TO PROVIDE FOR FUTURE REMOVAL.



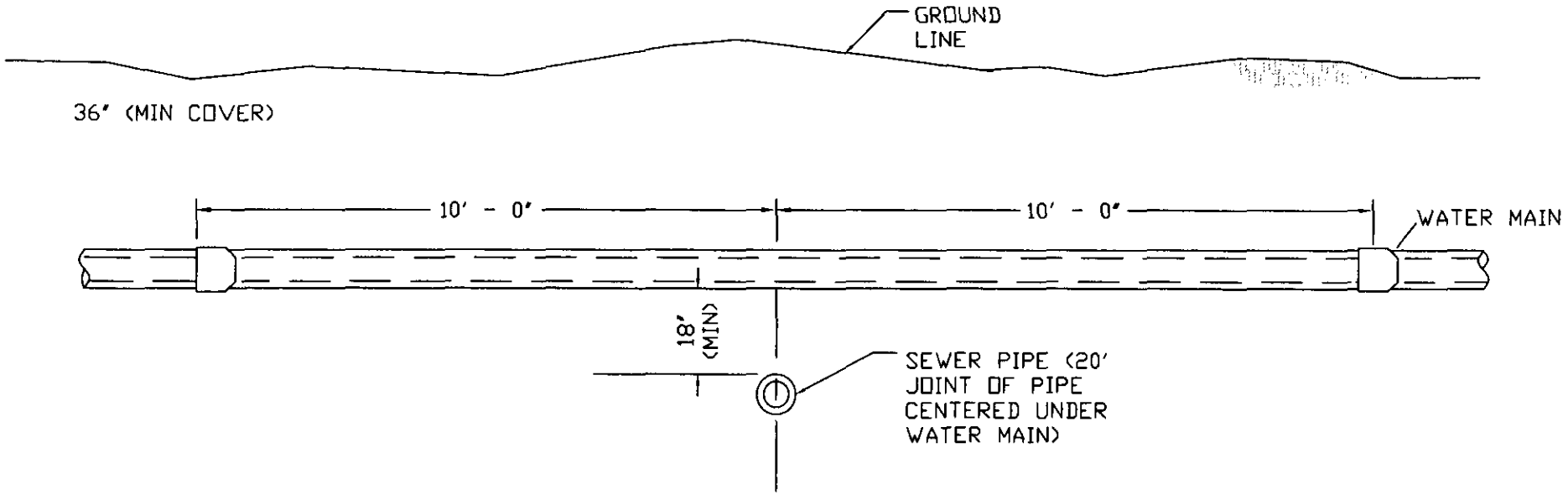
Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL THRUST BLOCK DETAIL NOT TO SCALE	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: jb		Drawing No: II-10

NOTE:
MJ FITTING WITH RETAINER GLANDS
REQUIRED FOR ALL VERTICAL BENDS

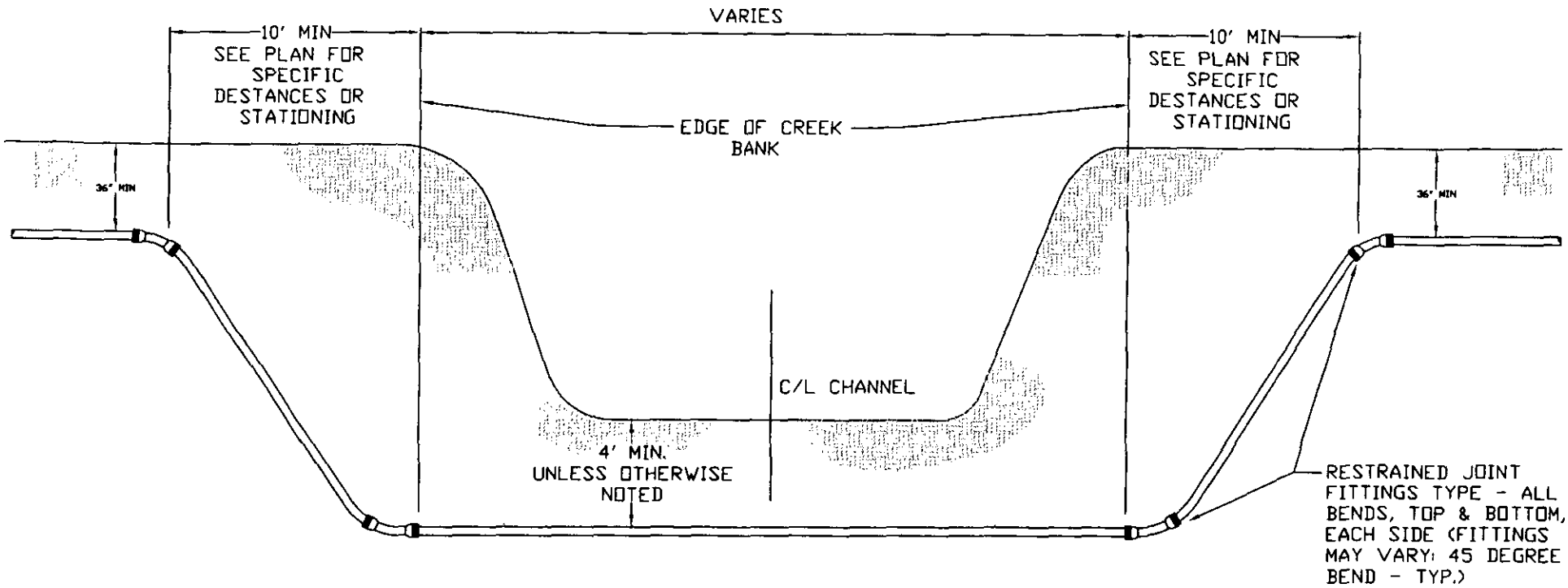




Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL VERTICAL BEND THRUST BLOCK NOT TO SCALE	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: jb		Drawing No: II-11



Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL WATER SEWER CROSSING NOT TO SCALE	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: jb		Drawing No: II-12



Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL CREEK CROSSING NOT TO SCALE	Design Guideline: SECTION 2
By: sh		WATER SYSTEM
Checked By: jb		Drawing No: II-13