

NOTICE OF MEETING AND BOARD OF ALDERMEN AGENDA



CITY OF OSAGE BEACH BOARD OF ALDERMEN MEETING

1000 City Parkway
Osage Beach, MO 65065
573.302.2000
www.osagebeach.org

TENTATIVE AGENDA

SPECIAL MEETING

May 9, 2024 - 5:30 PM
CITY HALL

**** Note:** All cell phones should be turned off or on a silent tone only. Agendas are available in the Council Chamber; however, complete meeting packets are available on the City's website at www.osagebeach.org.

CALL TO ORDER

PLEDGE OF ALLEGIANCE

ROLL CALL

UNFINISHED BUSINESS

NEW BUSINESS

- A. Public Hearing - City Code changes to Design Guidelines relating to the Water and Sewerage System, Storm Drainage, and Road Cut, Utility Trench, and Excavation Permit
- B. Discussion - City Code changes to Design Guidelines relating to the Water and Sewerage System, Storm Drainage, and Road Cut, Utility Trench, and Excavation Permit
- C. Discussion - Proposed Water & Sewer User Charge Rates

ADJOURN

Remote viewing is available on Facebook at *City of Osage Beach, Missouri* and on YouTube at *City of Osage Beach*.

Representatives of the news media may obtain copies of this notice by contacting the following:

Tara Berreth, City Clerk
1000 City Parkway
Osage Beach, MO 65065
573.302.2000 x 1020

If any member of the public requires a specific accommodation as addressed by the Americans with Disabilities Act, please contact the City Clerk's Office forty-eight (48) hours in advance of the meeting at the above telephone number.

City of Osage Beach
Agenda Item Summary

Date of Meeting: May 9, 2024
Originator: Jeana Woods, City Administrator
Presenter: Mike Welty, Assistant City Administrator

Agenda Item:

Public Hearing - City Code changes to Design Guidelines relating to the Water and Sewerage System, Storm Drainage, and Road Cut, Utility Trench, and Excavation Permit

Requested Action:

Presentation

Ordinance Referenced for Action:

Not Applicable

Deadline for Action:

None

Budgeted Item:

Not Applicable

Budget Line Information (if applicable):

Not Applicable

Department Comments and Recommendation:

A press release was published on April 9, 2024, to invite the public to review and comment on the proposed Design Guidelines and City Code changes relating to the Water and Sewerage System, Storm Drainage, and Road Cut, Utility Trench, and Excavation Permit. Public comments are accepted through Tuesday, April 30, 2024.

Enclosed is the Press Release and proposed details.

City Attorney Comments:

Not Applicable

City Administrator Comments:

Not Applicable



NEWS RELEASE

For Release: Immediate Release
Tuesday, April 9, 2024

Contact: Mike Welty
Assistant City Administrator
City of Osage Beach
573.302.2000 x1011
mwelty@osagebeach.org

-City of Osage Beach-

Design Guidelines and City Code Proposed Changes – Open for Public Review and Comments \ Public Hearing has been scheduled.

Osage Beach, MO –City Code changes to Design Guidelines and Design Standards regarding the *Water and Sewerage System, Storm Drainage, and Road Cut, Utility Trench, and Excavation Permit* are being proposed and are available to the public for review and comment.

A Special Board of Aldermen meeting for the purpose of a Public Hearing is scheduled for Thursday, May 9, 2024, 5:30 PM, at City Hall. Meeting agenda will be available on our [website](#) closer to the meeting date.

The proposed changes are accessible at <https://osagebeach-mo.gov/CivicAlerts.aspx?AID=473>

Public comments will be accepted through Tuesday, April 30, 2024, ahead of the Public Hearing. Comments may be submitted to the Office of the City Clerk by email, mail, or in-person drop off.

Email – tberreth@osagebeach.org;
Mail or Drop-off – Osage Beach City Hall, Attn: City Clerk,
1000 City Parkway, Osage Beach, MO 65065.

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City of Osage Beach

Design Guidelines & Code of Ordinances PROPOSED CHANGES

Enclosed for Review:

Design Guidelines Section 1 – Overview [**Page 1**]

Design Guidelines Section 2 – Water System [**page 2**]

Design Guidelines Section 3 – Sewerage System [**page 33**]

Design Guidelines Section 4 – Storm Drainage [**page 58**]

Design Guidelines Section 6 – Road Cut, Utility Trench, and Excavation Permit [**page 85**]

Title VII Utilities – Article III Water Service Connection To City Water System – Section 705.250
Meter Installation and Maintenance [**page 102**]

Title VII Utilities – Article IV Rates and Charges – Section 705.310 Water Fees [**page 102**]

Title VII Utilities – Article III Building Sewers and Connections – Section 710.190 Connections
Costs and Liabilities [**page 102**]

Note: Proposed changes in **RED / DELETIONS ~~crossed out~~*

Public Comment Deadline: Tuesday, April 30, 2024

Public Hearing – Thursday, May 9, 2024, 5:30 PM, City Hall

Comments may be submitted to the Office of the City Clerk by email, mail, or in-person drop off.

Email: tberreth@osagebeach.org;

Mail or Drop Off: Osage Beach City Hall, Attn: City Clerk: Tara Berreth,
1000 City Parkway, Osage Beach, MO 65065

Design Guideline
City Of Osage Beach
SECTION 1 – OVERVIEW

(Revised 21OCT 2004 - SH)

This guideline is a supplement to the ordinances of the City of Osage Beach, Missouri and sets forth the requirements and policies for the design of city infrastructure. The basic design parameters and specifications for approval by the city are set forth herein.

City Infrastructure shall be designed and constructed in accordance with the Missouri Department of Highways and Transportation Commission Project Design Manual; the Missouri Department of Highways Standard Specifications; American Association of State Highway and Transportation Officials (AASHTO) Policy for the Geometric Design of Highways and Streets, the Missouri Department of Natural Resources regulations; the International Building Code; the National Electric Code; the International Plumbing Code; the International Mechanical Code; the International Fire Code, and additional standards, policies and ordinances referenced herein. In general, the policies and ordinances stated herein are supplemental to the applicable County, State, or Federal regulations as necessary to meet specific conditions in the City of Osage Beach.

The requirements for water system permits, sewer system permits, excavation permits, and road-cut permits are contained herein.

The public is encouraged to call or come to the City Hall and see the City Building Official or City Engineer for clarification of design, construction, and permitting issues.

The primary goal of these guidelines is to assure the public safety and provide for a high quality environment for those living or visiting our city.

End

Design Guideline
City of Osage Beach
SECTION 2 - WATER SYSTEM

(Revised 23 OCT 2014-NLE)

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~~ Basic Standards

Chapter 410.320 Waterlines

Chapter 505.~~040~~ Fire ~~Prevention~~ and 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:

Design Guideline
City of Osage Beach
SECTION 2 - WATER SYSTEM

EAST SIDE SYSTEM

	<u>1999</u>	<u>2019</u>	<u>Ultimate</u>
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		
Passover Tower, gpd	150,000		
Bluff Tower, gpd		800,000	1,300,000

Required Water Supply, gpm	451	880	1,094
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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

	<u>1999</u>	<u>2019</u>	<u>Ultimate</u>
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
Swiss Village Well No. 3, 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

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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~~ than 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. Hydrant spacing in commercial and industrial areas shall be not less than 300’.
 - d. Provide one hydrant within 125 feet of each fire main entrance into the structure.
 - e. Provide fire main service to each structure with indicating type valve at the water main. Minimum size fire service line is four inches.
 - f. Minimum static pressure at each structure shall be 35 psi.
 - g. Commercial buildings, Condominiums and Multi-Family Occupancies, which have a fire suppression system, must also be served by an approved fire hydrant not further than 150’, in the line of hose path travel, from the fire department connection.
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~~ 600 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, ~~Internation~~ Fire Code 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 ~~the~~ main and ~~the~~ building except for an indicating shut-off valve at the main and a post indicating valve which shall be located a minimum of 5 feet away from the building. Shut-off valves installed on fire mains shall be of the indicating type that clearly shows if the valve is open or closed.

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C. Water Distribution Mains

1. Water distribution mains shall be looped to the maximum ~~extend~~ extent 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~~ 500 feet commercial, 800 feet residential 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~~ privately 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.

Design Guideline
City of Osage Beach
SECTION 2 - WATER SYSTEM

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 Public Works ~~Director~~ **Operations Manager** or designee:

<u>Meter size</u>	<u>Meter Demand</u>	<u>Requirements</u>
5/8"x 3/4"	1 to 20 gpm	Single family residence with 2-1/2 baths, small commercial offices or retail establishments establishments . Maximum continuous continuous 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)

Design Guideline
City of Osage Beach
SECTION 2 - WATER SYSTEM

B. Meter Connection Policy

1. Single Family Residential, and small commercial connections
 - a. Each individually owned residence or business shall be connected through a single tap on the main, 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 Public Works ~~Director~~ Operations Manager or designee 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 duplexes 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.

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- 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 Public Works ~~Director~~ Operations Manager or designee.
- 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 Public Works ~~Director~~ Operations Manager or designee. 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.
- 3. Pipe materials for the main between the building and post indicating valve shall be Ductile Iron as shown below in Materials for Waterlines and Appurtenances section A. point 1 subpoint a.

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.

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MATERIALS FOR WATERLINES AND APPURTENANCES

A. Water Mains

1. All mains ~~four~~ six 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~~ 305
 - 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~~, CTS, ~~DR 7 SDR9~~, Class 200 ~~for I.D. pipe, or DR 9, Class 200 for O.D. pipe.~~
 2. ~~Larger than two inch to be approved by Public Works Operations Manager~~
- 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. ~~four~~ 6 inches and Larger:
 - a. Fittings:
 - 1) Ductile iron fittings, cement mortar lined, conforming to AWWA C150 or C151.

Design Guideline
City of Osage Beach
SECTION 2 - WATER SYSTEM

- 2) All buried or flooded locations shall use **grip restraint** mechanical joint pipe and fittings, **such as Megalug or approved equal.**
 - 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 **with** a minimum thickness of 24 mils.
 - 5) **Bolts shall be stainless steel, fluoropolymer coated, or approved equal.**
- 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.~~ Bell Joints shall be restrained with all threads 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 Public Works ~~Director~~ **Operations Manager or designee.**
 - ~~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.

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- 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, ~~American-Darling B32~~ 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 Public Works ~~Director~~ Operations Manager or designee.
- G. Blow-Off Assembly
1. Post Hydrants shall be non-freezing, self draining type with a minimum ~~42"~~ 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 1/2" 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 Hinged Series S91 for PVC and Series 202B IP for DIP, 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 single~~ yoke, with lockable angle valve, spreader bar, and CTS pack joint. *Do not place dual check assembly on residential service lines.*

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City of Osage Beach
SECTION 2 - WATER SYSTEM

- d. Meter Vault shall be ADS N-12 corrugated plastic of appropriate size (min. ~~20~~ 24 in.), with Ford Wabash lid cover with Clay & Bailey extension ring. *The lid cover must have a hole that accommodates the meter antenna.*
 - e. *If the distance from the angled valve to the top of the lid is greater than 24 inches, the meter pit shall be up sized to 36 inches in diameter.*
 - f. *All additional devices, equipment, and valves shall be down stream of the water meter and not located within the water meter pit.*
2. 1, 1-1/2, and 2 in. Meters for Commercial or Multi-family Residential Use:
- a. Tapping saddle shall be Ford Brass Saddles Hinged Series S91 for PVC and Series 202B IP for DIP. It shall be a 2-in tap with 2-in service line to the meter., 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~~ *single* 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. The pressure reducing valve shall be Watts LF25AUB-23~~
 - e. Meter Vault shall be ADS N-12 corrugated plastic of appropriate size (min. ~~20~~ 36 in.), with Ford Wabash lid cover with Clay & Bailey extension ring. *The lid cover must have a hole that accommodates the meter antenna.*
 - f. *All additional devices, equipment, and valves shall be down stream of the water meter and not located within the water meter pit.*
3. Meter larger than two inches.
- 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~~ *than* 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~~

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- ~~dual check valves, Class 250.~~
- g. All additional devices, equipment, and valves shall be located on the customers side of the water meter and not located within the water meter pit.

WATERLINE AND APPURTENANCE INSTALLATION REQUIREMENTS

A. Waterline Installation

1. The minimum depth of cover is ~~36~~ 42 in. above the top of the pipe.
2. The maximum depth of cover for waterlines is ~~eight (8)~~ five (5) ft. unless specifically authorized in writing by the Public Works ~~Director~~ Operations Manager or designee.
3. ~~Green or~~ Blue minimum four inch wide marking tape marked "waterline below" shall be installed twelve inches above all waterlines.
4. Locator wire shall be standard tracer wire, a single No. 12 U.L. approved copper wire of the solid type with insulation for 600 volts. Wire for this service shall be blue in color and provided in standard rolls of not less than five hundred (500) foot lengths. Locator wire shall be placed on top of the water main and secured with tape at 8-foot intervals. Locator wire shall extend to all terminus, such as valves, hydrants, and meter pits. ~~No. 12 solid copper Toning wire shall be located three inches above taped to the top of all City owned waterlines and shall be extended to all valves, hydrants, meter sets, and terminus points.~~
 - a. Splices shall only be allowed where accessible. Buried splices will not be allowed. If valve box locations are spaced more than 500 feet apart, contractor shall install a vertical piece of 6-inch diameter PVC adjacent to the water main topped with a cast iron bonnet and cover marked "water". The wire shall be run outside up alongside the valve box, then through a hole in the valve box just below ground level. The splice connector shall be left exposed at the top of the valve box. Wire contact points shall be provided at no more than 500-foot intervals.
 - b. Prior to final acceptance by the City, the contractor shall demonstrate that the locator wire works to the satisfaction of the City Inspector, Public Works Operations Manager or designee.
5. Bedding shall be installed around the pipe from 6 inches below to 12 inches above the pipe. Bedding shall be ~~nominal 1/2 inch minus~~ crushed rock conforming to MoDOT Type 5 aggregate, Section 1007.

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~~1004, Grade D, Chat, or pea gravel, or Osage River Sand. Any material used shall have a PI of six or less. Trench backfill material shall not contain any material with a nominal particle size greater than six (6) inches.~~

6. Waterlines shall be separated by a minimum of 18 inches vertically and 10 feet horizontally from sanitary/storm sewer lines or sanitary/~~storm sewer~~ sewer line appurtenances unless:
 - a. At crossings the water or ~~sewer non-potable main~~ 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 ~~of a material that is approved for use as a water main or one of the water or sewer main shall be constructed of mechanical or manufactured restrained joint pipe, fusion welded pipe, 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 Public Works ~~Director~~ Operations Manager or designee. Either the water main or the non-potable main shall be constructed of mechanical or manufactured restrained joint pipe, fusion welded pipe, or cased in a continuous casing. Casing pipe must be a material that is approved for use as a water main. ~~or designee. 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. 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.

Design Guideline
City of Osage Beach
SECTION 2 - WATER SYSTEM

2. Post Indicating Valves shall be located a minimum of 5 feet from the building that they are servicing.
- 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 Public Works ~~Director~~ Operations Manager or designee.
- D. Installation of Meter Assembly:
1. Residential and commercial hookup – 5/8 inch through 1 inch:
 - a. The Owner shall furnish and install the ~~service saddle, corporation stop, curb valve and box, tap,~~ meter service line, meter set, lockable shut-off valve, ~~pressure-reducing valve,~~ and the ~~tandem single~~ meter setter and the meter vault.
 - b. Wet taps are to be performed by City Staff or a City approved contractor and witnessed by the City.
 - c. The City will furnish the water meter and transponder.
 - d. The meter installation shall be as detailed in the attached Typical Meter Installation Detail.
 - e. The water meter lid shall be easily accessible and visible.
 - f. All hard surfaces, including concrete and asphalt, that surround the water lid assembly will need prior approval from the Public Works Operations Manager or designee.
 - g. All obstructions within a 5-foot radius that present a clear obstacle to the maintenance of the city water meter shall be removed at the home owner's expense.
 2. Residential and commercial hookup – 1-1/2 inch and 2 inch:
 - a. The Owner shall furnish and install the ~~service saddle, corporation stop, curb valve and box, tap,~~ meter service line, meter set, lockable shut-off valve, ~~pressure-reducing valve,~~ and the ~~tandem single~~ meter setter and the meter vault.
 - b. Wet taps are to be performed by City Staff or a City approved contractor and witnessed by the City.
 - c. The City will furnish the water meter and transponder.
 - d. The meter installation shall be in accordance with the attached Typical Meter Installation for 1-1/2 and 2 inch Meters.
 - e. The water meter lid shall be easily accessible and visible.
 - f. All hard surfaces, including concrete and asphalt, that surround the water lid assembly will need prior approval

Design Guideline
City of Osage Beach
SECTION 2 - WATER SYSTEM

- from the Public Works Operations Manager or designee.
- g. All obstructions within a 5 foot radius that present a clear obstacle to the maintenance of the city water meter shall be removed at the home owners expense.

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.
- b. Any wet tap larger than 2-inch shall be performed by an approved contractor and witnessed by City Staff.

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 the 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; construction of one- and two-family dwellings and their accessory structures are excluded from this requirement, unless the design requires an extension to the City's system. 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 Public Works ~~Director~~ Operations Manager or designee prior to any onsite construction.

Design Guideline
City of Osage Beach
SECTION 2 - WATER SYSTEM

2. During the progress of the work each utility line shall be inspected by the ~~Engineering Department~~ City Inspector 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 of~~ 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 ~~needed~~ to refill the line shall be measured and recorded.
 - e. The amount of water ~~needed~~ to refill the line must be less than the maximum allowable leakage. The maximum allowable leakage shall be computed thusly:

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

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.

Design Guideline
City of Osage Beach
SECTION 2 - WATER SYSTEM

- 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 in the following manner:~~
 - 1) Two consecutive sets of samples taken at least 24 hours apart from the new main in accordance with AWWA.
 - i. Samples to be taken ever 1,200 of new main, plus one set from the end of the line and at least one set from each branch.
 - ii. Samples shall be collected in sterile bottles treated with sodium thiosulfate. No hose or fire hydrant shall be used in the collection of samples.
 - 2) Samples shall be tested by a Certified laboratory
 - 3) 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.

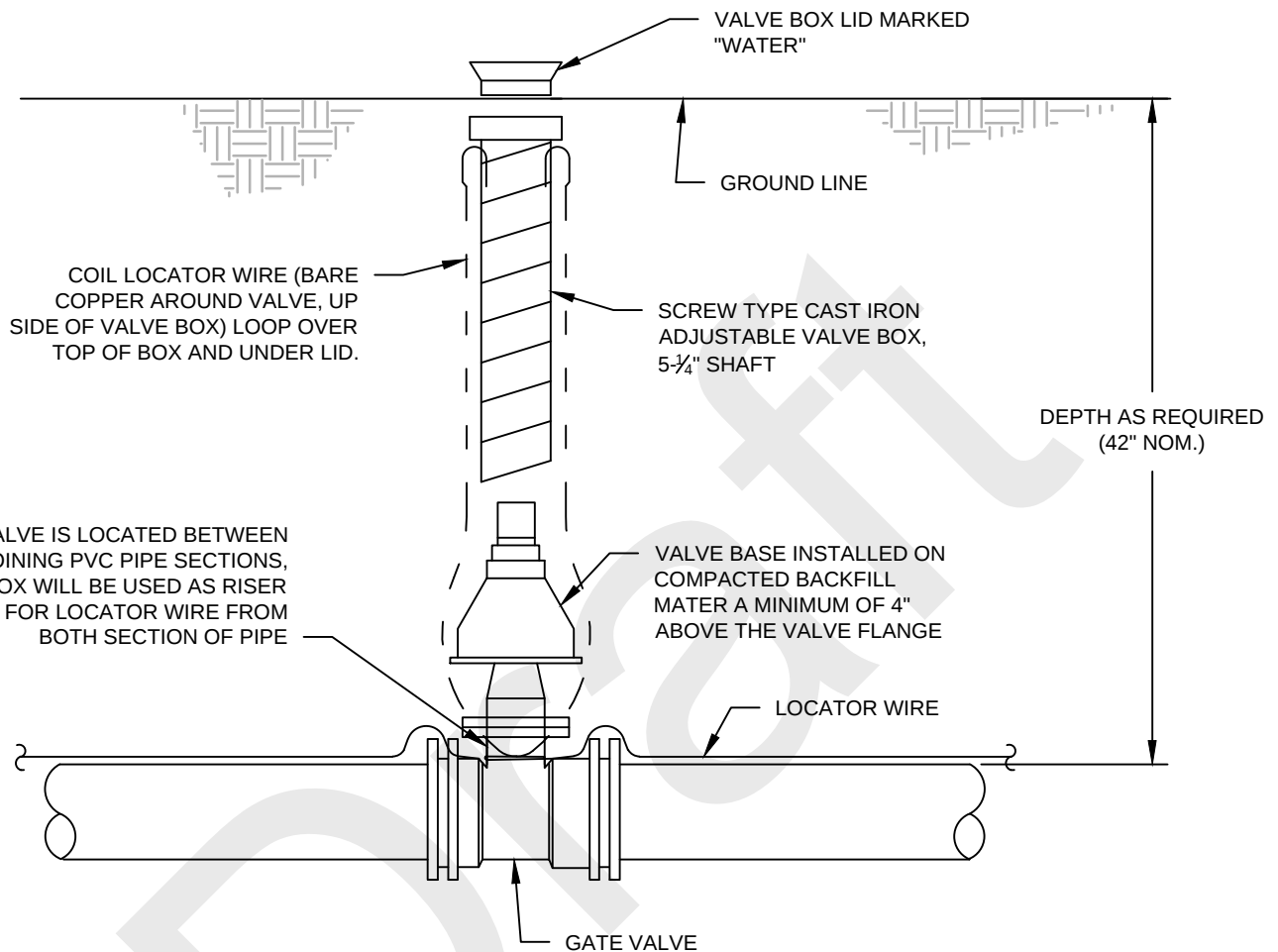
Design Guideline
City of Osage Beach
SECTION 2 - WATER SYSTEM

AS CONSTRUCTED DRAWINGS AND MAINTENANCE DOCUMENTS

The Developer/Contractor shall provide the Public Works 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 Public Works ~~Director~~ **Operations Manager or designee**.

WATERLINE AND APPURTENANCES CONSTRUCTION DETAIL DRAWINGS

Construction details and sketches are attached.



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

By:
SH

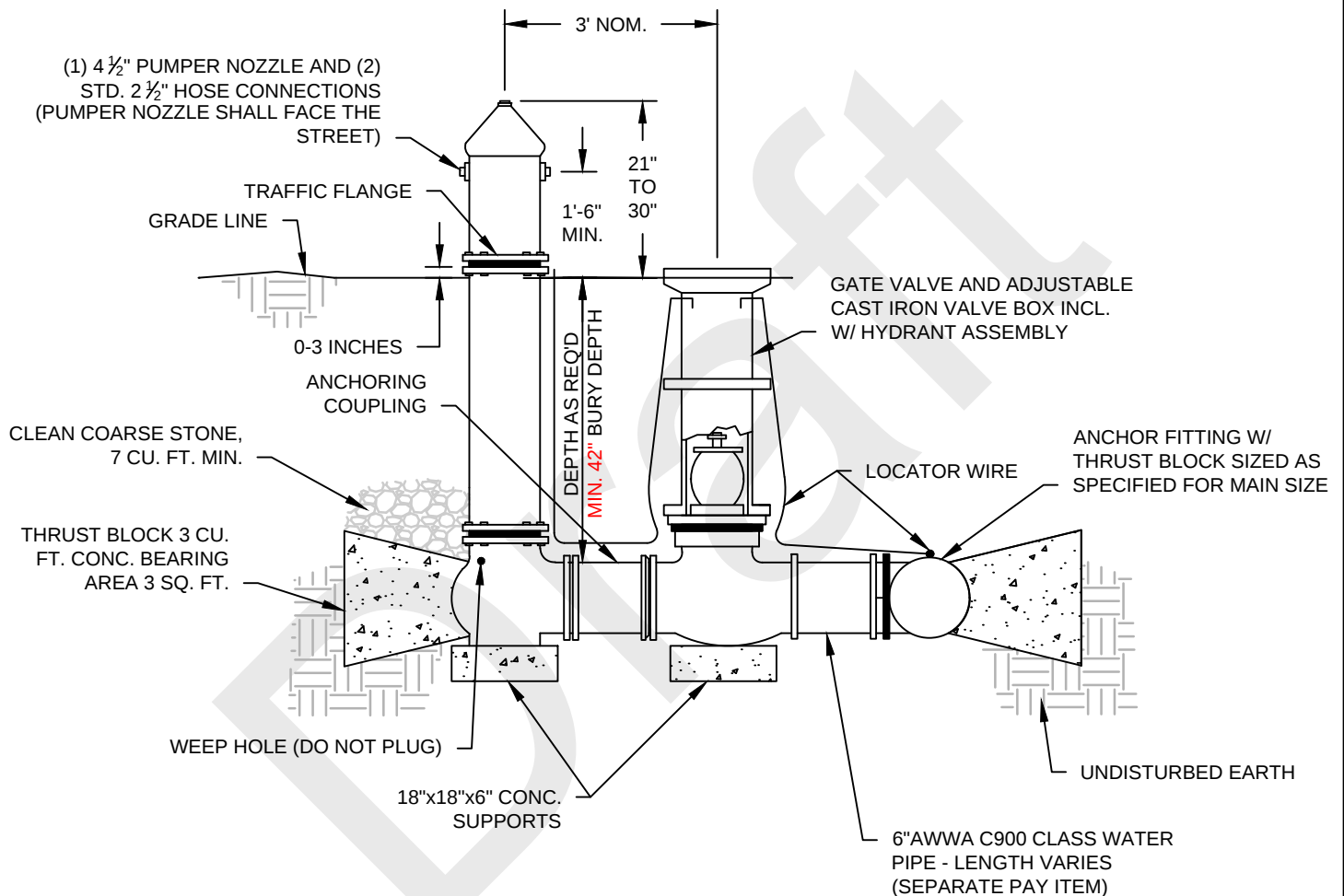
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JB

**CITY OF OSAGE BEACH
TYPICAL DETAIL
GATE VALVE INSTALLATION**

Design Guideline:
SECTION 2

WATER SYSTEM

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	Design Guideline: SECTION 2
By: SH		WATER SYSTEM
Checked By: JB		Drawing No: II-2

C/L ROADWAY

C/L WATER MAIN

EDGE OF PAVEMENT

R/W

R/W

RIGHT-OF-WAY LINE

R/W

NOTE:
FIRE HYDRANT SHALL BE LOCATED
5' FROM EOP OR WITHIN THE
CITY'S RIGHT-OF-WAY

5' MINIMUM

FIRE
HYDRANT
ASSEMBLY

Date Revised:
OCTOBER 2004

By:
SH

Checked By:
JB

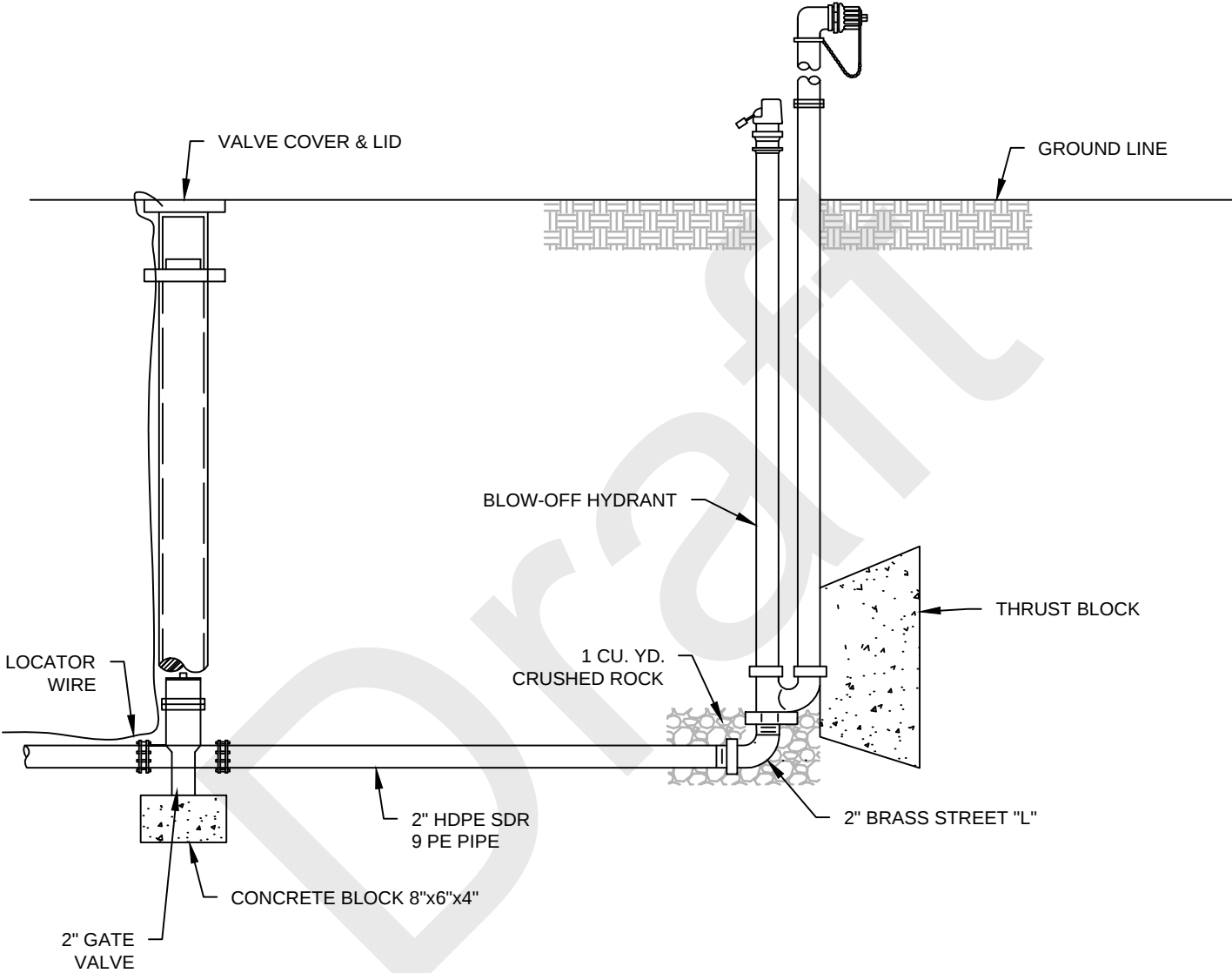
CITY OF OSAGE BEACH
TYPICAL DETAIL
FIRE HYDRANT LOCATION

Design Guideline:
SECTION 2

WATER SYSTEM

Drawing No:
II-3

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



Date Revised:
OCTOBER 2004

By:
SH

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JB

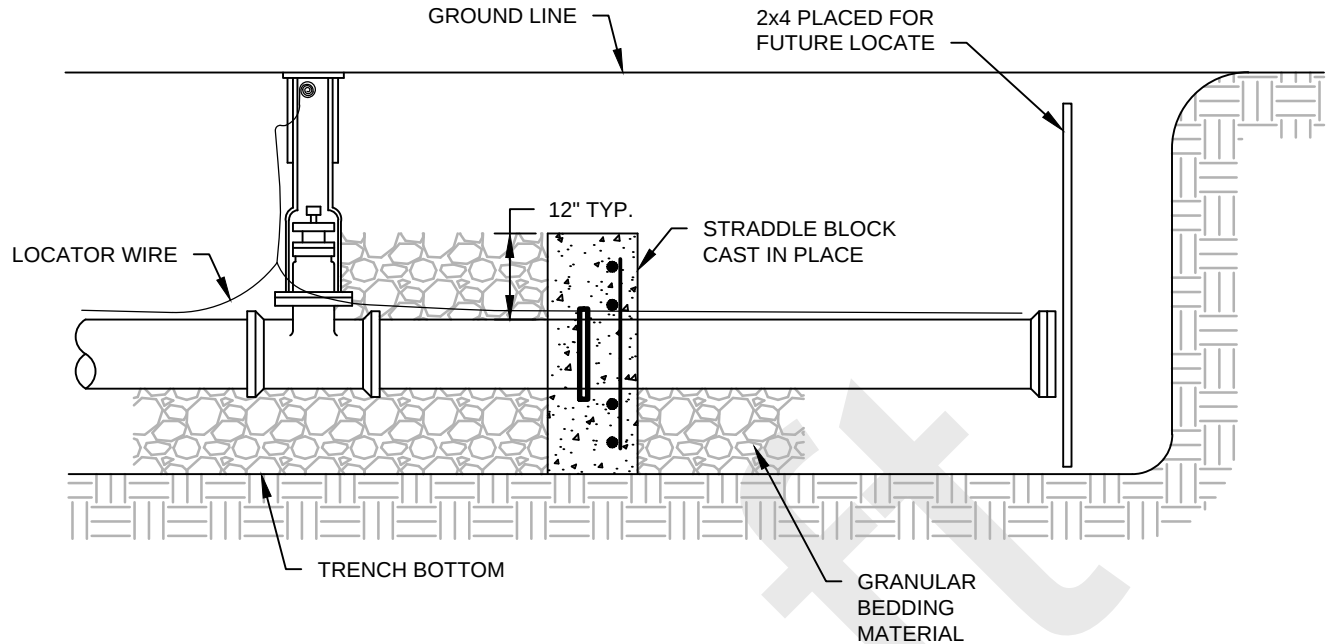
CITY OF OSAGE BEACH
TYPICAL DETAIL
BLOW-OFF ASSEMBLY

Design Guideline:
SECTION 2

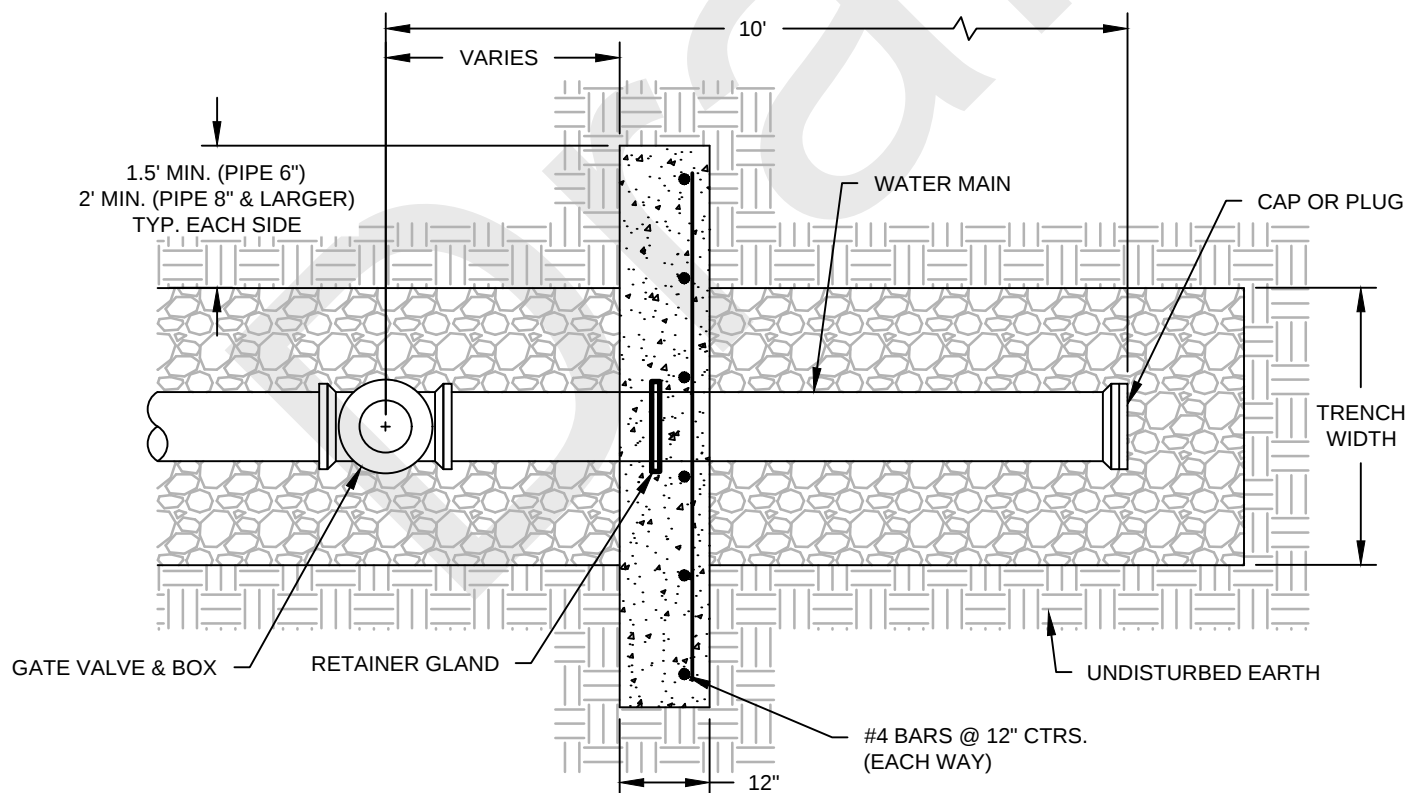
WATER SYSTEM

Drawing No:
II-4

NOTE:
CONTRACTOR TO INCLUDE RETAINER
GLANDS FOR THE GAVE VALVE



ELEVATION



PLAN VIEW

Date Revised:
OCTOBER 2004

By:
SH

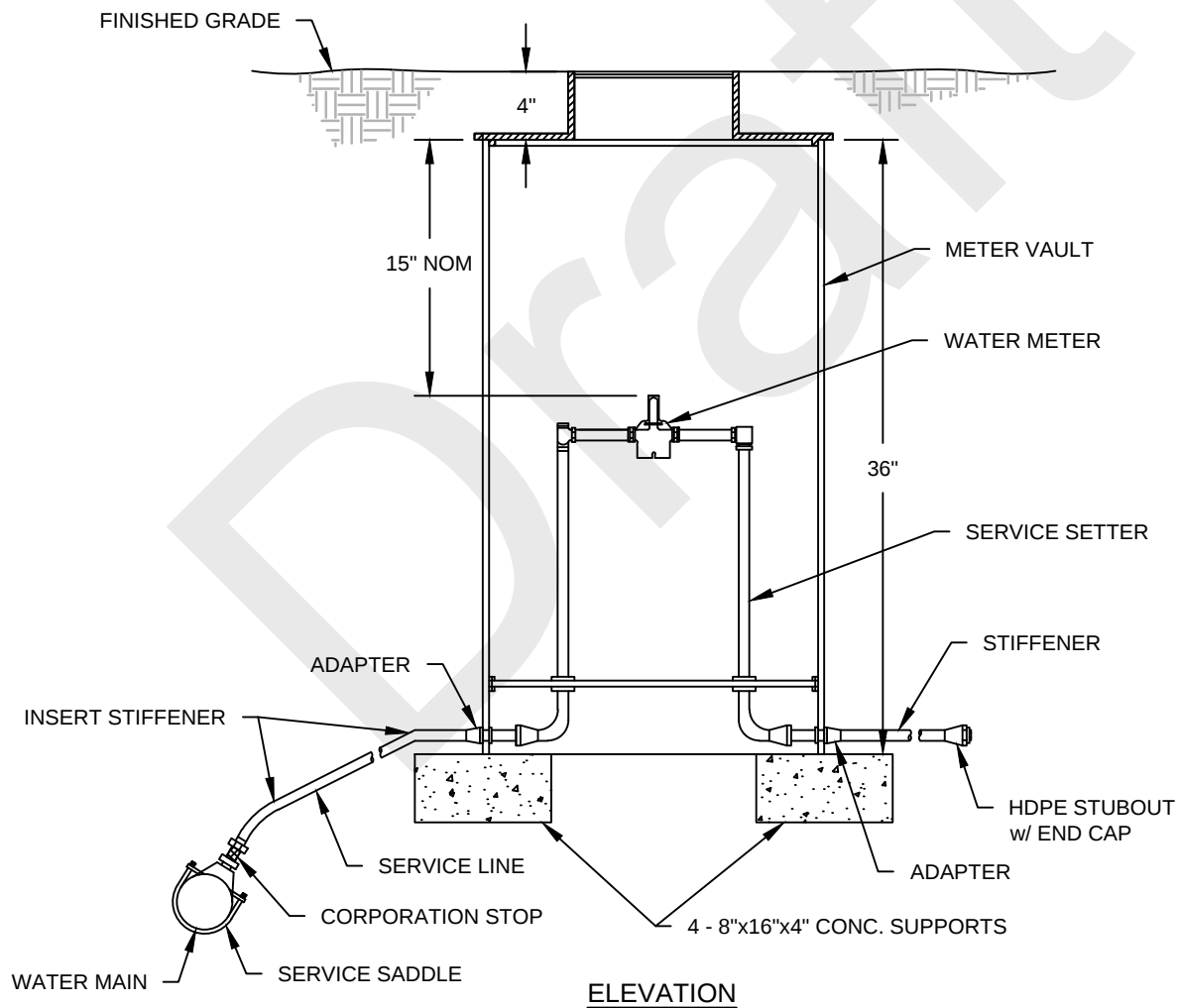
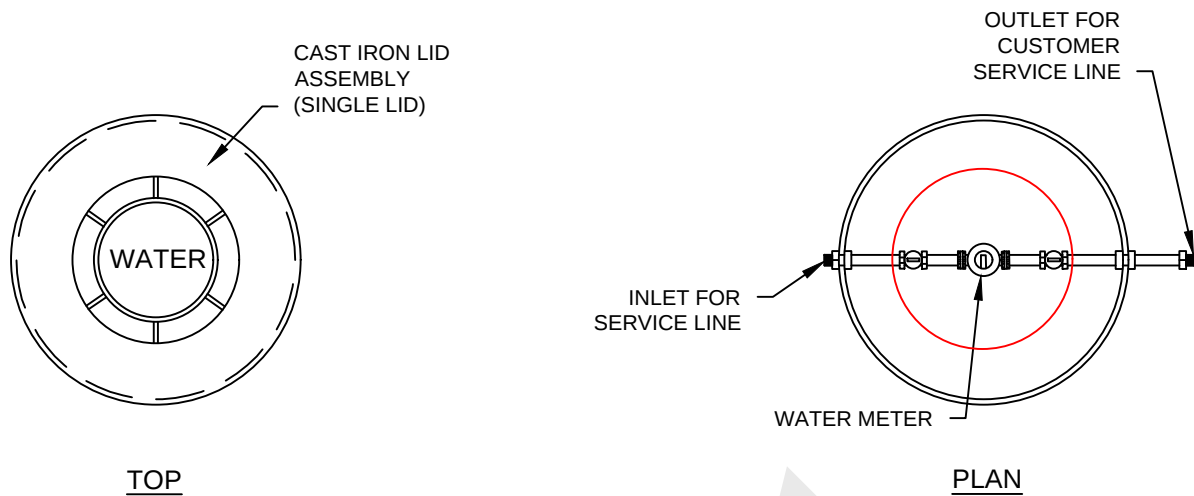
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**CITY OF OSAGE BEACH
TYPICAL DETAIL
WATER LINE TERMINATION**

Design Guideline:
SECTION 2

WATER SYSTEM

Drawing No:
II-5



Date Revised:
OCTOBER 2004

By:
SH

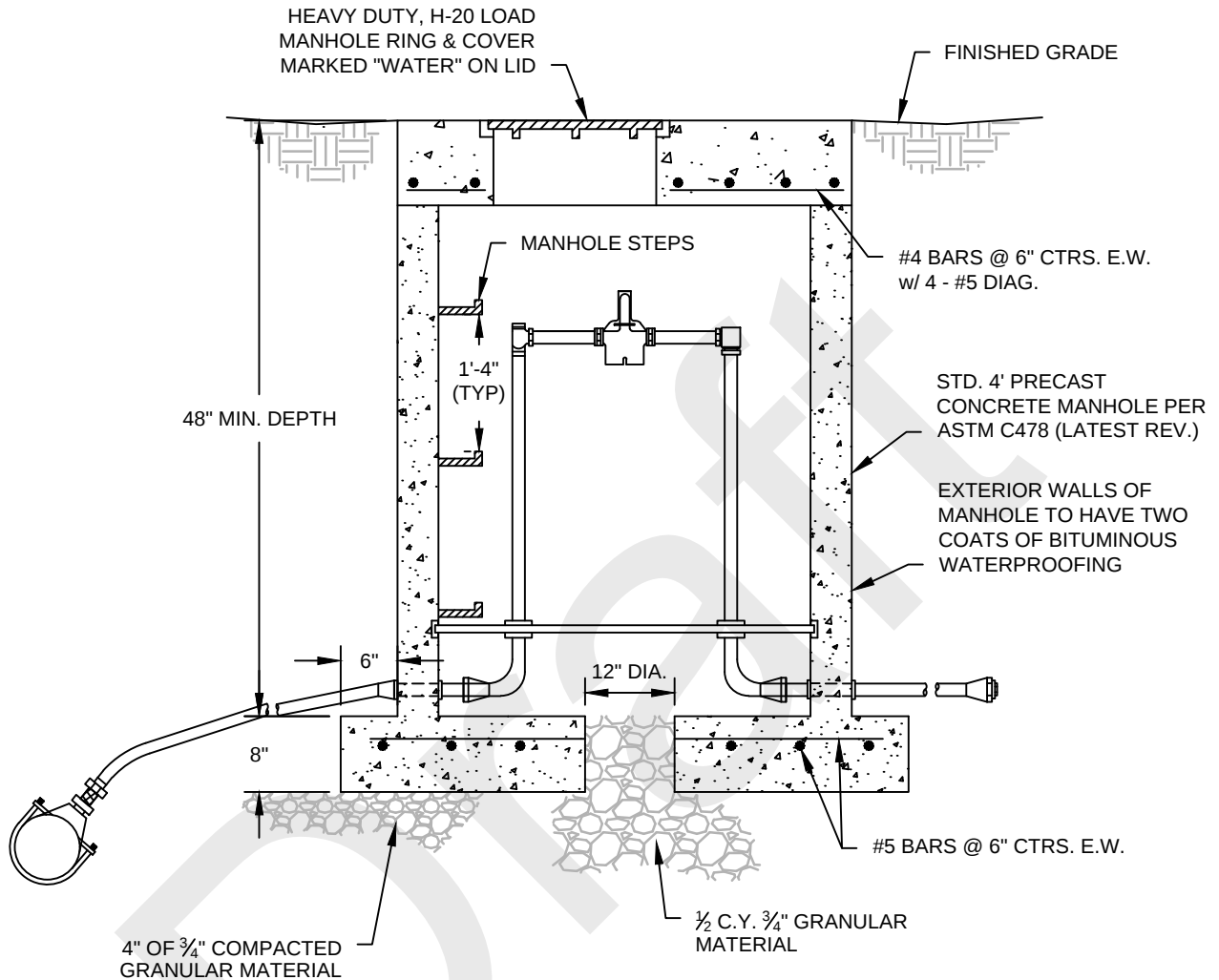
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JB

CITY OF OSAGE BEACH
TYPICAL DETAIL
METER SETTING SIDEWALK OR LAWN
5/8"x3/4", 1", 1-1/2", OR 2" METERS

Design Guideline:
SECTION 2

WATER SYSTEM

Drawing No:
II-6



Date Revised:
OCTOBER 2004

By:
SH

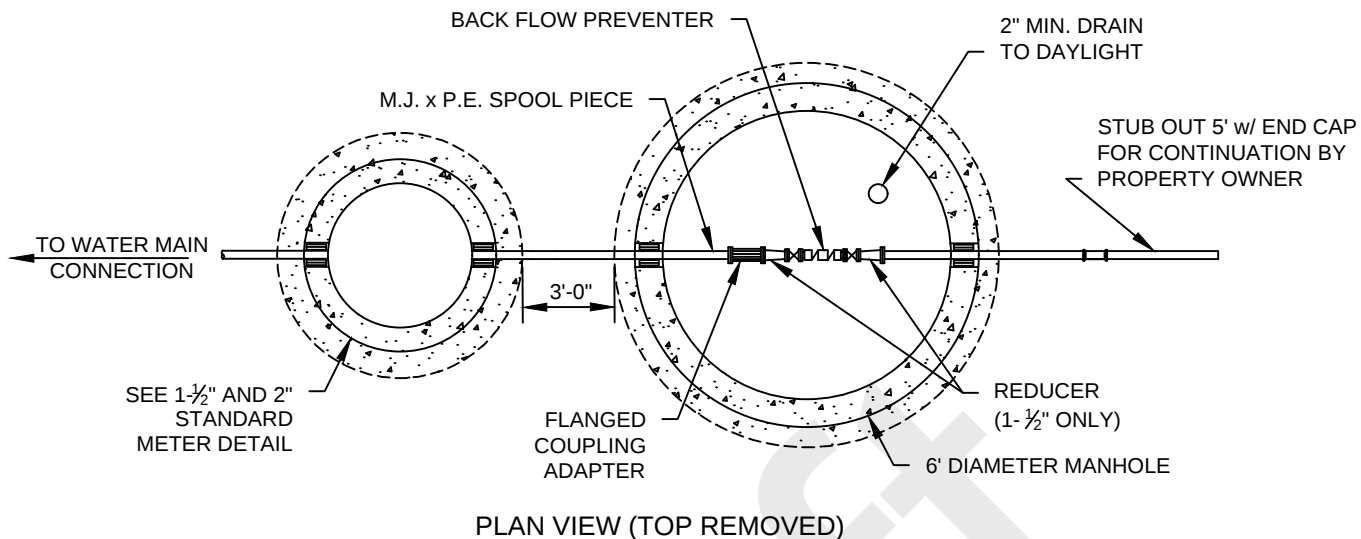
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CITY OF OSAGE BEACH
TYPICAL DETAIL
METER VAULT DRIVEWAY OR
PARKING AREA

Design Guideline:
SECTION 2

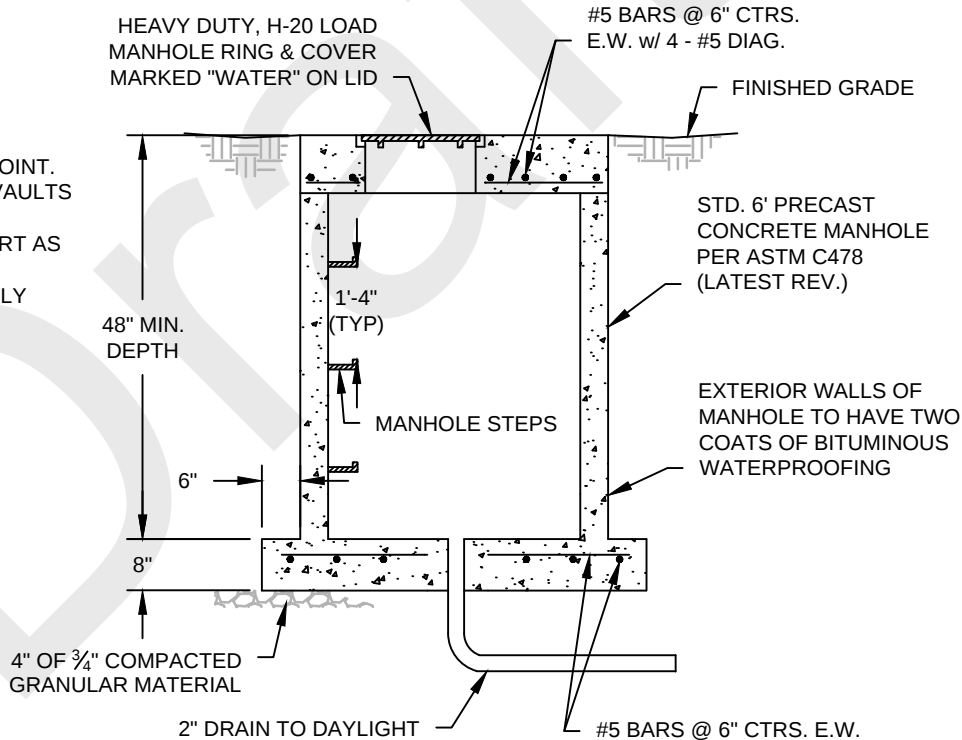
WATER SYSTEM

Drawing No:
II-7



NOTES:

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



BACKFLOW PREVENTER ELEVATION

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By:
SH

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JB

**CITY OF OSAGE BEACH
TYPICAL DETAIL
1- $\frac{1}{2}$ " TO 2" METER WITH
BACK FLOW PREVENTER**

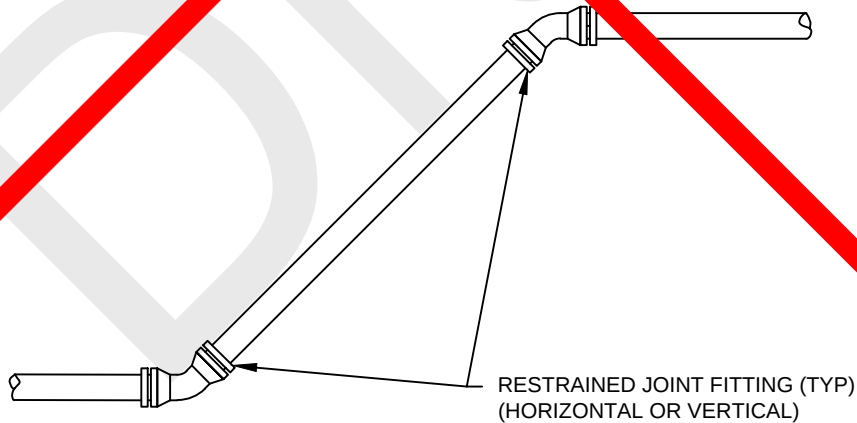
Design Guideline:
SECTION 2

WATER SYSTEM

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 MATERIAL



RESTRAINED JOINT PIPE

Date Revised:
 OCTOBER 2004

By:
 SH

Checked By:
 JB

**CITY OF OSAGE BEACH
 TYPICAL DETAIL
 RESTRAINED JOINT PIPE**

Design Guideline:
 SECTION 2

WATER SYSTEM

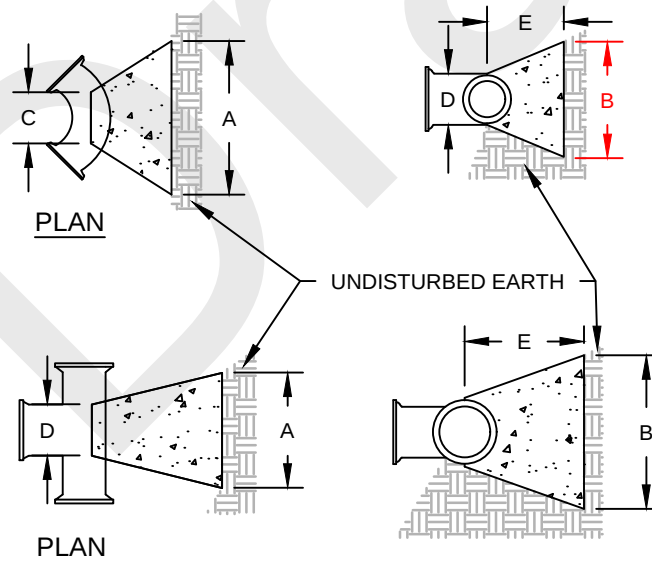
Drawing No:
 II-9

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°	18	9	8	8	12
	90°	21	12	8	8	12
	TEE/PLUG	15	12	8	8	12
6"	11.25° & 22.5°	12	12	8	10	12
	45°	27	12	8	10	12
	90°	33	18	8	10	12
	TEE/PLUG	24	18	8	10	12
8"	11.25° & 22.5°	18	15	8	10	12
	45°	33	15	8	10	18
	90°	42	24	8	10	18
	TEE/PLUG	30	24	12	10	18
10" & 12"	11.25° & 22.5°	27	24	12	12	18
	45°	51	24	12	12	24
	90°	63	36	12	12	30
	TEE/PLUG	45	36	12	12	24
14" & 16"	11.25° & 22.5°	33	33	12	16	18
	45°	69	33	12	16	30
	90°	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.



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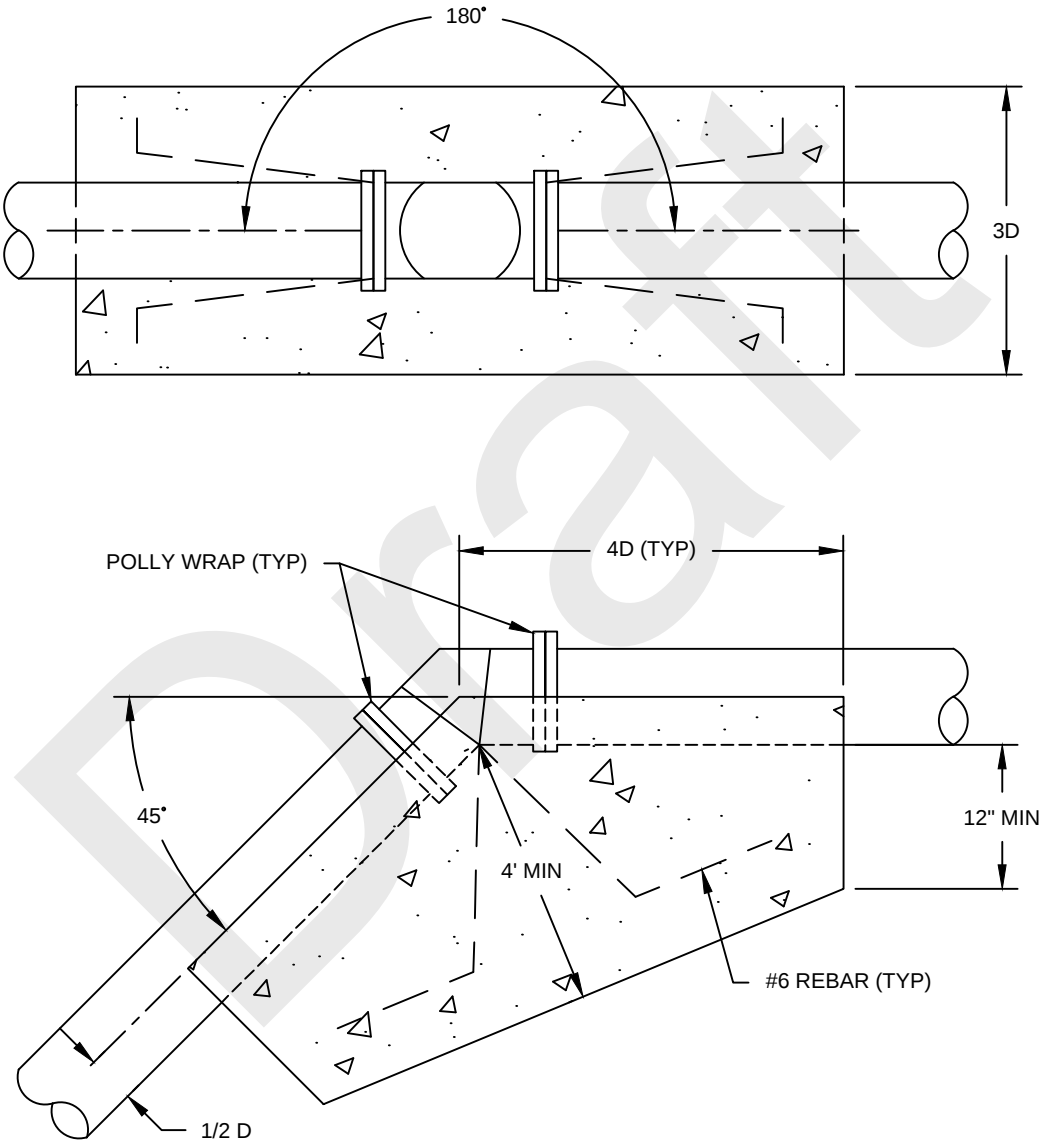
CITY OF OSAGE BEACH TYPICAL DETAIL THRUST BLOCK DETAIL

Design Guideline:
SECTION 2

WATER SYSTEM

Drawing No:
II-10

NOTE:
M.J. FITTING WITH RETAINER GLANDS
REQUIRED FOR ALL VERTICAL BENDS



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By:
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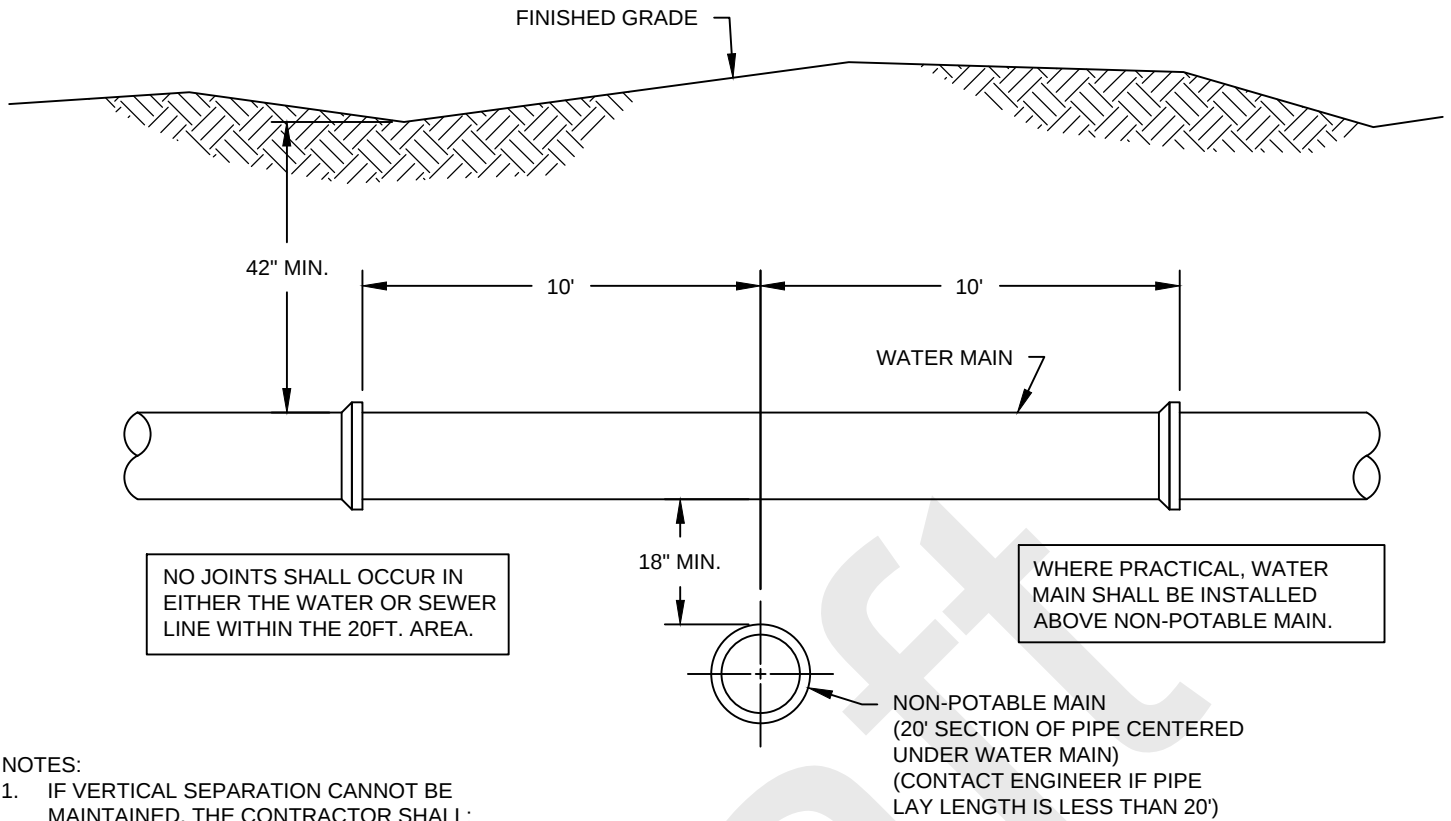
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CITY OF OSAGE BEACH
TYPICAL DETAIL
VERTICAL BEND THRUST BLOCK

Design Guideline:
SECTION 2

WATER SYSTEM

Drawing No:
II-11



NOTES:

1. IF VERTICAL SEPARATION CANNOT BE MAINTAINED, THE CONTRACTOR SHALL:

1.1. PROVIDE ENCASEMENT TO A POINT OF TEN FEET ON EITHER SIDE OF THE SEWER/WATER LINE CROSSING AS APPROPRIATE. CASING PIPE MUST BE A MATERIAL THAT IS APPROVED FOR USE AS WATER MAIN.

OR

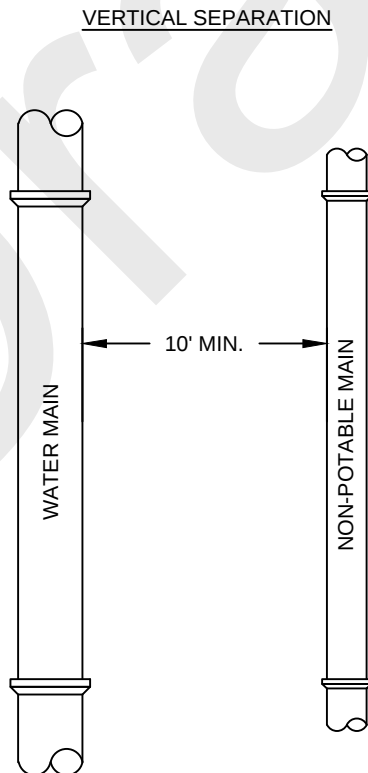
1.2. CONSTRUCT ONE OF THE WATER OR SEWER MAIN WITH MECHANICAL OR MANUFACTURED RESTRAINED JOINT PIPE OR FUSION WELDED PIPE.

2. IF HORIZONTAL SEPARATION CANNOT BE MAINTAINED, THE CONTRACTOR SHALL:

2.1. CONSTRUCT ONE OF THE WATER OR SEWER MAIN WITH MECHANICAL OR MANUFACTURED RESTRAINED JOINT PIPE OR FUSION WELDED PIPE.

OR

2.2. PROVIDE A CONTINUOUS CASING. CASING PIPE MUST BE A MATERIAL THAT IS APPROVED FOR USE AS A WATER MAIN



HORIZONTAL SEPARATION

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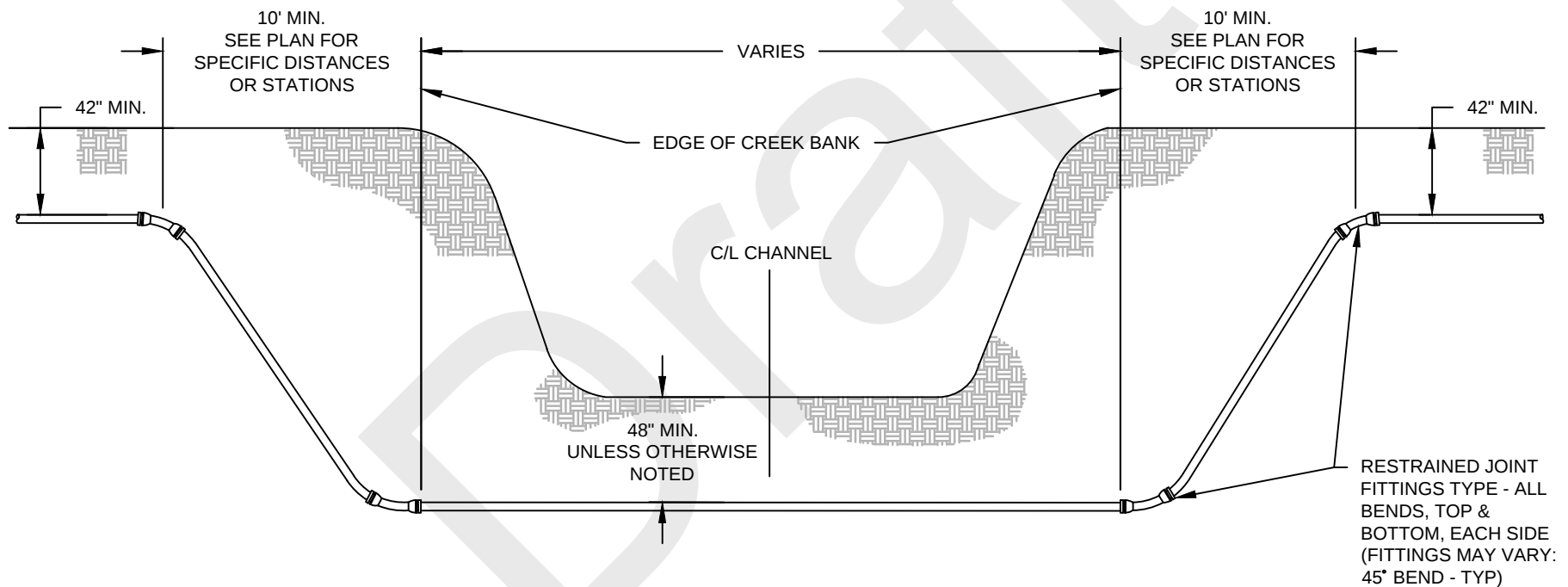
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**CITY OF OSAGE BEACH
TYPICAL DETAIL
WATER / NON-POTABLE MAIN CROSSING**

Design Guideline:
SECTION 2

WATER SYSTEM

Drawing No:
II-12



Date Revised:
OCTOBER 2004

By: SH

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CITY OF OSAGE BEACH TYPICAL DETAIL CREEK CROSSING

May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes

Page 32 of 102

Design Guideline:
SECTION 2

WATER SYSTEM

Drawing No:
II-13

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

SECTION III – SEWER SYSTEM

OVERVIEW

The City of Osage Beach operates a sewage collection and treatment system in accordance with the Missouri Department of Natural Resources (MDNR) regulations. The system is comprised of pressure and gravity sewer lines, grinder stations, lift stations, and a jointly owned regional sewage treatment facility. The plant is managed by the Lake Ozark / Osage Beach Joint Sewer Board. The collection system within Osage Beach, and from the city to the plant, is owned and operated by the City of Osage Beach. At the current time, there are a few isolated areas within the city that are not served by the collection system. It is the policy of the city that all occupied facilities within the city will have city sewer service.

At the present time, there are over 1125 grinder stations and 56 sewage lift stations. These stations have been standardized to use ABS/Sulzer pumps and appurtenances. ~~Grinder station packages, including simplex and duplex stations, can be purchased from the City of Osage Beach. Packages include the standard depth basin (6 feet), electrical panel, pumps, base elbow, guiderail, lifting chain, floats and bracket. Contact Public Works at (573) 302-2020 for additional information or questions. Packages may be purchased from a supplier so long as they conform to the City's standards described by this section. The Public Works Operations Manager reserves the rights to redirect anyone to a supplier for the purchase of multiple packages at one time. This practice shall continue until determined by the city to be infeasible or otherwise unsatisfactory.~~

All modifications to the sewage treatment plant or the sewage collection system shall conform to the MDNR regulations and polices as supplemented herein.

REFERENCED CITY ORDINANCES

Chapter 400.110	Subdivision Regulations
Chapter 410.130	Contents (Location and design of water mains and appurtenances)
Chapter 410.190	Design Basic Standards
Chapter 410.260	Location of Utilities in Right-of-Ways
Chapter 410.330	Sanitary Sewers
Chapter 710	Sewers and Sewerage Systems

SEWERAGE DESIGN

Wastewater Treatment Facility

Modifications to the existing treatment facility must be made under the direction of the Lake Ozark/Osage Beach Joint Sewer Board. Such modifications must be designed in accordance with and approved by MDNR. If the City needs to have changes made in the plant, they must forward the request to the Lake Ozark/Osage Beach Joint Sewer Board.

Sewage Collection System

Modifications of and additions to the existing sewage collection system shall be made in accordance with MDNR regulations as supplemented herein.

Hydraulic Design

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

AVERAGE DAILY FLOWS

<u>Type of Establishment</u>	<u>Pounds BOD per Person</u>	<u>Gallons/Day per Person</u>
<i>Residential</i>		
Single Family	0.17	100
Apartments	0.17	100
Condos	0.17	100
<i>Commercial Food & Drink</i>		
Tavern	0.01	2
Fast Food	0.02	5
Restaurant w/ garbage grinder	0.04	5
Carwash (10.3 gpd/sf) (31.5 gpm Peak Hour/ Bay)	See Data To Left	
<i>Institutions</i>		
Day School w/ gym & showers	0.03	20
Day School w/ cafeteria (Add)	0.02	4
Day School w/ garbage grinding (Add)	0.02	1
Hospital (per bed)	0.22	200
Nursing Home	0.17	125
Park Restroom	0.02	5
Park Restroom w/ showers	0.06	25
Swimming Pool	0.06	25
Country Club (per resident)	0.17	100
Country Club (per member)	0.06	25
Service Station	0.01	5
Laundromat (per machine)	1.25	580
Hotels	0.15	50
Motel w/o Restaurant	0.1	40
Luxury Resort	0.17	75
Camp Trailer	0.08	30
Church (per seat)	0.01	5
Store/Shopping Center/Mall (per 1000 sf of floor area)	0.34	200
Stadium/Auditorium/Theater/Drive-In (per seat)	0.01	5
*Includes infiltration		

Hydraulic Design shall be based upon the following criterion:

EQUIVALENT POPULATION

<u>Facility</u>	<u>Persons/Unit</u>
------------------------	----------------------------

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

Single Family Residence	3.7
Apartment/Condo—One Bedroom	2
Apartment/Condo—Two Bedroom	3
Apartment/Condo—Three Bedroom	3.7
Mobile Home	3
Camper Trailer	3
Motels (per room)	3

Wastewater design shall be in accordance with MDNR's Wastewater Guidelines and Standards Document (PUB2754). For hydraulic capacity, refer to Table 1-1. Minimum Design Loadings in MoDNR's PUB2754. The designer shall provide data used for calculating the system flow data. For population per dwelling, refer to Table 1-2. Minimum Population Equivalent in the above referenced document.

Property Owners shall be responsible for improvements to existing stations due to increased flow volumes. If the City deems a property owner has changed the conditions of an existing station, a notice will be provided by the City's Compliance Officer. Common changes causing station upgrades includes, but are not limited to, overnight rentals, building expansion, excessive water use, change in dwelling type, etc.

PEAK HOURLY FLOW = 4 X AVERAGE DAILY FLOW

Gravity Sewers

Gravity Sewers design shall conform to the applicable MDNR regulations and as specified herein. The peak hourly flow shall be determined, and the gravity line sized accordingly with the following additions:

1. Gravity sewer laterals from a residence to grinder station or main:
 - a. Shall be not less than 4-inch pipe.
 - b. Shall have a cleanout located within 5 feet of the residence and at all vertical and horizontal bends; a sanitary tee within 5 feet of the grinder station or main; and a backflow valve adjacent the grinder station.
 - ~~c. Shall not exceed 150 feet in length. Residence service lines over 150 feet in length shall be treated as sewer mains.~~
 - d. Shall be SCH 40 with SCH 40 fittings or ASTM D3034 DR 26 PVC with sanitary sewer DR 26 PVC ~~or ductile iron~~ fittings.
 - e. All bends shall be long radius bends. Short radius 90° bends are specifically prohibited.
2. Gravity Sewer mains:
 - a. Sewer mains shall be designed for the peak hourly flow and shall be not less than 8-inch pipe.
 - b. Gravity sewer pipe shall be:
 - ~~i. Ductile iron, ASTM A746, Class 350 with cement lining. Ductile iron Push-on type joints and fittings shall be used, or~~
 - ~~ii. ASTM 2241, DR 21, Class 150 with approved fittings.~~
 - iii. ~~PVC~~, ASTM D3034, SDR 26, with SDR 26 PVC sanitary fittings. For depths greater than 8 feet
 - iv. ASTM D3034, SDR 35, with SDR 35 fittings where maximum depth of cover is eight (8) feet or less.
 - ~~v. SCH 40 PVC with SCH 40 fittings~~

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

- c. Manholes shall be constructed at the end of main and at changes in horizontal or vertical alignment, or not more than every 350 feet.
 - ~~d. When a residence service line will exceed 150 feet, a manhole shall be constructed with a 4-inch service line to the residence and a minimum eight-inch main to remainder of the system.~~
 - f. All bends shall be long radius bends. Short radius 90° bends are specifically prohibited.
3. **Residential lateral** connections to sewer mains shall be made using a sanitary wye tapping fitting.
4. Connections to grinder pump basins:
- a. Shall be made using a cast iron inlet hub of appropriate diameter and shall be bolted to the grinder basin and sealed with an approved silicone seal. A PVC backflow valve (check valve) shall be installed within 2 feet of the basin.
 - b. Inlet pipes shall be installed **18-inches to 30-inches below the grinder station lid. a minimum of 4 feet above the bottom of the grinder basin and not less than 18 inches below the top of the basin.**
5. Bedding:
- a. Shall be installed around the pipe from **3 6 inches below to 12 inches above the pipe. Bedding shall be nominal ½ inch minus crushed rock conforming to MoDOT Type 5 aggregate, Section 1007. 1004, Grade D, Chat, or pea gravel, or Osage River Sand. Any material used shall have a PI of 6 or less. Trench backfill shall not contain any material with a nominal particle size greater than six (6) inches.**
6. Detectable Marking Tape and Toning Wire:
- a. Metallic detectable marking tape, Type III, shall be placed in the trench above all sewers, gravity, and pressure, one foot above the pipe.
 - ~~b. Locator wire shall be standard tracer wire, a single No. 12 U.L. approved copper wire of the solid type with insulation for 600 volts. Wire for this service shall be green in color and provided in standard rolls of not less than five hundred (500) foot lengths. Locator wire shall be placed on top of the water main and secured with tape at 8-foot intervals. Locator wire shall extend to all terminus, such as manholes, valves, pump stations, and valve vaults. No. 12 solid copper Toning wire shall be located three inches above taped to the top of the sewer line and shall be continuous from terminus to terminus and shall include all city-owned sewers.~~
 - i. ~~Splices shall only be allowed where accessible. Buried splices will not be allowed. If valve box locations are spaced more than 500 feet apart, contractor shall install a vertical piece of 6-inch diameter PVC adjacent to the water main topped with a cast iron bonnet and cover marked "water". The wire shall be run outside up alongside the valve box, then through a hole in the valve box just below ground level. The splice connector shall be left exposed at the top of the valve box. Wire contact points shall be provided at no more than 500-foot intervals.~~
 - ii. ~~Prior to final acceptance by the City, the contractor shall demonstrate that the locator wire works to the satisfaction of the City Inspector or Public Works Operations Manager or designee.~~
7. Minimum grades for gravity sewers:
- a. 4-inch sewer shall be not less than 1.00%
 - b. 6-inch sewer shall be not less than 0.67%
 - c. 8-inch sewer shall be not less than 0.50%
 - d. 10-inch sewer shall be not less than 0.33%
 - e. Larger shall be as approved by the ~~City Engineer~~ **Public Works Operations Manager**

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

8. Minimum depth of cover for gravity sewers:
 - a. Shall be not less than ~~18 inches~~ 24 inches above the top of pipe.
9. Maximum depth of cover shall be 8 feet unless specifically authorized in writing by the ~~City Engineer~~ Public Works Operations Manager.
10. Manholes shall be as detailed (~~Drawing III-4/ III-5~~) in the Osage Beach Design Guidelines or as approved by the ~~City Engineer~~ Public Works Operations Manager.

Sewer manhole casting and cover specification:

- a. All Osage Beach sanitary castings/ frames shall be Neenah Cat R-1642 or approved equal.
 - b. Cover marked "Sanitary Sewer".
 - c. Concealed pick holes (2) per NF 1015
 - d. Mechanical Groove in lid for oil resistant T-gasket.
 - e. Bolts are not required unless called out in special conditions
11. Valve Boxes shall be a vertical piece of 6-inch diameter PVC pipe ~~Buffalo type~~ with cast iron bonnet and cover ~~lid~~ marked "sewer".
 12. Leak testing for gravity sewers may be tested by air or water method.
 - f. **Water Tests**
 - i. Gravity sewer lines shall be plugged at the bottom end and filled with water to the top of the next upstream manhole, left for 24 hours.
 - ii. If no manhole, to the top of the farthest upstream cleanout left for 24 hours.
 - iii. The line shall then be refilled with a measured amount of water.
 - iv. The allowable leakage shall be 1 gallon per 100 feet of line tested.
 - g. **Air Tests**
 - i. Test lines between manholes with low-pressure air.
 - ii. Safety requires a regulator or relief valve on pressurizing equipment, set at 8 psig
 - iii. No one will be allowed in manholes while there is air pressure against test plugs.
 - iv. Plug all pipe outlets to resist test pressure. Give special attention to laterals.
 - v. Plug all other pipes in both upstream and downstream manholes and fill manholes with clear water to just above the line plugged for testing. Any bubbles appearing during the test indicate leakage past a plug or in part of the test equipment.
 - vi. Compute the test pressure by multiplying 0.43 x the elevation difference (in feet) of the upstream manhole rim and the invert of the line under test at the downstream manhole. The result is in psig and may be rounded to the nearest half psig. The test pressure shall be not less than 3.5 psig, nor more than 6.0 psig. Total line length included in any test section shall not exceed 400 feet.
 - vii. Supply air into the line until test pressure is attained. Allow at least 5 minutes for air temperature in the test section to stabilize.
 - viii. Reestablish the test pressure and start a stopwatch. Determine the time required for pressure to drop 0.5 psig.
 - ix. If the pressure does not drop during the stabilization period and no additional air has been added, the section undergoing test will have passed without further testing.
 - x. The pipe section will also have passed if the time observed for the pressure to drop 0.5 psig is greater than that determined by using the following table:

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

<u>Pipe Size, Inches</u>	<u>Time</u>
4	4 minutes 2 seconds
6	6 minutes 0 seconds
8	7 minutes 37 seconds
10	9 minutes 8 seconds
12	10 minutes 58 seconds
14	12 minutes 30 seconds
16	14 minutes 32 seconds

*** When a combination of more than one pipe size is under test,
the calculated time for the larger pipe shall apply.**

- h. **Manholes** may be tested by vacuum or water method.
 - i. Water Method - shall be tested by plugging inlet and outlet pipes and filling with water to the top of the manhole cover ring and letting set for 24 hours. The maximum leakage shall be a drop in water level of 3 inches.

Pressure Sewers

Pressure Sewers design shall conform to MDNR requirements and as supplemented herein. The design of additions to the City sewer system shall minimize the need for pressure sewer to the maximum extent practicable to reduce the number of lift or grinder stations to the minimum required. Pressure sewers shall conform to the following criterion:

1. Pressure sewers shall be designed for flow rates between 2.0 fps and a maximum of 5.0 fps. The minimum diameter of pipe used shall be 1-1/4 inches.
2. Pressure pipe:
 - a. Less than 4 inches in diameter shall be schedule 80 PVC or ASTM 2241, DR 21, Class 150, or HDPE AWWA C906, ~~DR 9 copper tube size, SDR 21 class 200, or DR9 CTS.~~
 - b. 4 inches and larger shall be: ~~AWWA C151 Class 350 ductile iron, or~~ AWWA C900 DR 18 Class ~~150 235~~ PVC.
3. Joints:
 - a. For SCH 80 pipe shall be solvent welded.
 - b. For other pipe shall be neoprene lined push-on type joints or as approved by the ~~City Engineer~~ **Public Works Operations Manager.**
4. Fittings:
 - a. For Schedule 80 pipe shall be Schedule 80 fittings.
 - b. For other pipe may be appropriately rated and compatible PVC or ductile iron on PVC ~~and shall be ductile iron on ductile iron sewers.~~ All fittings shall be neoprene gasket push-on type or as approved by the ~~City Engineer~~ **Public Works Operations Manager.**
 - c. Long radius bends or multiple fittings shall be used. Short radius 90° bends are specifically prohibited.
5. **The minimum cover for all pressure sewer is 36 inches.**

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

6. The maximum depth of cover for pressure sewers is 4 feet unless specifically authorized in writing by the ~~City Engineer~~ Public Works Operations Manager. Deeper main installation will be allowed to achieve minimum separation when crossing other utilities. Cover for crossing utilities shall not be greater than 8 feet.
7. Bedding shall be installed around the pipe from ~~3~~ 6 inches below to 12 inches above the pipe. Bedding shall be nominal ½ inch minus crushed rock conforming to MoDOT ~~Type 5 aggregate. Section 1004, Grade D, Chat, or pea gravel, or Osage River Sand. Any material used shall have a PI of 6 or less.~~ Trench shall not contain any material with a nominal particle size greater than six (6) inches.
8. Detectable marking tape and Toning Wire:
 - a. A metallic detectable marking tape, Type III, marked “Sewer Below” shall be placed in the trench 1 foot above all pressure sewers pipe.
 - ~~b. Locator wire shall be standard tracer wire, a single No. 12 U.L. approved copper wire of the solid type with insulation for 600 volts. Wire for this service shall be green in color and provided in standard rolls of not less than five hundred (500) foot lengths. Locator wire shall be placed on top of the water main and secured with tape at 8-foot intervals. Locator wire shall extend to al terminus, such as manholes, valves, pump stations, and valve vaults. No. 12 solid copper Toning wire shall be located three inches above taped to the top of the sewer line and shall be continuous from terminus to terminus and shall include all city owned sewers.~~
 - i. Splices shall only be allowed where accessible. Buried splices will not be allowed. If valve box locations are spaced more than 500 feet apart, contractor shall install a vertical piece of 6-inch diameter PVC adjacent to the water main topped with a cast iron bonnet and cover marked “water”. The wire shall be run outside up alongside the valve box, then through a hole in the valve box just below ground level. The splice connector shall be left exposed at the top of the valve box. Wire contact points shall be provided at no more then 500-foot intervals.
 - ii. Prior to final acceptance by the City, the contractor shall demonstrate that the locator wire works to the satisfaction of the City Inspector or Public Works Operations Manager or designee.
- ~~9. The check valve shall be brass body, single flap type.~~
10. The inlet connection hub shall be cast iron inlet hub bolted to the basin. The back of the hub shall be sealed to the basin using approved silicone sealant. Appropriate inlet hubs are stocked by the ABS supplier.
11. An isolation valve shall be installed at the connection to the sewer main.
 - a. The valve shall be brass body, globe valve of the same nominal size as the pressure sewer.
 - b. Shall be installed at the connection to the sewer force main.
 - c. When possible, the valve should be located outside roadway or other similar traffic areas.
 - d. Globe valve shall have integral checks for open and closed positions.
 - e. Valve shall be placed upon a concrete, or approved, masonry pedestal to prevent settlement.
 - f. Shall be covered with a PVC piece of pipe and cast iron bonnet market “sewer” extended to 3 to 6 inch above finished surface.
 - g. If the finished surface is concrete or asphalt pavement, the valve box cover shall be flush with the paved surface.
 - h. Valve box covers on pressure sewers shall be marked “SEWER” and the markings shall be cast into the cover.

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

12. The tapping saddle:

- a. Shall be Brass similar and equal to Ford.
- b. Shall be sealed to the pipe by means of a rubber "O" ring seal to provide a connection suitable for a working pressure of 200 psi.
- c. Shall have flanged or threaded outlets conforming to ANSI B16.1.
- d. If possible, all tapping saddles shall be in the horizontal position.
- e. The Owner shall provide all equipment necessary to complete the tap, including saddle, corporation stop, valve and pipe.
- f. All wet taps 2-inch and smaller are to be performed by City Staff or a City approved contractor and witnessed by the City. Taps larger than 2-inch shall be performed by an approved contractor and witnessed by the City.
- g. Under no circumstances shall anyone make a wet tap without approval and authorization by the City Public Works ~~Director~~ Operations Manager or designee.

13. Leakage testing procedure is as follows:

- a. Upon completion of the ~~water~~ force 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. Pressurized to 75 psi above normal working pressure at the test location and hold for a period of not less than 2 hours.
- d. At end of testing period, the line shall be refilled with water and the amount of water to refill the line shall be measured and recorded.
- e. Amount of water to refill the line must be less than the maximum allowable leakage.
- f. 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

DESIGN OF GRINDER PUMPS AND SEWAGE LIFT STATIONS

The design of grinder pump installation shall be certified by a Registered Professional Engineer and shall conform to the City and MDNR requirements. To reduce maintenance and operational cost, the City has selected ABS/Sulzer pumps and equipment as their standard. Accordingly, all grinder pumps and lift stations shall be designed using ABS/Sulzer equipment ~~unless specifically authorized by the City Engineer~~. The size, type, and capacity of the grinder pump, or lift station, shall be based upon the hydraulic loading and gradient necessary to pump sewage from the source to an appropriate location.

To all practical extents, development shall utilize an existing lift station or a new lift station to serve the property or properties. Multiple new grinder stations for a single development are subject to review and approval by the Public Works Operations Manager. See Typical Detail III-12 for Lift Station Requirements.

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

Hydraulic Design Considerations

1. Using the previously presented charts determine the following:
 - a. Average daily flow (ADF)
 - b. Peak hourly flow (PHF)
2. Calculate the following and provide calculations in the design submittal:
 - a. Total static head - from the proposed pump inlet to point of discharge. The point of discharge will be to the next lift station wet well on the sewer pressure main.
 - ~~b.~~ Total dynamic head - this must include total static head plus line friction losses for pipe, fittings, and connections from the proposed pump to the point of discharge. This also must include friction losses for flow in the main assuming that a portion of the downstream pumps are running. The **Public Works Operations Manager or a designee will assist with providing main pressure at a nearby lift station or connection point. City Engineer will be able to assist in this determination.**
 - c. Pumping rate based upon wet well size and a maximum cycle time at peak hourly flow of 6 times per hour.
 - d. Wet Well Capacity based upon a minimum storage above high pump off elevation of 2 hours of peak hourly flow or 45 minutes with SCADA installed. Wet well capacity shall be determined as follows:

$$VM = (QPHF \times 120) + VHPO$$

Where:

VM = Volume in wet well below inlet pipe
QPHF = Peak hourly flow in gpm
VHPO = Volume in wet well below emergency pump on

3. The wet well design shall also conform to the following:
 - a. Minimum diameter for simplex wet wells is 36 inches.
 - b. Minimum diameter for duplex wet wells is 48 inches.
 - c. Minimum depth **of the inlet pipe shall be 18 inches to 30 inches as measured from the station lid. from bottom invert of the inlet to bottom of the wet well is 48 inches.**
 - d. Maximum total depth of the wet well from lid to bottom is 12 feet.
4. Select the pump model and horsepower from the ABS pump curves.
5. Select the pressure line type and size as discussed under “pressure sewers” herein.

Additional Limitations or Specifications for Grinder Pumps

1. No more than 2 residences may be served by a simplex grinder station.
- ~~2.~~ No more than **15 10** single-family residences, or their equivalent, may be served by a single duplex grinder station. **This is subject to the review of the City Engineer. Multiple dwellings being served by a single simplex or duplex station is subject to review and approval by the Public Works Operations Manager.**

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

3. All commercial facilities shall have a duplex grinder pump station. ~~In instances where a commercial facility has an average daily flow of less than 16 gpm, and no further development or additional capacity is contemplated, a simplex pump and controls may be installed in a duplex basin.~~
4. Triplex package units or custom-built lift stations are subject to the review and approval of the City ~~Public Works Operations Manager~~ **Engineer**.
5. Each Grinder Pump Station shall include an ABS pump(s) fiberglass basin including internal piping, pump base and guide rail; and ABS Pump Control Panel as described in the specifications:
 - a. The basin will be an ABS basin, or the equivalent thereof, and either simplex or duplex as required.
 - b. All internal piping and pump guide rails shall be ~~galvanized~~ **stainless steel**.
 - c. Concrete anti-floatation ring shall be cast around the basin base.
 - d. Basin cover (lid) shall be of steel with minimum thickness of ¼ inch and coated with a high temperature baked epoxy or air-dried epoxy paint, green in color. **No fiberglass lids will be allowed for grinder stations.**
 - e. Lid shall be fully bolted and/or hinged secured.
6. All grinder stations of 6.2 HP or less shall have internal discharge piping of 1-1/4 inch stainless steel pipe.
7. All grinder stations of more than 6.2 HP shall have stainless steel discharge piping of minimum 2 inch; ~~or as approved by the City Engineer.~~
- ~~8. All grinder stations shall have a brass bodied globe valve installed in each discharge line within the grinder station at a location approved by the City Engineer.~~
9. Minimum distance from top of grinder basin cover to top of inlet pipe shall be ~~18~~ **24** inches.
10. Minimum distance from top of grinder basin to bottom of discharge pipe(s) shall be 48 inches.
11. Maximum depth of the grinder station basin shall be 12 feet.
- 12. A finished grade around the station shall be established to be 2-inches below the lid and a 5-foot flat working area surrounding the station.**
- 13. Access shall be provided to any grinder station for City access. The access is subject to review and approval by the Public Works Operations Manager and/or his/her designee.**

Electrical Service for Sewage Lift Stations and Grinder Stations

1. AmerenUE is the provider for electrical service. The owner, developer, or contractor shall make arrangements with AmerenUE for electrical service to the grinder station.
2. Electrical energy shall be provided on a direct individually metered service of the appropriate capacity for the facility to be served.
3. The use of "Add-a-Phase" or other artificial phasing devices is prohibited.

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

4. When three phase service is required the owner or developer shall make all necessary arrangements with AmerenUE to provide the required service.

Grinder Station Electrical Panel

1. ABS/~~Electric Control Company~~ panel supplier shall provide the standard panel developed for the City, of the correct model to match the pump(s).
2. Control panel shall be fully and completely compatible and parts interchangeable with existing ~~City owned~~ units or as directed by the ~~City Engineer~~ Public Works Operations Manager.
3. Shall be mounted on galvanized steel rack at a height of ~~four feet as measured from the top of station lid to the bottom of the station panel and four feet as measured horizontally away from the edge of the station. approximately 5 feet above finished grade.~~
4. Each control panel shall have a wiring diagram, or schematic, attached to the inside of the outer door of the control panel box.
5. All exterior wiring shall be run in rigid metal conduit ~~from the panel to the station and for at least 10 feet away from the panel in any direction. All ridged metal conduit installed below grade shall have be wrapped or coated with a waterproofing sealer. No junction box will be allowed between the control panel and the station.~~
6. Each station shall have a City owned quick throw disconnect with the appropriate rating for the station's electrical requirements.
7. All work should be done in accordance with the National Electric Code and all material should be UL approved.
8. Control rack:
 - a. Shall be ~~a minimum of~~ 24-inch frame width.
 - b. Frame shall be 2-inch square steel tubing (#9 gauge minimum).
9. All components shall be hot dip galvanized.
10. Field cuts must be saw cut and saw cuts shall be painted with Rust-Oleum or Galva-Well.
11. Below grade metal components shall be painted with a minimum of two coats of Koppers Super Service (blk) Tenemec #450 Heavy Tenemecol coating/sealer or approved equal.
12. Legs shall be set in concrete and concrete shall be a minimum of 18 inches deep and 12 inches in diameter.
13. Electrical service wires, pump service wires, and float control wires, shall be run in minimum 2-inch galvanized rigid steel conduit. ~~Minimum of two (2) conduits shall be run to the station, one (1) conduit for pump wires and one (1) conduit for communication controls.~~

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

14. All bends and fittings shall be long radius bends. ~~A maximum of one (1) sweep will be allowed between the panel vertical bend and the grinder station perforations.~~
15. An explosion proof wye fitting shall be installed 6 inches below the control panel.
16. No splice boxes will be permitted within the grinder pump basin.
17. Riser for ground wire shall be in ½ inch rigid, galvanized steel, conduit with grounded bushings, with stubbed and bonding jumper.
18. Grounding Rod:
 - a. Shall be copper clad grounding rod.
 - b. ½ inch by 8 feet in length.
 - c. Rod shall be driven vertically into the ground or as directed by the ~~City Engineer~~ **Public Works Operations Manager or designee.**
19. Electric meter, meter base, disconnect, and panel shall comply with AmerenUE Service Manual, **latest edition. Section 5.3.1 (bypass requirements).**
20. ~~SCADA shall be provided by Systems Manufacturing, 14042 W 107th St. Lenexa, KS, 66215; phone (913) 485-3307. Where SCADA is required the controls must be approved by the Public Works Operations Manager prior to installation.~~

REQUIRED INSPECTIONS, TESTING, AND START UP PROCEDURES

1. Construction Drawings are required for all gravity and pressure sewers and all grinder or sewage lift stations. Such drawings shall be designed and sealed by a Registered Professional Engineer in the State of Missouri. ~~Construction of one- and two-family dwellings and their accessory structures are excluded from this requirement, unless the design requires an extension to the City's system.~~
2. ~~All~~ **The design and materials and equipment** shall conform to ~~these~~ **the City of Osage Design Guidelines. Such drawings shall be reviewed and approved by the Public Works Operations Manager or designee prior to any onsite construction.**
3. All gravity and pressure sewers shall be inspected by ~~the City Inspector Public Works Department Personnel~~ prior to backfill.
4. All gravity and pressure sewers, manholes, and wet wells shall be tested for leakage as specified herein and shall be performed in the presence of City personnel.
5. Grinder and sewage lift stations shall be fully tested for performance and operation in the presence of City personnel. Such testing shall include:
 - a. Pumping rates
 - b. Pumping cycle tests including emergency alarm and startup of standby equipment (if so equipped)
 - c. Electrical current and voltage checks.
 - d. The contractor/developer shall provide the services of a manufacturer's factory representative to be present during the tests.

Design Guidelines
City of Osage Beach
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6. Upon completion of all testing startup procedures the City will issue a certificate of acceptance. The system will not be connected to City Service or accepted by the City until the acceptance certificate is issued. ~~If the system cannot be accepted, no building occupancy permit will be issued.~~

AS CONSTRUCTED DRAWINGS AND MAINTENANCE DOCUMENTS

The contractor/developer shall provide the City with not less than two full sized "As Constructed" drawings certified as being correct record drawings by a Registered Professional Engineer in the State of Missouri.

The contractor/developer shall provide one copy of a certified and recorded utility easement for all sewer lines and grinder station sites to be turned over to the City. Easements shall be prepared and sealed by a Registered Land Surveyor in the State of Missouri.

TYPICAL DETAILS FOR SEWER APPURTENANCES

Sewer appurtenances shall conform to the typical details attached hereto.

PUBLIC INFORMATION PACKET – SEWER DESIGN

Applicants for a building or zoning permit will be provided with a “Sewer Information Packet” which reflects the requirements contained in this design manual and pertinent City ordinances. Such packet shall be considered as an approved part of the Design Guidelines.

SEPTIC TANK SYSTEMS

City Code Section 710-~~090~~ requires that any facility constructed within 300 feet of an existing City sewer must connect to such sewer. There are a few locations within the City where City sewer is not available. In those cases, the owner may be authorized by the City to construct or repair a septic system.

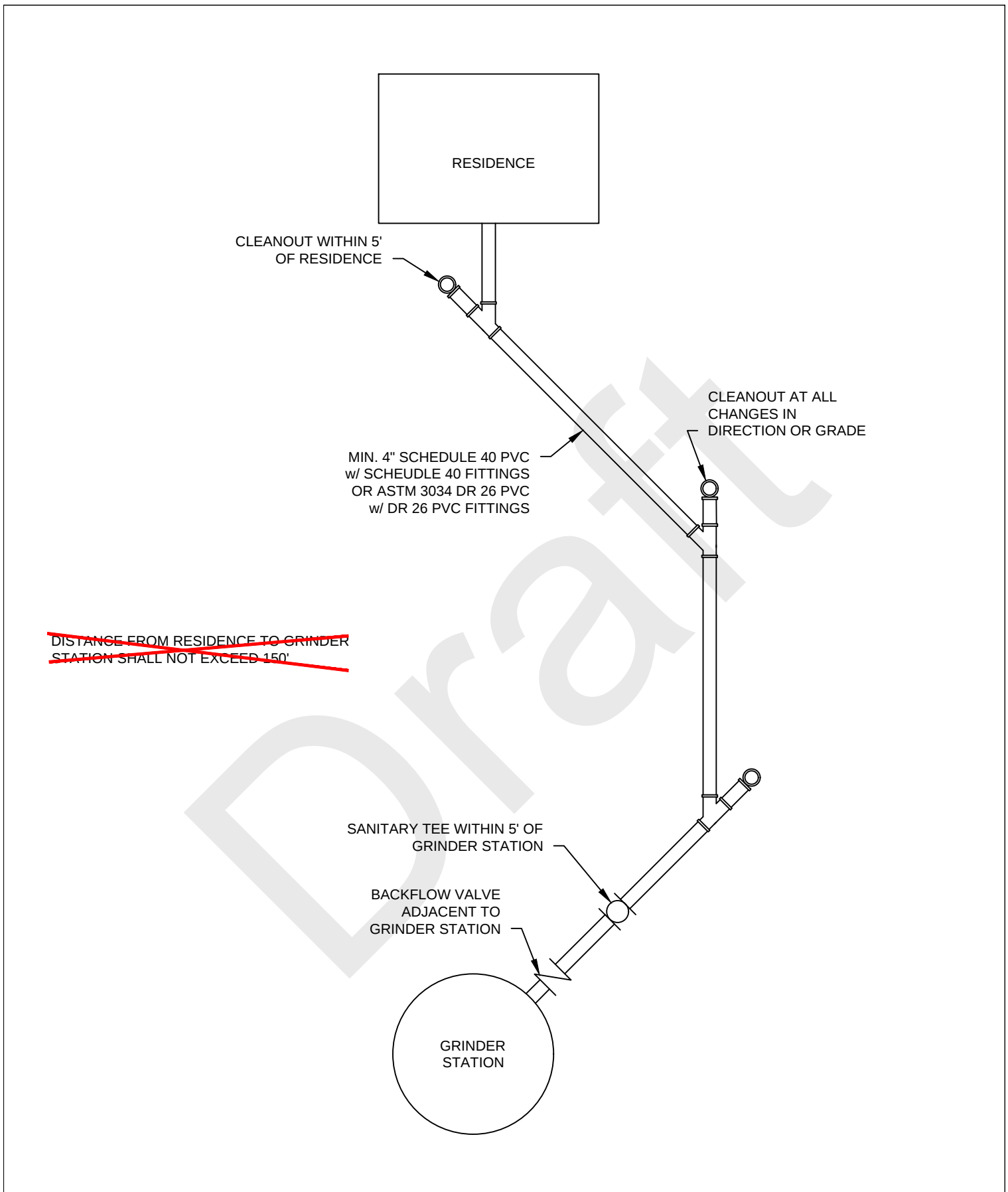
REQUIREMENTS FOR AUTHORIZED PRIVATE SEWAGE DISPOSAL SYSTEMS

A Septic Tank Permit from the City is required prior to construction. Approved soil morphology, permeability tests and soil percolation tests, site topography, septic tank, and absorption system, designed by a Registered Professional Engineer in the State of Missouri are required for the permit.

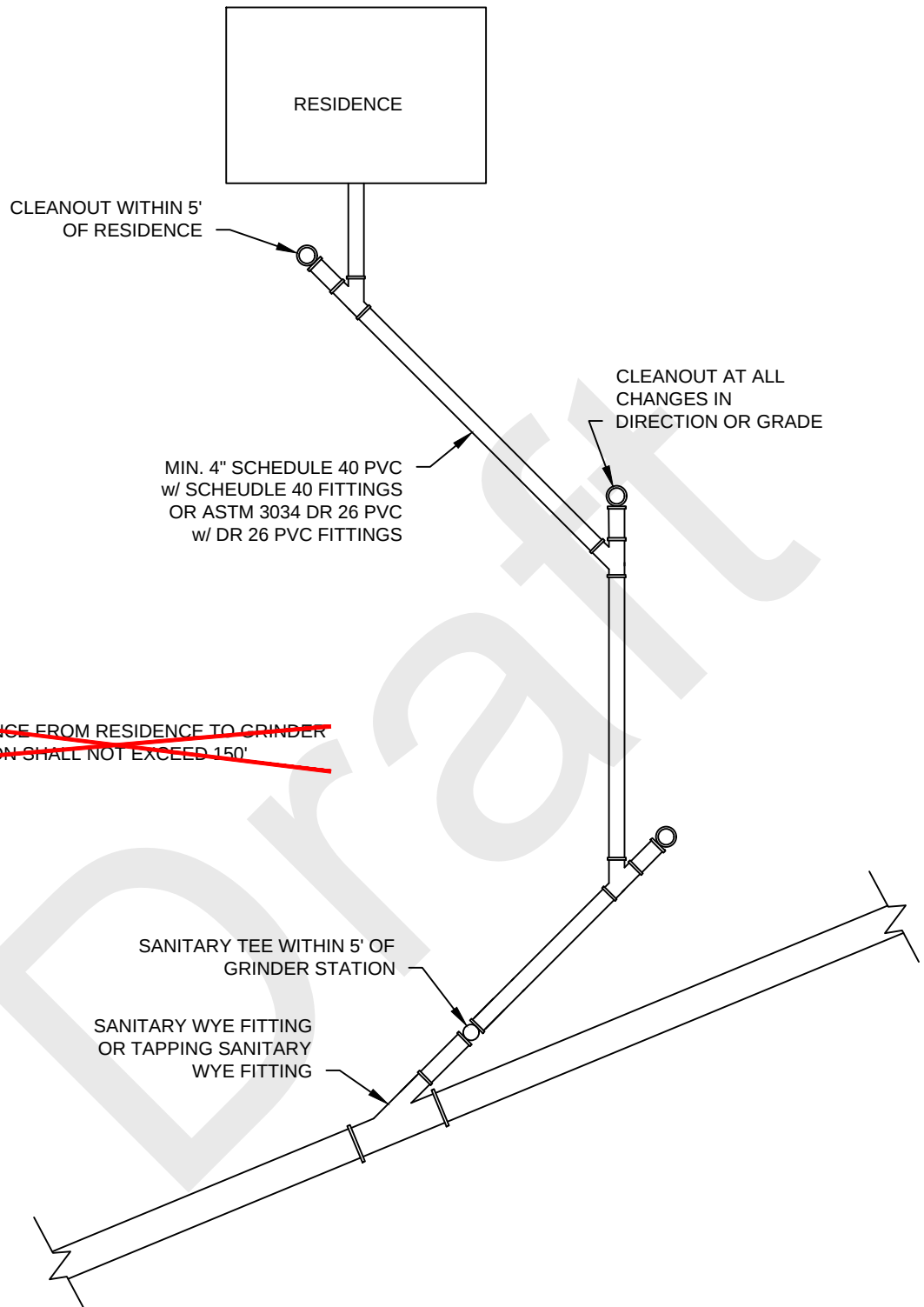
1. The system must be designed by a Registered Professional Engineer in accordance with Missouri Department of Health Regulations ~~710.025 through 710.059~~, Missouri Laws for On-site Sewage Disposal Systems, and 19 CSR 20-3.060 Minimum Standards for On-site Sewage Disposal Systems.
2. Soil morphology, permeability tests and soil percolation tests shall be made by a Registered Professional Engineer in the State of Missouri or State Certified Soil Scientist. Tests and reports shall be in accordance with 19 CSR 20-3, Para (2) Site Evaluation.
3. The minimum setback distances shown in 19 CSR 20-3, Table 1 Minimum Setback Distances shall be strictly followed.

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

4. Flow rates or volumes shall be computed based on 120 gal/day/bedroom or 60 gal/day/person, the minimum flow from a residence shall be 240 gal.
5. The minimum septic tank capacity shall be 1250 gallons. Septic tanks shall be constructed in strict conformance to 19 CSR 20-3, Para. (4) **Sewage Tanks**.
6. Absorption systems shall be in accordance with 19 CSR 20-3, Para. (5) Absorption Systems.
7. Alternative systems shall be in accordance with 19 CSR 20-3, Para (6) Alternative Systems.



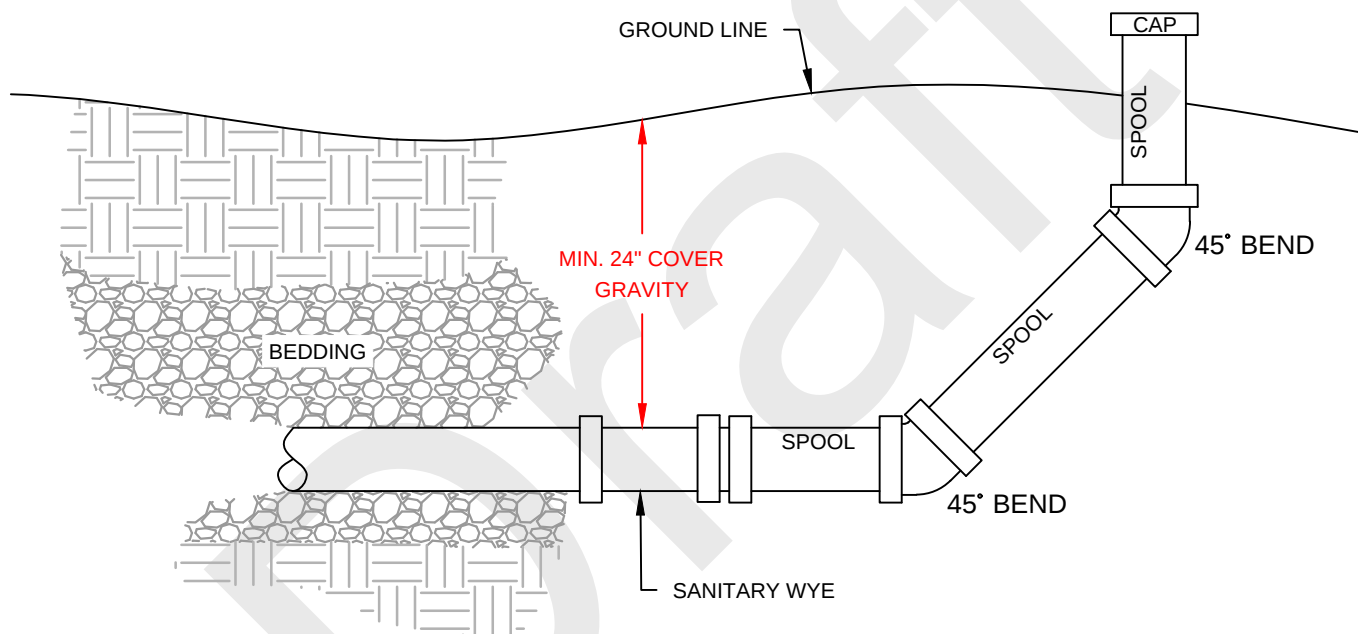
Date Revised: MARCH, 2007	CITY OF OSAGE BEACH TYPICAL DETAIL RESIDENTIAL SERVICE CONNECTION May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes	Design Guideline: SECTION 3
By: sh		SEWERAGE DESIGN
Checked By: JB		Drawing No.: III-1



Date Revised:	MARCH, 2007
By:	sh
Checked By:	JB

CITY OF OSAGE BEACH
TYPICAL DETAIL
RESIDENTIAL SERVICE CONNECTION

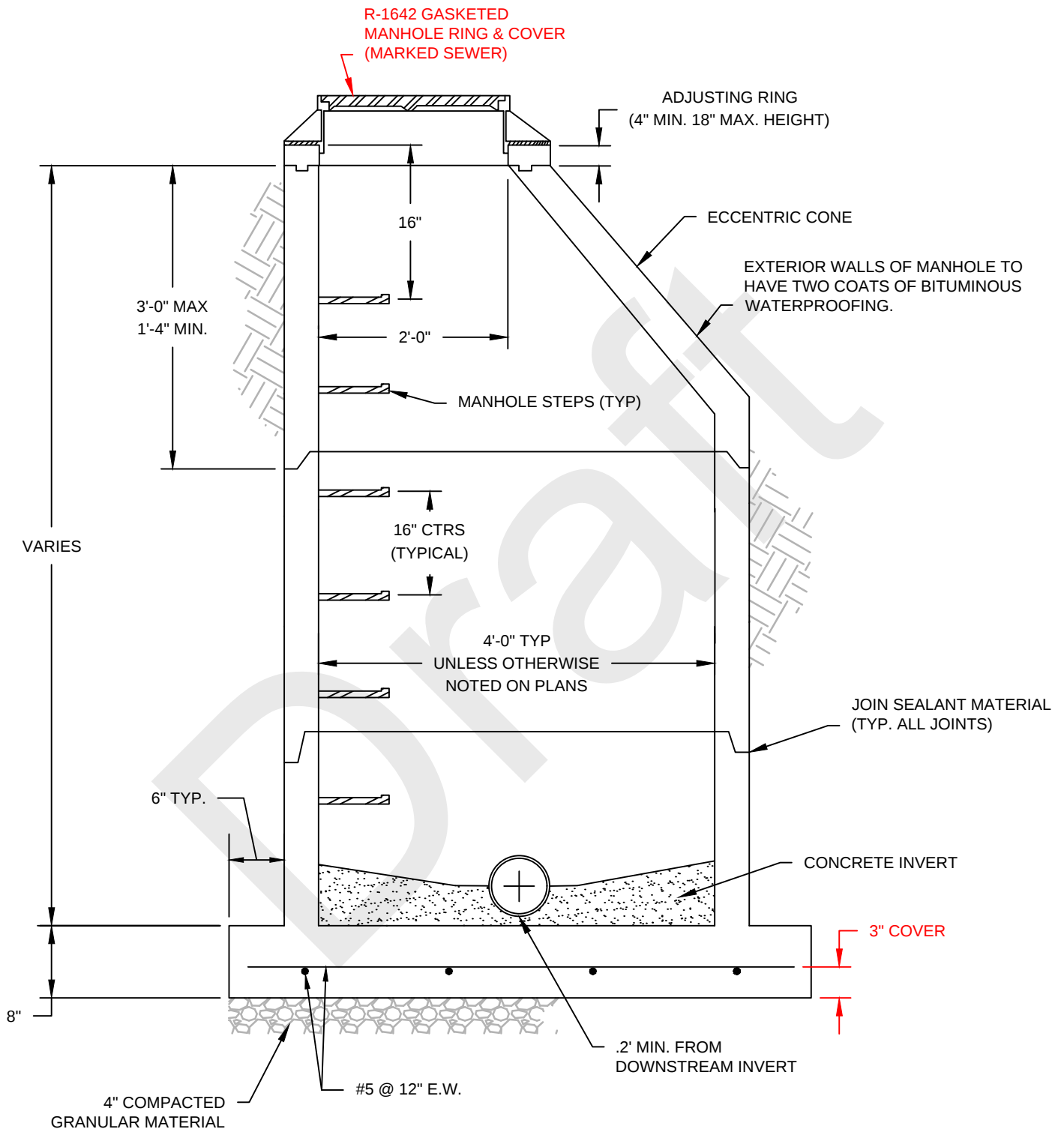
Design Guideline:	SECTION 3
	SEWERAGE DESIGN
Drawing No.:	III-2



Date Revised:	Oct., 2004
By:	sh
Checked By:	JB

CITY OF OSAGE BEACH
TYPICAL DETAIL
SANITARY SEWER CLEANOUT DETAIL
 May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes

Design Guideline:	SECTION 3
	SEWERAGE DESIGN
Drawing No.:	III-3

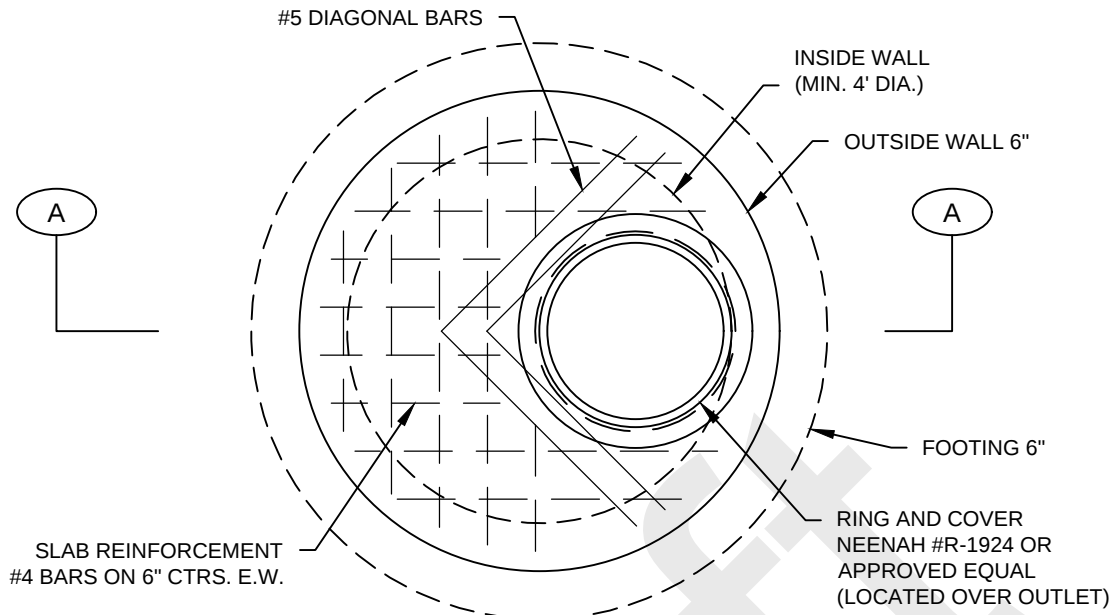


Date Revised:	MARCH, 2023
By:	NCW
Checked By:	DPV

CITY OF OSAGE BEACH
TYPICAL DETAIL
STANDARD PRECAST MANHOLE

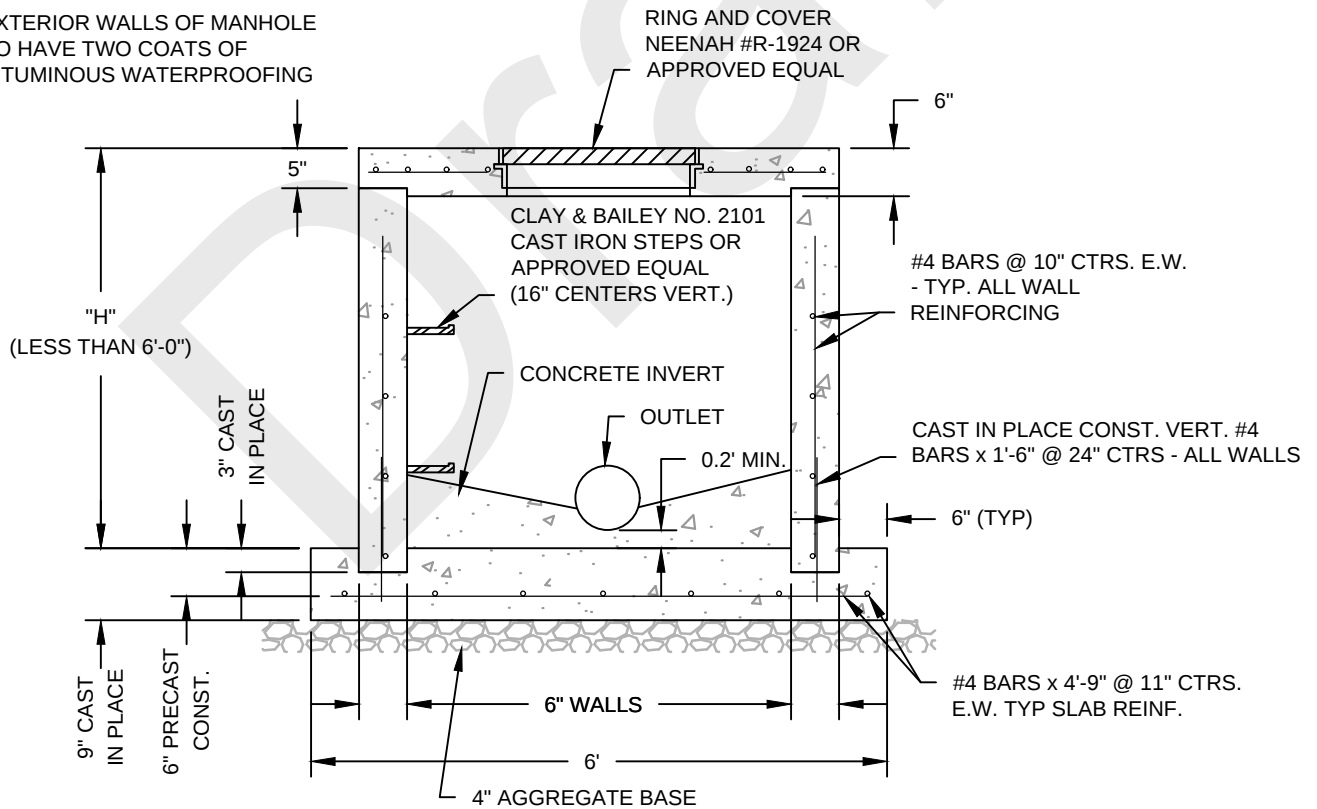
May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes

Design Guideline:	SECTION 3
	SEWERAGE DESIGN
Drawing No.:	III-4



PLAN VIEW

EXTERIOR WALLS OF MANHOLE TO HAVE TWO COATS OF BITUMINOUS WATERPROOFING



SECTION A-A

Date Revised:

AUG., 2008

By:

jdb

Checked By:

nle

**CITY OF OSAGE BEACH
TYPICAL DETAIL
FLAT TOP MANHOLE**

May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes

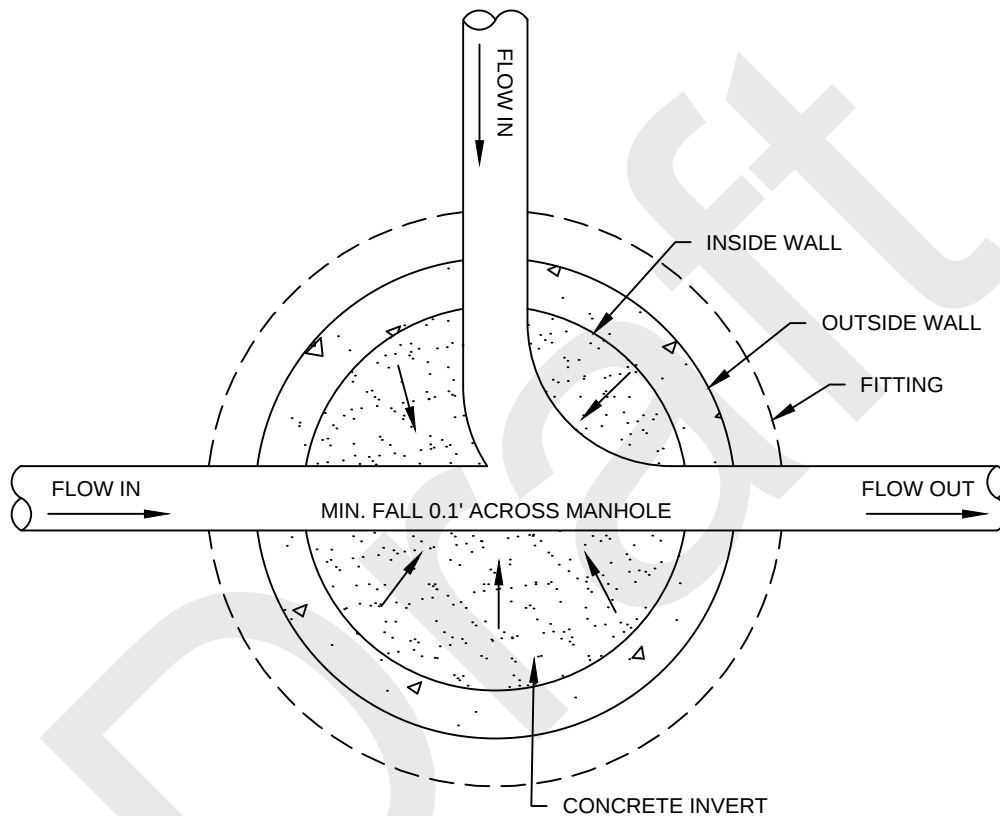
Design Guideline:

SECTION 3

SEWERAGE DESIGN

Drawing No.:

III-5

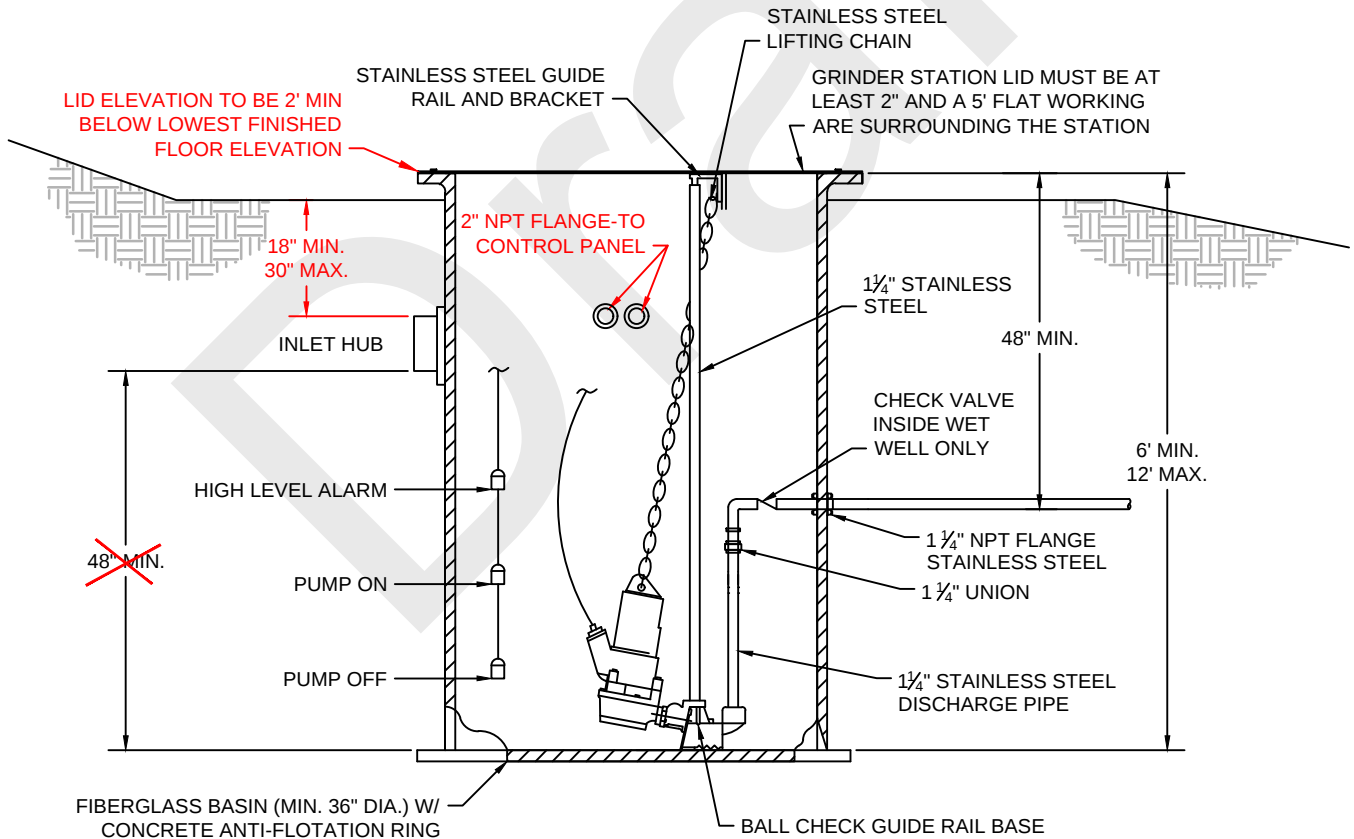
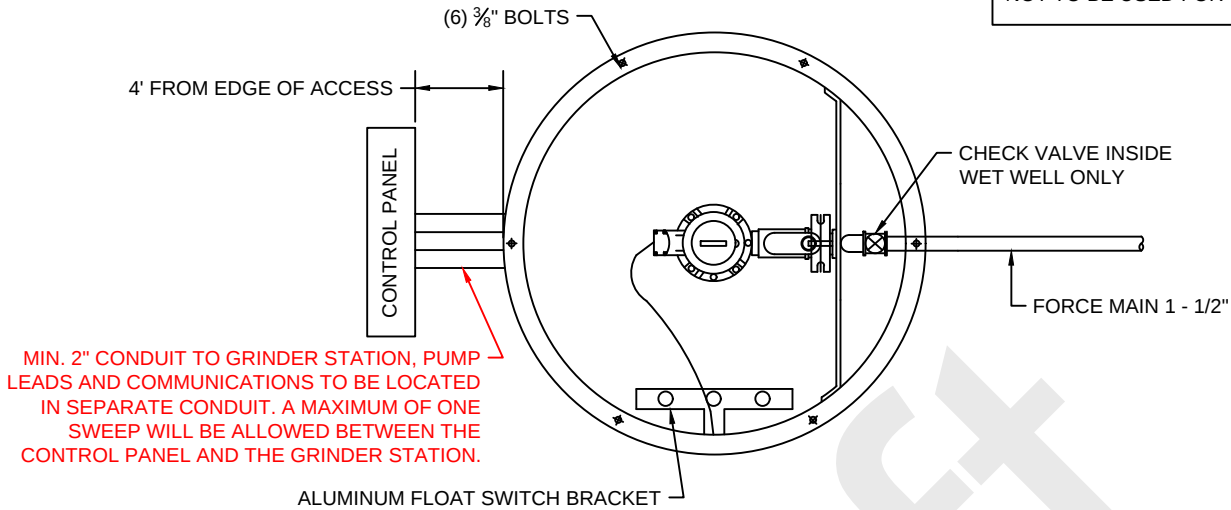


Date Revised:	Oct., 2004
By:	sh
Checked By:	JB

CITY OF OSAGE BEACH TYPICAL DETAIL MANHOLE INVERT DETAIL	Design Guideline:
	SECTION 3
	SEWERAGE DESIGN

Drawing No.:
III-6

THIS IS A TYPICAL INSTALLATION DRAWING.
NOT TO BE USED FOR CONSTRUCTION.



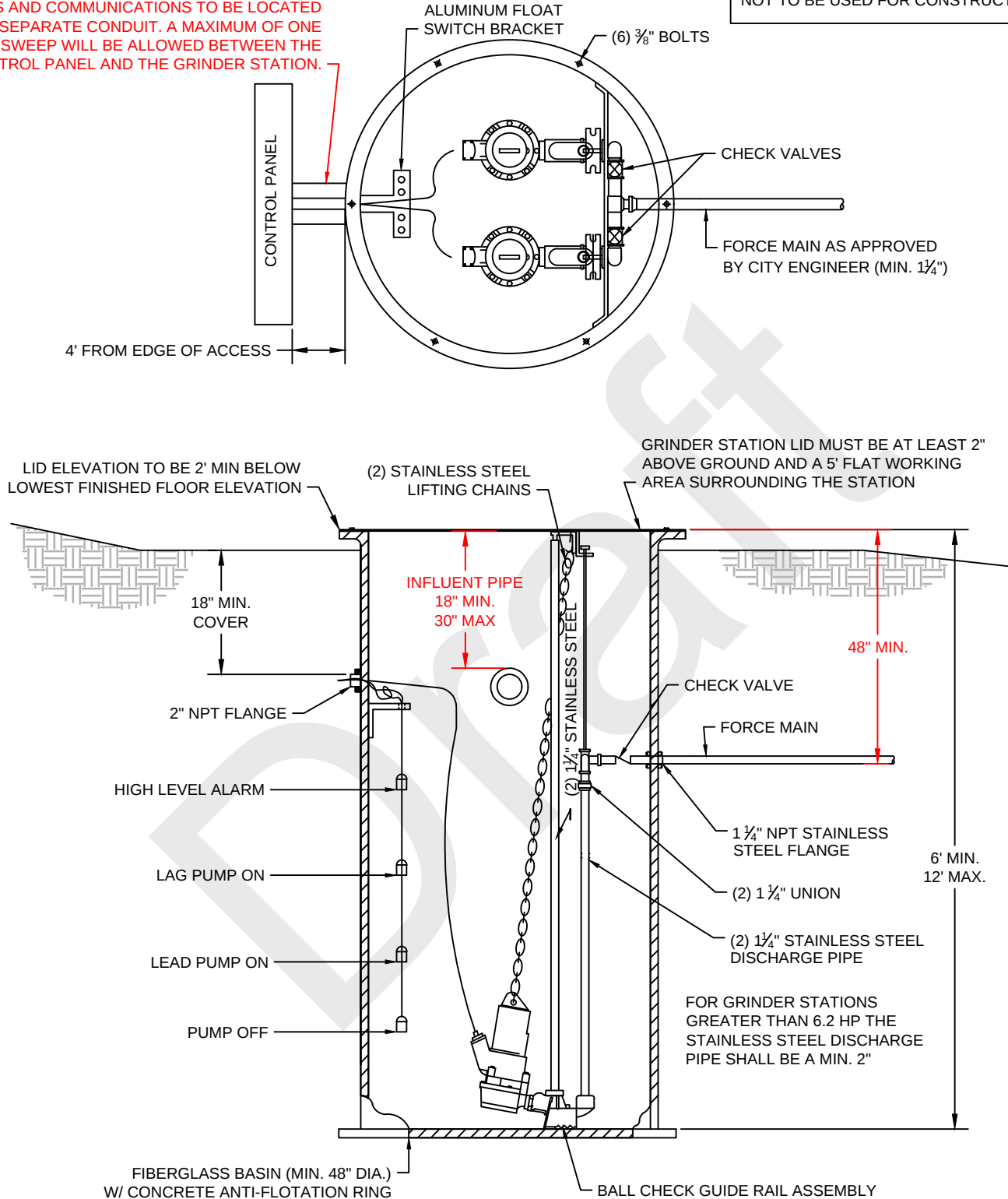
Date Revised:	MARCH, 2023
By:	NCW
Checked By:	DPV

CITY OF OSAGE BEACH
TYPICAL DETAIL
SIMPLEX PUMP STATION

Design Guideline:	SECTION 3
	SEWERAGE DESIGN
Drawing No.:	III-7

MIN. 2" CONDUIT TO GRINDER STATION, PUMP
LEADS AND COMMUNICATIONS TO BE LOCATED
IN SEPARATE CONDUIT. A MAXIMUM OF ONE
SWEEP WILL BE ALLOWED BETWEEN THE
CONTROL PANEL AND THE GRINDER STATION.

THIS IS A TYPICAL INSTALLATION DRAWING.
NOT TO BE USED FOR CONSTRUCTION.

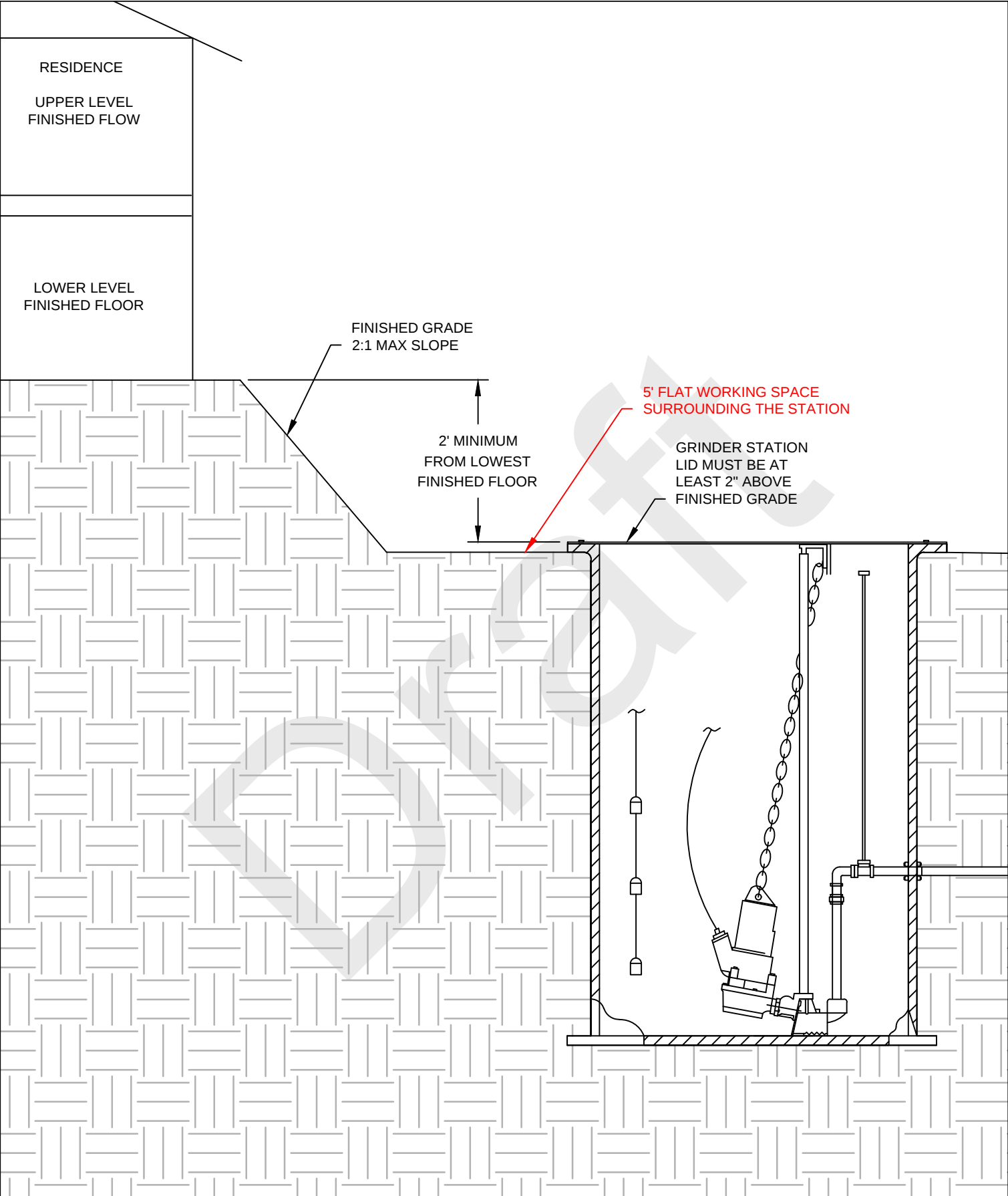


Date Revised:	MARCH, 2023
By:	NCW
Checked By:	DPV

CITY OF OSAGE BEACH
TYPICAL DETAIL
DUPLEX PUMP STATION

May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes

Design Guideline:	SECTION 3
	SEWERAGE DESIGN
Drawing No.:	III-8



Date Revised:	NOV.,2009
By:	cps
Checked By:	

CITY OF OSAGE BEACH

TYPICAL DETAIL

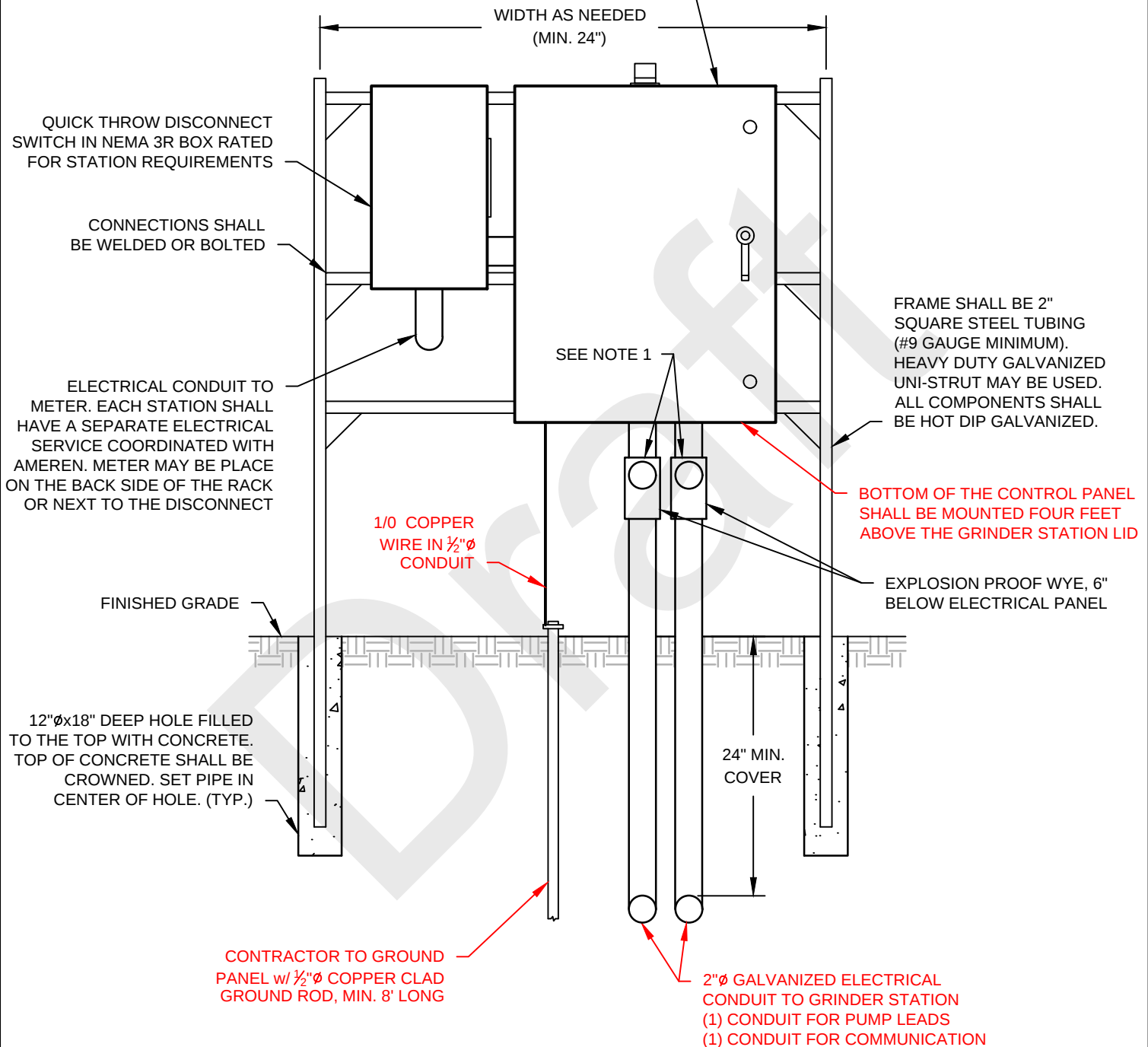
WET WELL ELEVATION

May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes

Design Guideline:	SECTION 3
	SEWERAGE DESIGN
Drawing No.:	III-9

ALL ELECTRIC WORK SHALL BE DONE IN ACCORDANCE WITH THE NATION ELECTRIC CODE AND ALL MATERIAL SHALL BE UL APPROVED.

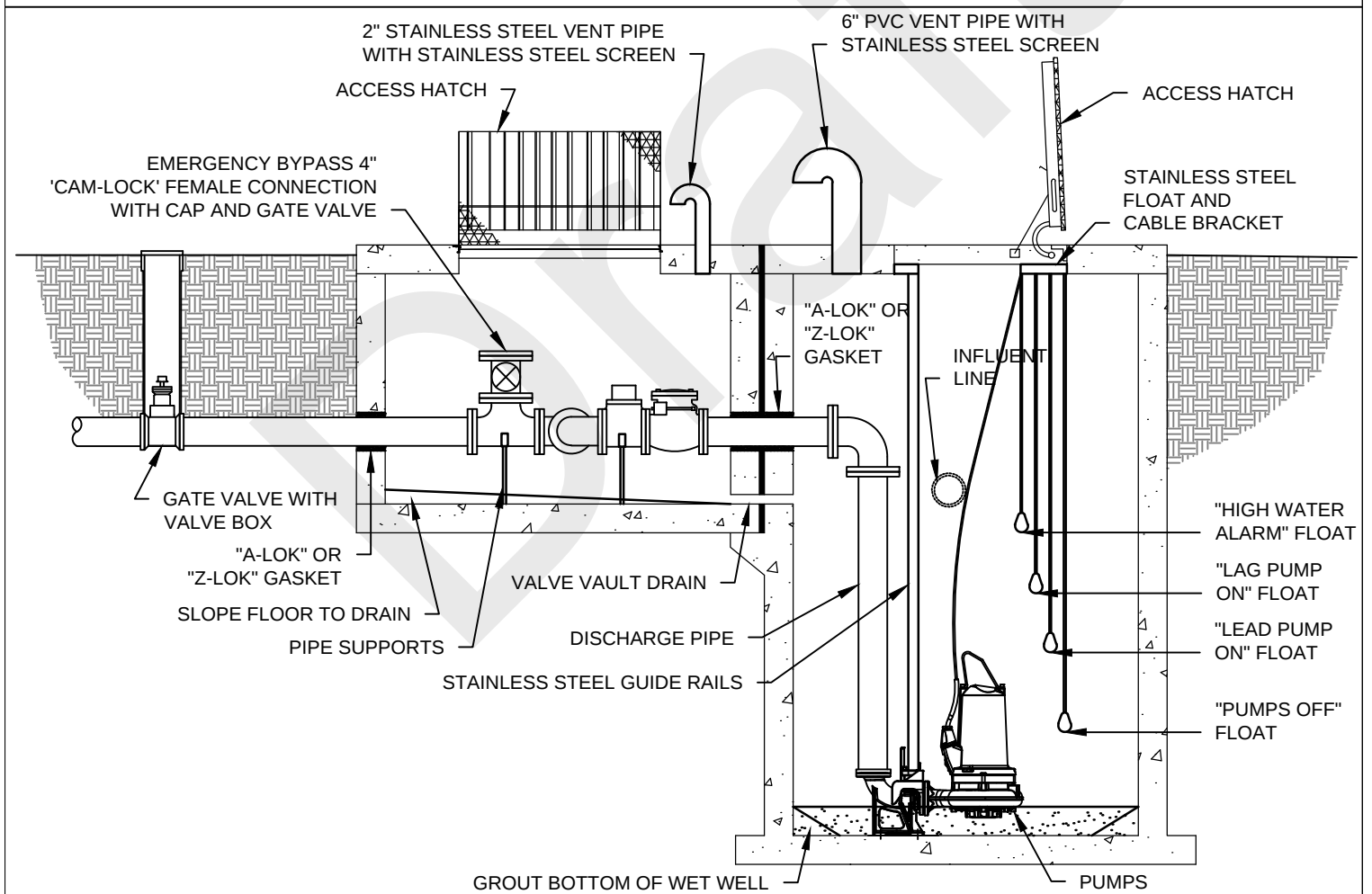
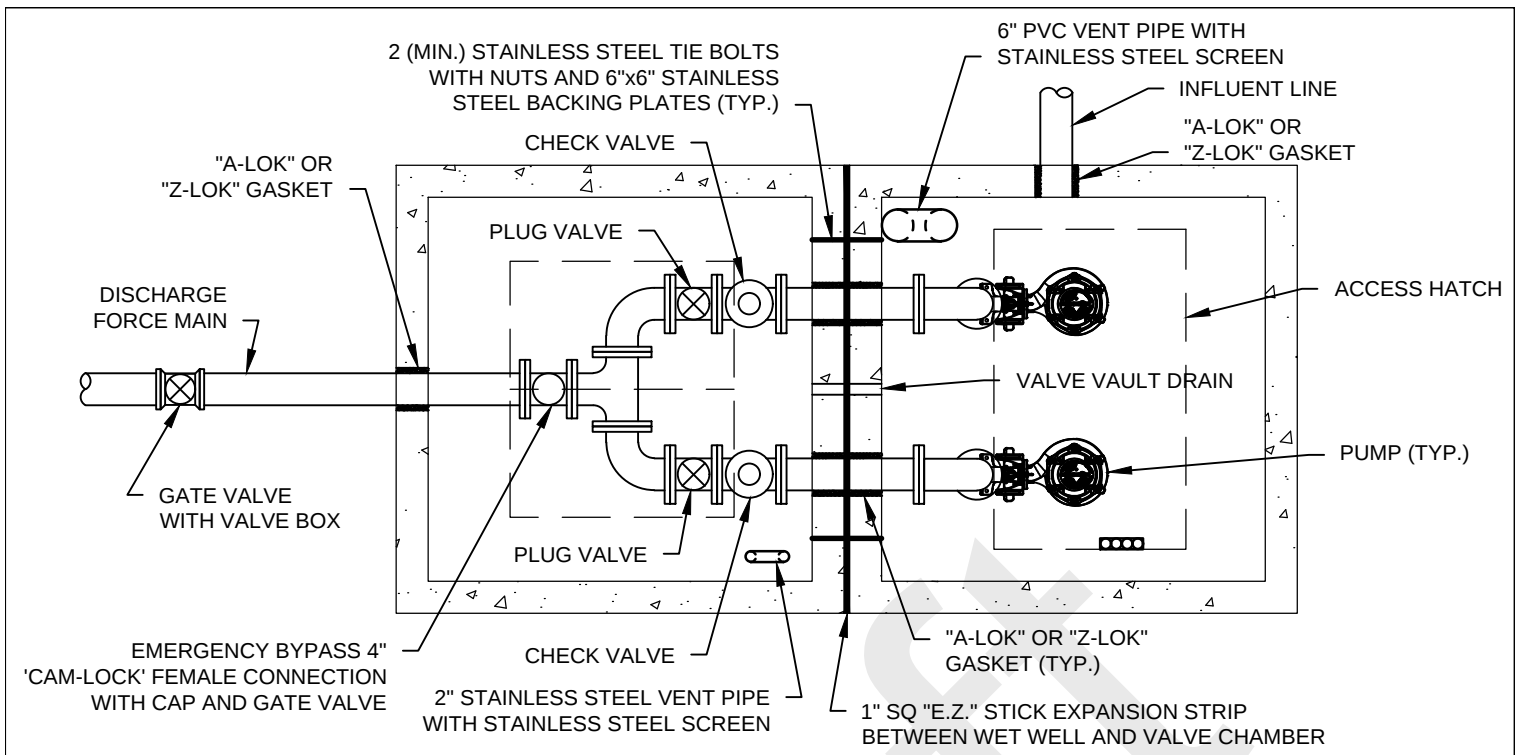
STATION CONTROL PANEL SHALL BE PROVIDED BY MUNICIPAL EQUIPMENT COMPANY, ST. LOUIS, MO., OF THE CORRECT MODEL TO MATCH THE PUMP. IT SHALL BE MOUNTED APPROXIMATELY 5' ABOVE FINISHED GRADE. EACH CONTROL PANEL SHALL HAVE A WIRING DIAGRAM OR SCHEMATIC ATTACHED TO THE INSIDE OF THE OUTER DOOR OR THE CONTROL PANEL BOX.



NOTE:
1. CONDUIT ENTRANCE AT TOP OF BOX TO BE SEALED AIRTIGHT TO PREVENT WET WELL GASES FROM ENTERING CONTROL PANEL

ALL GALVANIZED CONDUIT INSTALLED BELOW FINISHED GRADE SHALL HAVE WATERPROOF COATING OR WRAP.

Date Revised:	CITY OF OSAGE BEACH TYPICAL DETAIL GRINDER STATION RACK May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes	Design Guideline:
OCT., 2004		SECTION 3
By:		SEWERAGE DESIGN
sh		Drawing No.:
Checked By:		III-10
JB		



Date Revised:
APRIL 2023

By:
NCW

Checked By:
DPV

CITY OF OSAGE BEACH
TYPICAL DETAIL
LIFT STATION

May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes

Design Guideline:
SECTION 3

SEWERAGE DESIGN

Drawing No.:
III-11

Design Guidelines
City of Osage Beach
SECTION 4 - STORM DRAINAGE

(Revised October 2023)

OVERVIEW

Storm runoff accumulates pollutants, sediment, and debris as it flows over the landscape until it reaches a receiving waterway - the Lake of the Ozarks. These pollutants, sediments, and debris include oils and petroleum residues, animal refuse, garbage, organic debris from vegetation, silts, sands, and other objectionable materials. The U.S. Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources, Water Pollution Control Division, considers these pollutants to have adverse effects upon the human and aquatic life that uses the lake for habitat or recreational needs. The water quality of the Lake of the Ozarks is vital to the health and economic well being of our residents, visitors, and community.

Storm drainage within the City of Osage Beach falls under regulatory authority of the U.S. Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources (MDNR). The provisions of the U.S. Clean Water Act of 1978, Section 402 mandates the National Pollutant Discharge Elimination System (NPDES) and requires permitting for specific types of non-point pollutant sources under Phase II (Final Rule dated December, 1999) for areas where more than one acre of natural ground cover is disturbed. In addition, it mandates other control measures for designated cities, industries, and locations. The City of Osage Beach is not currently designated as a small city with a separate storm water system (MS4) or required to have a NPDES Permit. Several of the Phase II requirements do apply to the City. It is the policy of the City to reduce the contamination of the Lake of the Ozarks to comply with NPDES Phase II to the extent practicable for the city

The City of Osage Beach complies with these requirements through City Code, Title IV Land Use, Section ~~410.350 thru 410.380 410.340, 410.350, 410.360, and 410.370~~ and the applicable portions of the Osage Beach Design Guidelines.

GOALS AND OBJECTIVES

The goal and objective of the City of Osage Beach's Storm Water Management Plan is to manage storm water drainage within the city limits so as to minimize the pollution of the Lake of the Ozarks and to prevent storm water run-off damage to the maximum extent practicable.

The primary source of visible pollutants during storm runoff is through sediment and debris picked up on construction sites or locations where the natural vegetation has been removed. The major secondary source is through volatile fuels, oils, animal wastes, and refuse picked up by storm runoff as it flows off large parking areas, roofs and over the terrain in route to the lake. These sources of contamination will be addressed separately through the application of a Sediment Control Plan and/or a Storm Drainage Plan.

Design Guidelines
City of Osage Beach
SECTION 4 - STORM DRAINAGE

Recent developments in the Storm Drainage Compliance area have lead to the development of “Best Management Practices” (BMP’s) and less emphasis on retention facilities. Also the trend is toward reduction of contamination by: 1) reducing the quantity of storm water runoff, 2) reducing or removing the contamination of the runoff, and 3) by conveying the storm run-off without further contamination.

Our goal is to reduce the pollution of the lake through public education, awareness, and the application of MoDNR Best Management Practices (BMP’s). Our immediate objective is to manage the storm drainage system to reduce collectable sediment or pollutants entering the lake and/or causing damage to adjacent or downstream properties.

The following design guidelines will establish the minimum steps or procedures required to reach these goals and objectives.

EROSION & SEDIMENT CONTROL PLAN

- A. The Erosion and Sediment Control Plan shall be submitted as a part of the building permit process and shall be reviewed and approved by the City Engineer prior to the start of any onsite work for any and all projects involving two or more lots or ½ acre, whichever shall be the smaller.

Note: The MoDNR requires a Land Disturbance Permit for construction disturbance activities of one or more acres. Permitting with MoDNR is the responsibility of the property owner or their representative.

1. The Sediment Control Plan must be prepared by a Registered Professional Engineer in the State of Missouri stating the goals of the plan and depicting the locations and details of the construction of all sediment control devices to be utilized on the project during construction.
2. The plan shall clearly set out the contractor’s schedule and requirements for maintaining the integrity of the plan.
3. The primary goal of the plan is to assure that no visible or measurable sediment or debris is allowed to leave the developed area.
4. The devices and measures utilized shall follow the recommended “Best Management Practices” as described in the publication “Protecting Water Quality” by MDNR and as directed herein. At the minimum the following shall be required:
 - a. Wire backed silt fencing with steel tee-posts **or an approved equal method** shall be installed around the downhill edges of the disturbed area.
 - b. Earth berms and swales shall be used to reduce sheet flow volumes and velocities.
 - c. Straw bale check dams, earth berms and other BMP’s shall be utilized as necessary to prevent run-off from carrying sediment and debris off site.
 - d. Check dams or other BMP’s shall be used to reduce velocities in areas of concentrated flow.

Design Guidelines
City of Osage Beach
SECTION 4 - STORM DRAINAGE

- e. Approved engineering fabric or erosion control matting shall be used in all drainage courses or ditches where flow velocities exceed 5 fps. Velocities shall be calculated and included with permit submittal.
 - f. All denuded slopes or embankments shall be protected from erosion by the installation of earthen berms, straw bale dikes, or other appropriate BMP's.
 - g. Temporary catch basins, drop inlets and/or storm drains (culverts) shall be utilized as necessary to convey concentrated flow and prevent erosion.
 - h. Temporary sediment basins shall be provided for each drainage area with one or more acres disturbed at one time. Basins shall be maintained until final stabilization is achieved as approved by the City Engineer. Each sediment basin shall be sized, at a minimum, to provide a total storage volume of 4,000 cubic feet per acre of contributing area. The sediment basin shall include an outlet structure designed for the slow release of stored runoff to allow for sedimentation in the basin. A perforated riser wrapped in filter fabric and covered with a mound of clean 2-inch stone is the City's preferred outlet structure.
 - i. Depict existing and proposed contours.
 - j. Clearly depict the entire drainage area effecting the development site including downstream areas that will be affected by storm water run-off or drainage and upstream areas that contribute to the site.
 - k. The installation of all BMP's shall be inspected and approved by the City Engineer and the Engineer of Record prior to commencing land disturbance activities. The Engineer of Record shall provide a letter to the City stating he or she approves the installation of the BMP's. Phased projects may require multiple approvals.
 - l. Where soil disturbing activities on site have ceased either temporarily or permanently and will not resume for a period of 14 calendar days, stabilization shall be initiated immediately and completed within 14 calendar days. All denuded slopes or areas shall be reseeded with appropriate seed, fertilizer, and for final stabilization, approved slope stabilization fabric or stone armoring shall be installed on all slopes steeper than 3:1.
 - m. Phased clearing and grading of sites is encouraged to minimize denuded areas and potential for erosion.
5. In the event that the plan is deficient or inadequate to prevent sediment escaping the jobsite, the Owner/Developer shall immediately take any and all measures necessary to stop and prevent further contamination, and to clean up contaminated areas.

Design Guidelines
City of Osage Beach
SECTION 4 - STORM DRAINAGE

All calculation necessary for the Erosion and Sediment Control Plan shall be signed and sealed by an Engineer licensed in the State of Missouri and submitted with the permit application for review by the City Engineer. Calculations shall be prepared in a report format.

The City's Standard Erosion and Sediment Control Plan Note Block shall be included on the Plans prior to approval.

STORM DRAINAGE PLAN

- A. A Storm Drainage Plan is required for all new construction sites within the jurisdictional boundaries of the City of Osage Beach in which the construction or clearing for construction disturbs an area exceeding two lots or one half acre, whichever shall be the smaller.
1. The Storm Drainage Plan shall be prepared by a Registered Professional Engineer in the state of Missouri stating the goals of the plan and depicting the locations and details of construction of all permanent sediment and drainage control devices, and post construction BMP's, to be utilized in the plan. The Storm Drainage Plan shall depict permanent drainage structures and post-construction BMP's.
 2. The plan shall clearly state owners schedule and requirements for maintaining the components of the system.
 3. The devices and measures utilized shall follow the recommended "Best Management Practices" as described in the publication "Protecting Water Quality" by and available through MDNR, the City of Osage Beach City Code and the City of Osage Beach Design Guidelines
 4. At the minimum the Storm Drainage Plan shall provide the following technical data:
 - a. Clearly depict all permanent drainage structures, conveyance devices, and post construction BMP's.
 - b. Clearly depict the entire drainage area effecting the development site including downstream areas that will be affected by storm water run-off or drainage and upstream areas that contribute to the site.
 - c. Accurately calculate the anticipated storm run-off from a theoretical twenty-five (25) year storm event. Storm duration shall be calculated to correspond to the time of concentration for the tributary drainage area.
 - d. Determine the anticipated flows and capacities of all channels, culverts and conveyance devices. Conveyance structures shall be designed utilizing the criteria in A.4.c of this Section.
 - e. Clearly identify and provide flow data for all velocity control and/or energy dissipation devices.

Design Guidelines
City of Osage Beach
SECTION 4 - STORM DRAINAGE

5. At the minimum the Storm Drainage Plan shall provide the following post construction sediment and drainage controls:
- a. Provide removal or containment of all silt, sediment, and debris carried onto or across the development so as to assure that no silt, sediment, or debris is allowed off the developed area. See Post Construction Water Quality.
 - b. Assure that all storm run-off is controlled such that no damage will occur to adjacent downstream properties or facilities. Stormwater detention requirements are as follows:
 - 1. The rates (pre-developed and post-developed) of runoff shall be determined for the 2-year, 25-year and 100-year rainfall frequencies. The storm duration shall be calculated to correspond to the time of concentration of the tributary area. Minimum storm duration shall be 20 minutes.
 - 2. Storm water shall be detained on site or on adjacent property under agreement and released at the rate of an undeveloped site for the above frequencies and minimum duration to prevent possible flooding and erosion downstream.
 - 3. In the event the natural downstream channel or storm sewer system is inadequate to accommodate the release rate provided above, then the allowable release rate shall be reduced to that rate permitted by the capacity of the downstream channel or storm sewer system.
 - 4. Detention basin volume and outlet structure will be based on routing each post-developed runoff through the detention facility while not exceeding the pre-developed run-off. The routing computation shall be based on an application of the continuity principle. The discharge rate shall be based on the maximum head conditions in the detention facility.
 - 5. Project site discharging via right-of-way, easement, or land owned by developer to the Lake of the Ozarks shall be exempt from stormwater detention requirements.
 - 6. Project sites with a differential runoff of less than 2 cfs for the 25-year event shall be exempt from stormwater detention requirements.
 - 7. All calculations necessary for stormwater detention design shall be signed and sealed by an Engineer licensed in the State of Missouri and submitted with the permit application for review by the City Engineer. Calculations shall be prepared in report format.
 - c. Where parking areas for more than twenty cars exist provide for removal of oils, grease and volatile wastes to the maximum practicable extent by the use of post construction BMP's.

Design Guidelines
City of Osage Beach
SECTION 4 - STORM DRAINAGE

- d. Assure that conveyance discharges into the Lake of the Ozarks will have a velocity of less than 5 fps.

This can be accomplished by the use of BMP's, filtration devices, retainage and sedimentation collection basins, filtered curb inlets/manholes or other devices as approved by the City Engineer.

STORM DRAINAGE COMPUTATIONS

- A. The Rational Method shall be used for computation of stormwater run-off.
1. The base storm event for computation of run-off volumes shall be a twenty five-year (25) storm event.
 2. The Rational Method of computation shall be used as herein.

$$Q=CIA$$

Where:

- Q = Peak runoff in cubic feet per second (cfs)
I = Rainfall Intensity.¹
A = Area of watershed in acres. This area includes the actual area drained through or in addition to the developed area.
C = Coefficient (weighted by area)²

¹ Storm duration shall be calculated to correspond to the time of concentration for the tributary drainage area.

²Values of C categorized by surface:

<u>Surface Type</u>	<u>Value of C</u>
Impervious (asphalt pavement, concrete pavement, stone/rock surfaces, rooftops, etc.)	0.95
Pervious (greenspace, lawns, unimproved areas)	0.35

If more than one surface type is included in the drainage area, the designer shall calculate the weighted coefficient for use in runoff calculations.

All stormwater calculation shall be signed and sealed by an Engineer licensed in the state of Missouri and submitted with the permit application for review by the City Engineer. Calculations shall be prepared in a report format.

DESIGN OF DRAINAGE STRUCTURES AND DEVICES

- A. Culverts and Storm Drainage Piping Systems shall be designed using the Manning equation for open channel flow. Inlet conditions should be investigated and openings designed to handle the peak runoff condition. In addition, the following conditions shall be met:
1. The minimum pipe size shall be 18-inch diameter.
 2. Bedding shall be installed around the pipe from ~~four~~ 6 inches below to 12 inches above the pipe. Bedding shall be ~~nominal ½-inch minus~~ crushed rock conforming to MoDOT Type 5 aggregate, **Section 1007**.
 3. The minimum grade shall guarantee a minimum velocity of 2.0 fps.
 4. Manholes or inlets shall be constructed at not more than 350-foot intervals and at all bends and changes of grade.
 5. All pipe shall be run true to line and grade between manholes or inlets.
 6. Outlets shall have intrusion gates to prevent entry by children or animals.
 7. Outlets shall end in an energy-dissipating device that will reduce the outlet flow velocity to less than 5 fps.
 8. Piping shall be designed to sustain any anticipated loading conditions
- B. Curb Inlets of the “Kansas City Type” are preferred. See Drawing No. IV-11
1. The length of Curb Inlet opening shall be determined as in Chapter IX of the MoDOT Project Development Manual.
 2. Floor of Inlet shall be shaped with invert to provide smooth flow.
 3. Locate manhole ring and cover over outlet.
 4. Each Inlet shall have cast iron steps spaced at 1’-4” centers vertically.
 5. Bevel all exposed edges with ¾” chamfer or ½” tooled edge.
 6. On grade Inlets shall conform to the street grade and sump Inlets shall be level.
 7. The length plus the width shall not exceed 15’ without special design.
 8. Each Inlet shall be placed on a 4” compacted aggregate base.
 9. Each Inlet shall have a steel inlet frame.
 10. Each Inlet shall be designed to sustain any anticipated loading conditions. In no case shall materials and design not be sufficient to support an ASHTO HS-20 loading.
 11. Transition curb in 10’ on upstream side of inlet and in 5’ on the downstream side. 10’ transition on both sides for sump inlet. See detail.
- C. Open Channel Design
1. Open Channel Drainage shall be designed using the Mannings Equation for open channel flow. The channel shape maybe trapezoidal, rectangular or circular at the designer’s discretion.
 - a. The channel depth shall be designed so that the peak runoff flow will be accommodated at 2/3rd of the channel depth.

Design Guidelines
City of Osage Beach
SECTION 4 - STORM DRAINAGE

- b. Where channel depth will exceed one foot, a trapezoidal section with a maximum of 1:1 side slopes shall be used.
- c. Where flow velocity will exceed 2 fps engineering fabric or erosion mat shall be utilized. Selected fabric or mat shall be rated for the intended application. Velocities shall be calculated and included with permit submittal.
- d. Where velocity will exceed 5 fps riprap shall be installed to eliminate scouring. See Drawing No. IV-7. Velocities shall be calculated and included with permit submittal.

All stormwater calculation shall be signed and sealed by an Engineer licensed in the State of Missouri and submitted with the permit application for review by the City Engineer. Calculations shall be prepared in a report format.

POST CONSTRUCTION WATER QUALITY

- 1. It shall be required that appropriate filtration methods are used in order to assure that silt, sediment, and debris do not get into the conveyed storm drainage flow. Parking areas, roof tops and other similar surfaces (not including single or two family residential), will require the collection and isolation of silts, sediments, debris, oils, and volatile materials. Also see Storm Drainage Plan A.5.c. New developments that disturb less than 1 acre and are not part of a larger common plan of development that will disturb 1 or more acres over the life of the project are not required to meet the post construction water quality requirement. Water quality requirements shall not apply to City streets or new constructed streets to be dedicated to the City.

Approved filtering systems are as follows:

- 2. Fabricated Filtration Manholes or Curb Inlets
 - a. Several patented filtration devices are now available that can effectively reduce sediment discharges such as:
 - 1) Treatment systems such as Stormceptor
 - 2) Catch Basin or Curb Inlet inserts such as FloGard manufactured by Hancor, Inc. or Hydro-Kleen manufactured by ACF Environmental.
 - 4) Or several non-patented devices by various highway departments, etc.
- 3. Post Construction Sediment Basin
 - a. Sediment Basin volume, or WQV, shall be based on the following calculation:

Design Guidelines
City of Osage Beach
SECTION 4 - STORM DRAINAGE

$$WQV (ft^3) = (P/12)(R_v)(A*43,560)$$

Where

P = rainfall depth = 1 inch

R_v = volumetric runoff coefficient = $0.05 + 0.009I$

I = percent impervious cover (in percent, e.g. 80% = 80)

A = total site area in acres

- b. The inlet should be designed to prevent short-circuiting between entrance and discharge to the maximum extent practicable. This can be accomplished by providing baffles in the channel, turns in the channel, etc.
- c. The shape of the storage basin should allow for easy cleanout of sediment and debris. Proper maintenance is the responsibility of the property owner. Terrain and other site conditions will tend to dictate the shape of the facility. Sediment Basins with water depth greater than 4' shall be fenced for safety.
- d. The sediment basin shall include an outlet structure designed for the slow release of stored runoff to allow for sedimentation in the basin. A perforated riser wrapped in filter fabric and covered with a mound of clean 2-inch stone is the City's preferred outlet structure. Basin shall be designed to prevent permanent standing water.

The details of the design are at the discretion of the designer subject to approval of the City Engineer.

All stormwater calculation shall be signed and sealed by an Engineer licensed in the state of Missouri and submitted with the permit application for review by the City Engineer. Calculations shall be prepared in a report format.

CONSTRUCTION MATERIALS

- A. See Drainage ditches maybe stabilized earth, riprap, concrete, or other durable material.
- B. Retention basin inlets, basin, and outlet structures maybe of any durable material subject to the approval of the City Engineer.
- C. Storm drainage pipe and culvert pipe shall be reinforced concrete, or dual wall polypropylene pipe.
 1. All pipes at a minimum must be capable of sustaining an ASHTO HS-20 loading.
 2. The use of polypropylene pipe for storm drainage at drop inlets or in areas where leaf burning is allowed is prohibited.

Design Guidelines
City of Osage Beach
SECTION 4 - STORM DRAINAGE

D. Curb Inlets

1. Shall be prefabricated or cast-in-place.
 - a. Shall be place on a 4" compacted aggregate base.
 - b. Reinforcement in footing shall be #4 bars on 6" centers both ways.
 - c. Reinforcement in walls shall be #4 bars on 12" centers both ways.
 - d. Reinforcement in lid shall be a minimum of six #4 bars placed at 45 degree angle. See detail.
2. Shall have a 10" throat galvanized steel inlet frame.
3. Cast iron manhole ring and cover, Neenah R-1537 or approved equal.
4. Cast iron step, Clay & Bailey No. 2101 or approved equal.

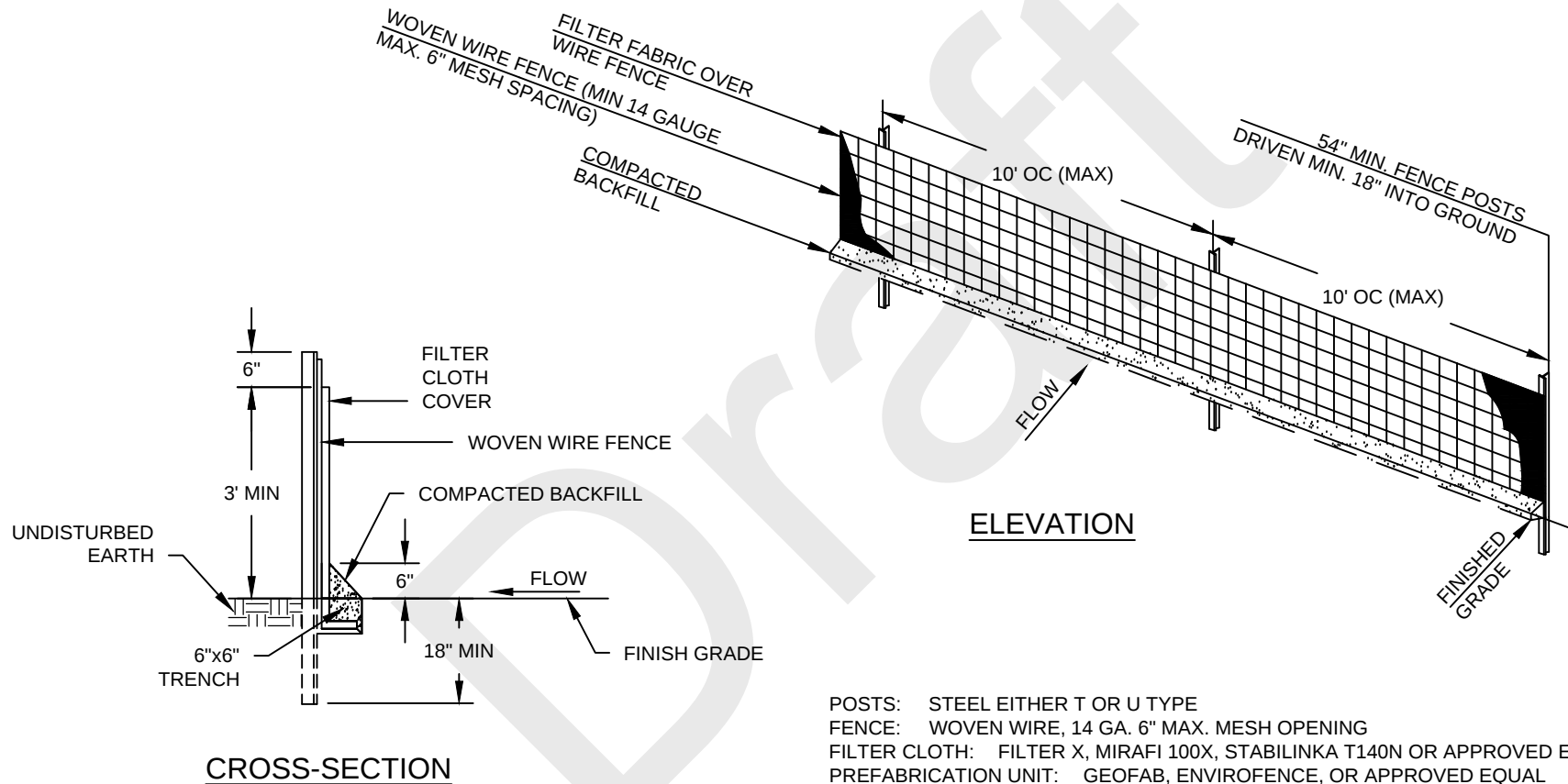
STORM DRAINAGE CONSTRUCTION DETAIL DRAWINGS

Construction details and sketches are attached.

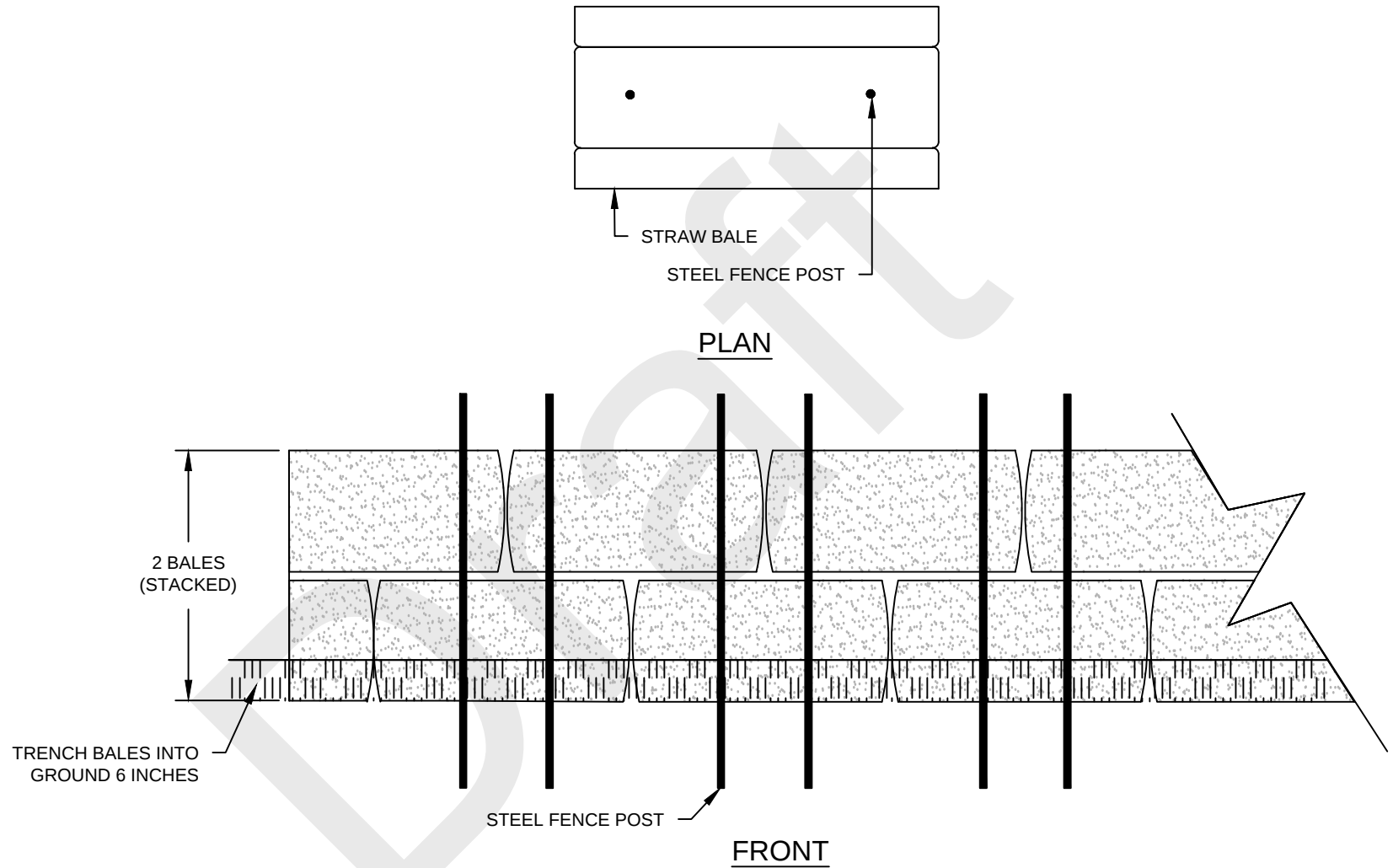
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NOTES:

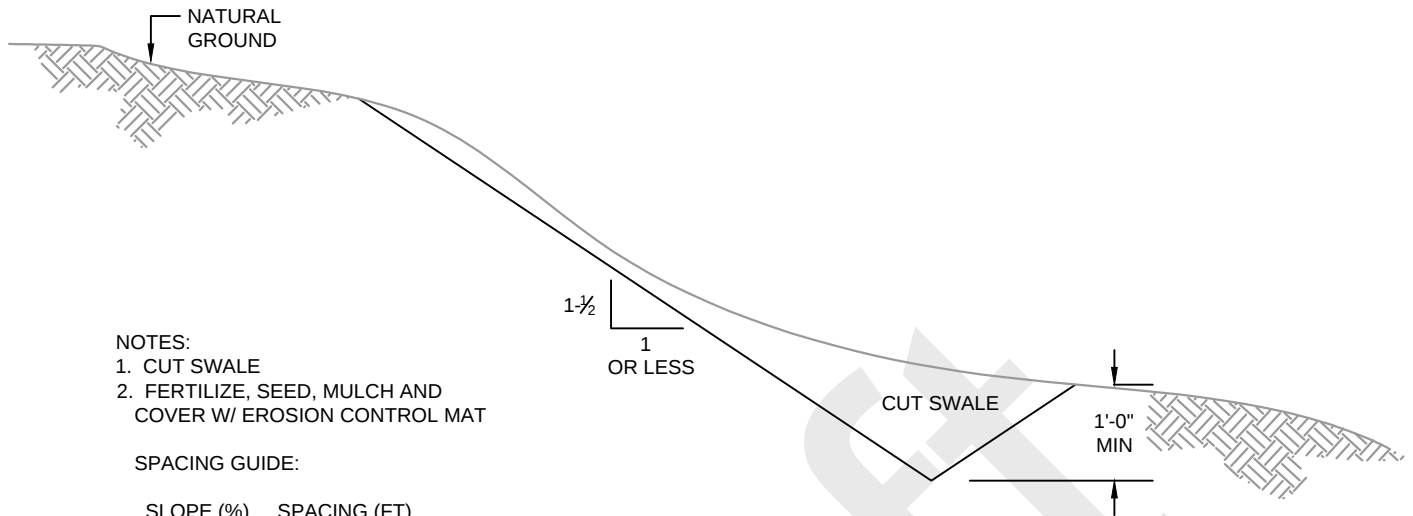
1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6" AND FOLDED.
4. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.



Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL SILT FENCE	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-1



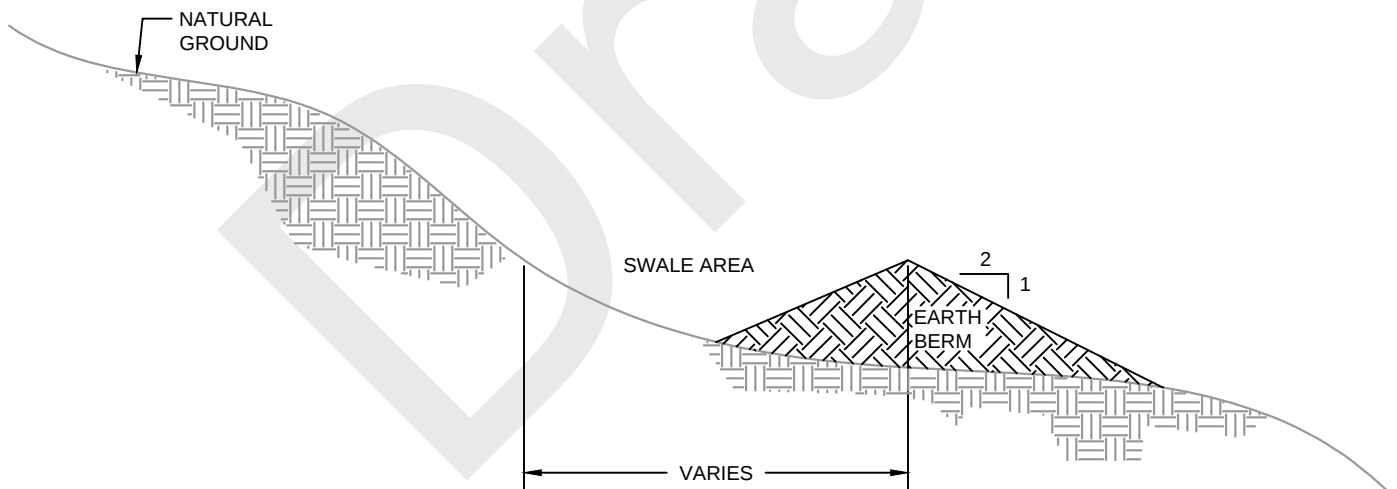
Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL STRAW BALE CHECK FENCE	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-2



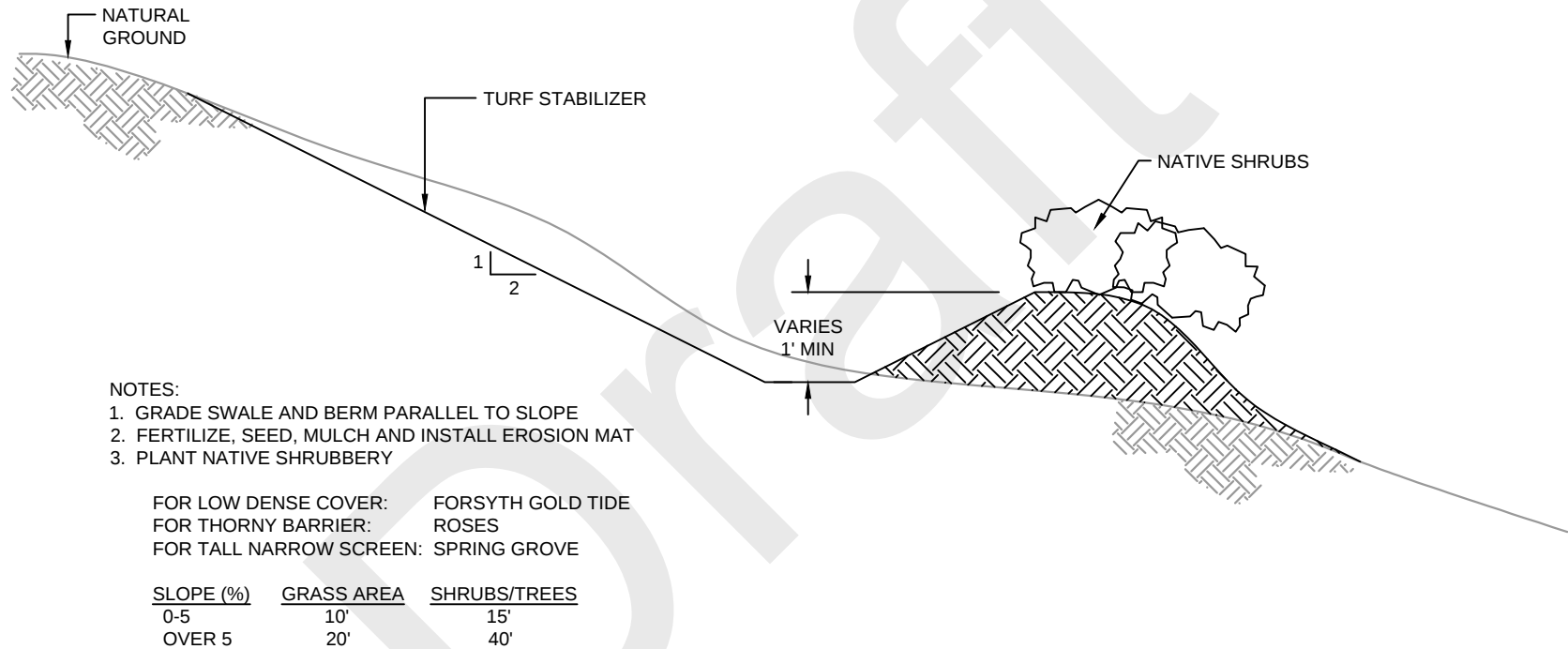
- NOTES:
1. CUT SWALE
 2. FERTILIZE, SEED, MULCH AND COVER W/ EROSION CONTROL MAT

SPACING GUIDE:

SLOPE (%)	SPACING (FT)
33-50	20
25-33	40
15-25	60
10-15	80
6-10	120
3-6	200



Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL SWALE	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-3



Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL VEGETATION BARRIER & SWALE	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-4

CLEAN ¾" MINUS
AGGREGATE

4'-0"

12"
MIN.

NOTES:

1. FIELD TEST TO DETERMINE
INFILTRATION RATE $\pm$ 1 GAL/SF/MIN
2. DO NOT USE ABOVE RETAINING
WALLS, BASEMENTS OR OTHER
GROUND WATER SENSITIVE
LOCATIONS

Date Revised:

March, 2014

By:

SH

Checked By:

JB

**CITY OF OSAGE BEACH
TYPICAL DETAIL
INFILTRATION TRENCH**

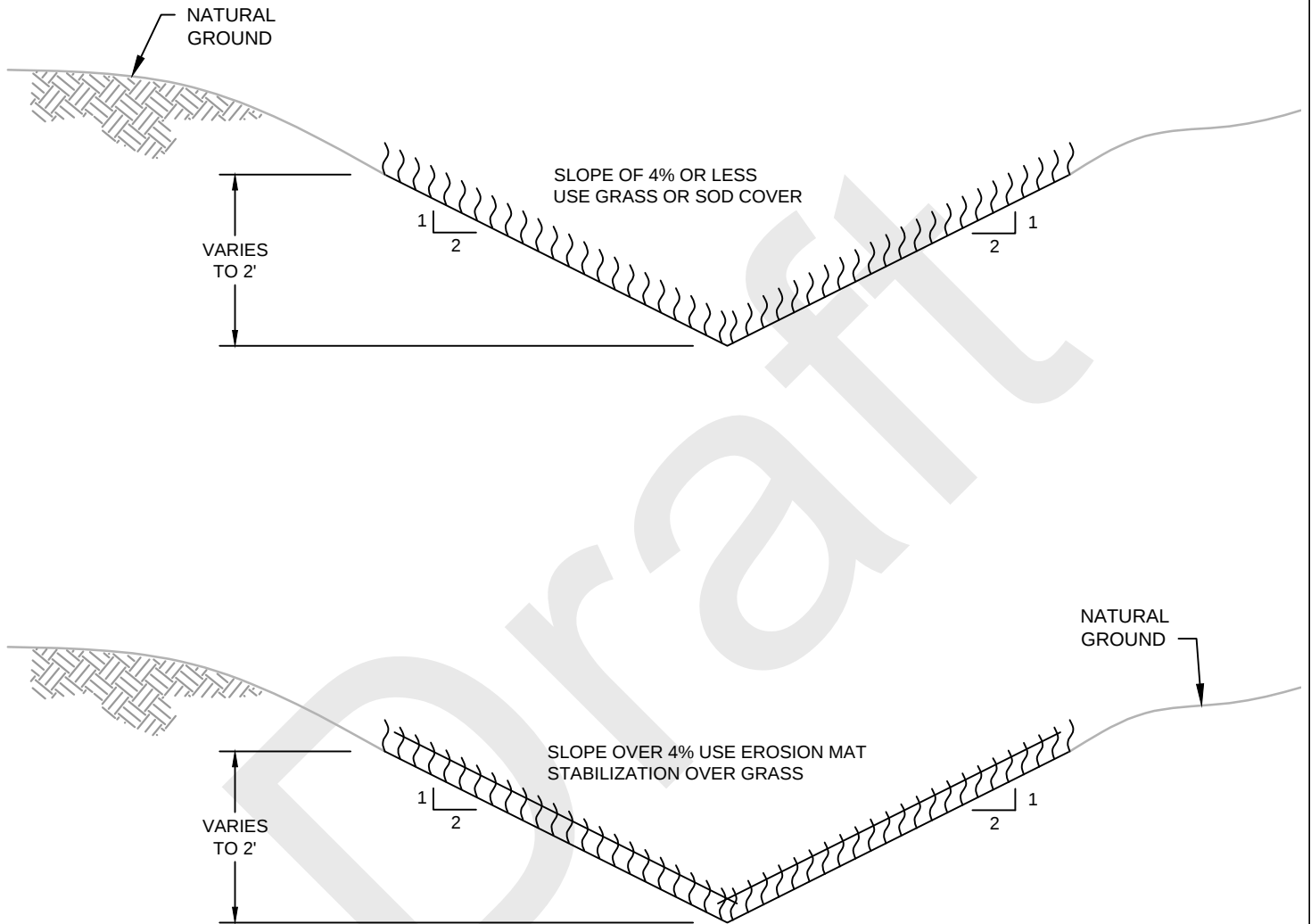
Design Guideline:

SECTION 4

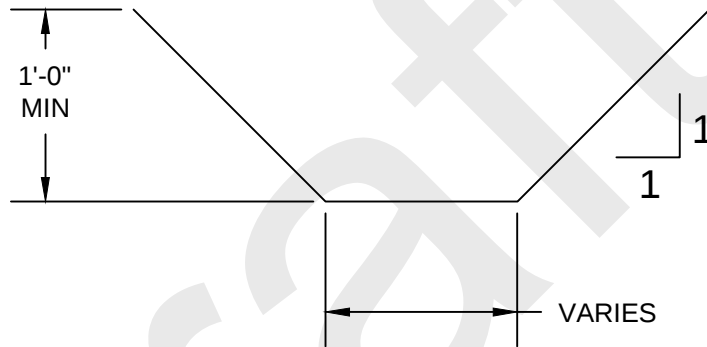
STORM DRAINAGE

Drawing No:

IV-5



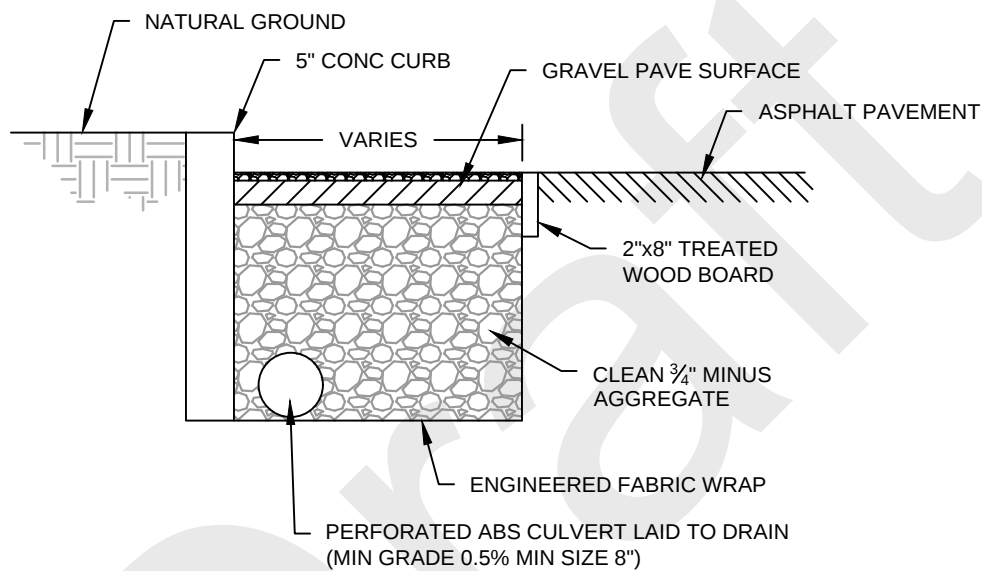
Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL DRAINAGE SWALE-GRASS OR TURF	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-6



NOTES:

1. VELOCITY LESS THAN 2 FPS - GRASS OR TURF
2. VELOCITY 2-5 FPS - TURF AND EROSION MAT
3. VELOCITY OVER 5 FPS - RIP-RAP MIN SIZE 3" SMALLEST DIMENSION

Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL OPEN DRAINAGE CHANNEL	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-7

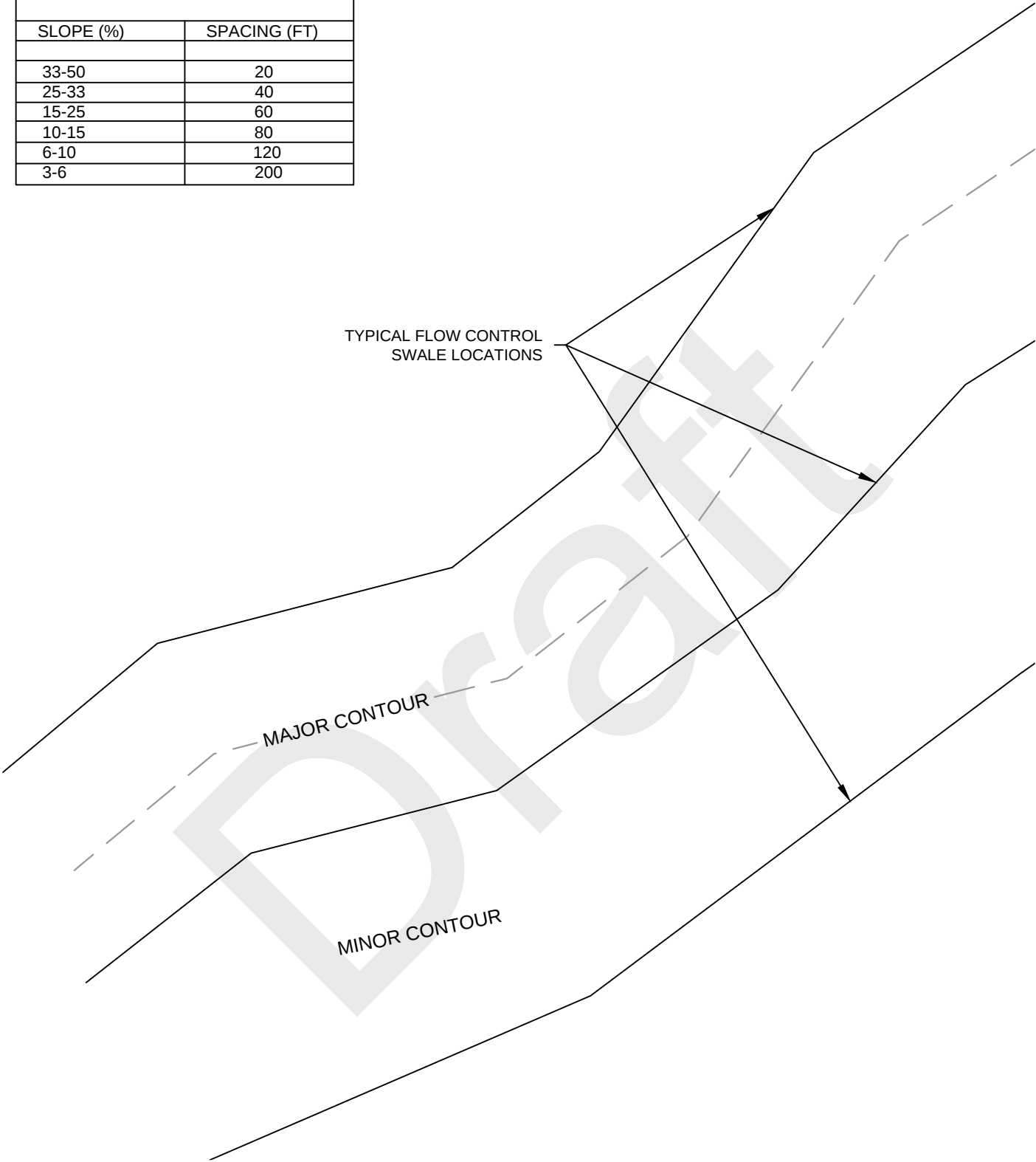


NOTES:

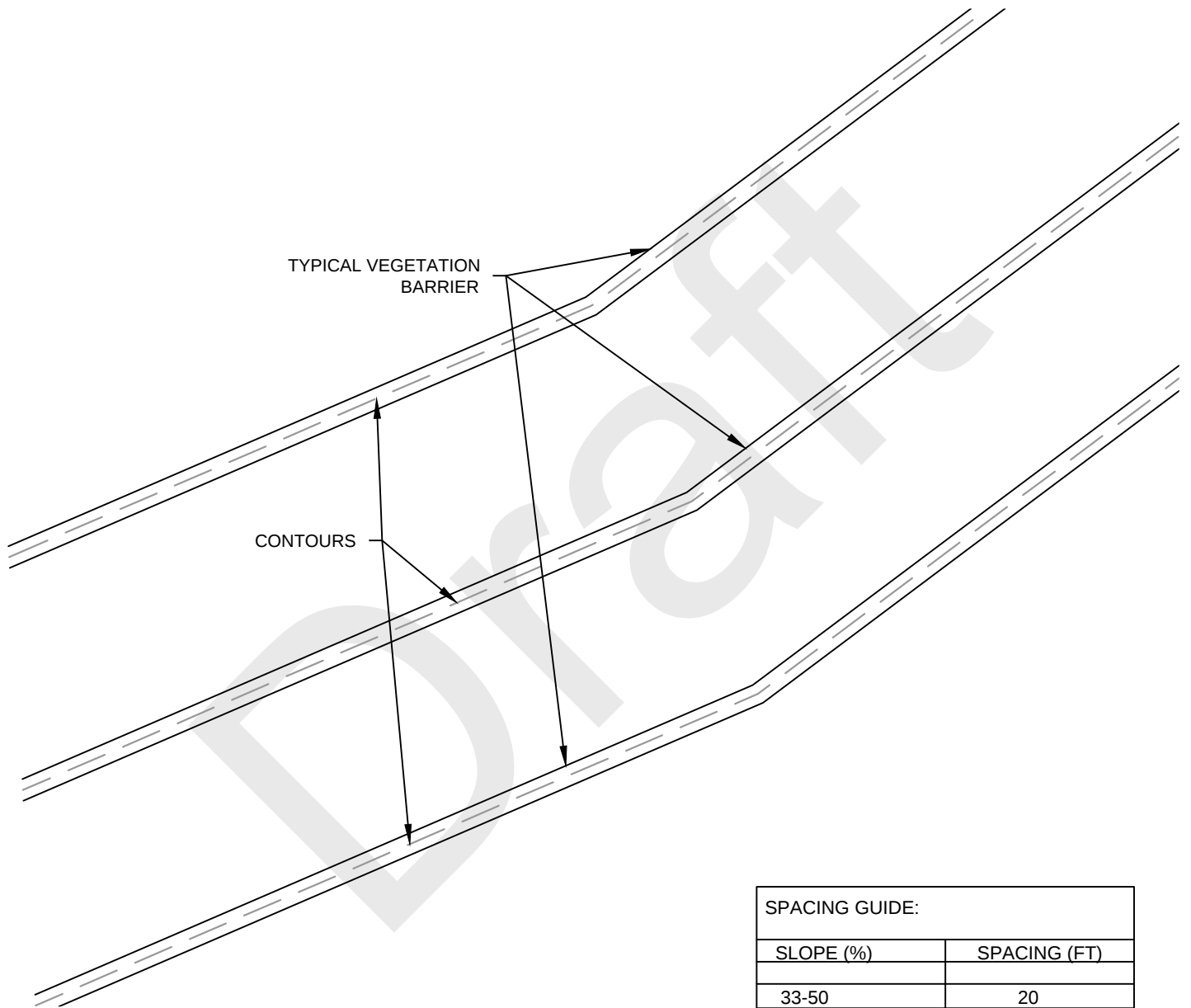
1. WIDTH VARIES DEPENDENT UPON DRAINAGE AREA (PER MANUFACTURES RECOMMENDATION - 0.25 GPM/SF TARGET VALUE)
2. DIAMETER OF DRAIN DEPENDS ON FLOW
3. DEPTH DEPENDS ON SIZE OF DRAIN - MIN 16"

Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL FILTER STRIP	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-8

SPACING GUIDE:	
SLOPE (%)	SPACING (FT)
33-50	20
25-33	40
15-25	60
10-15	80
6-10	120
3-6	200

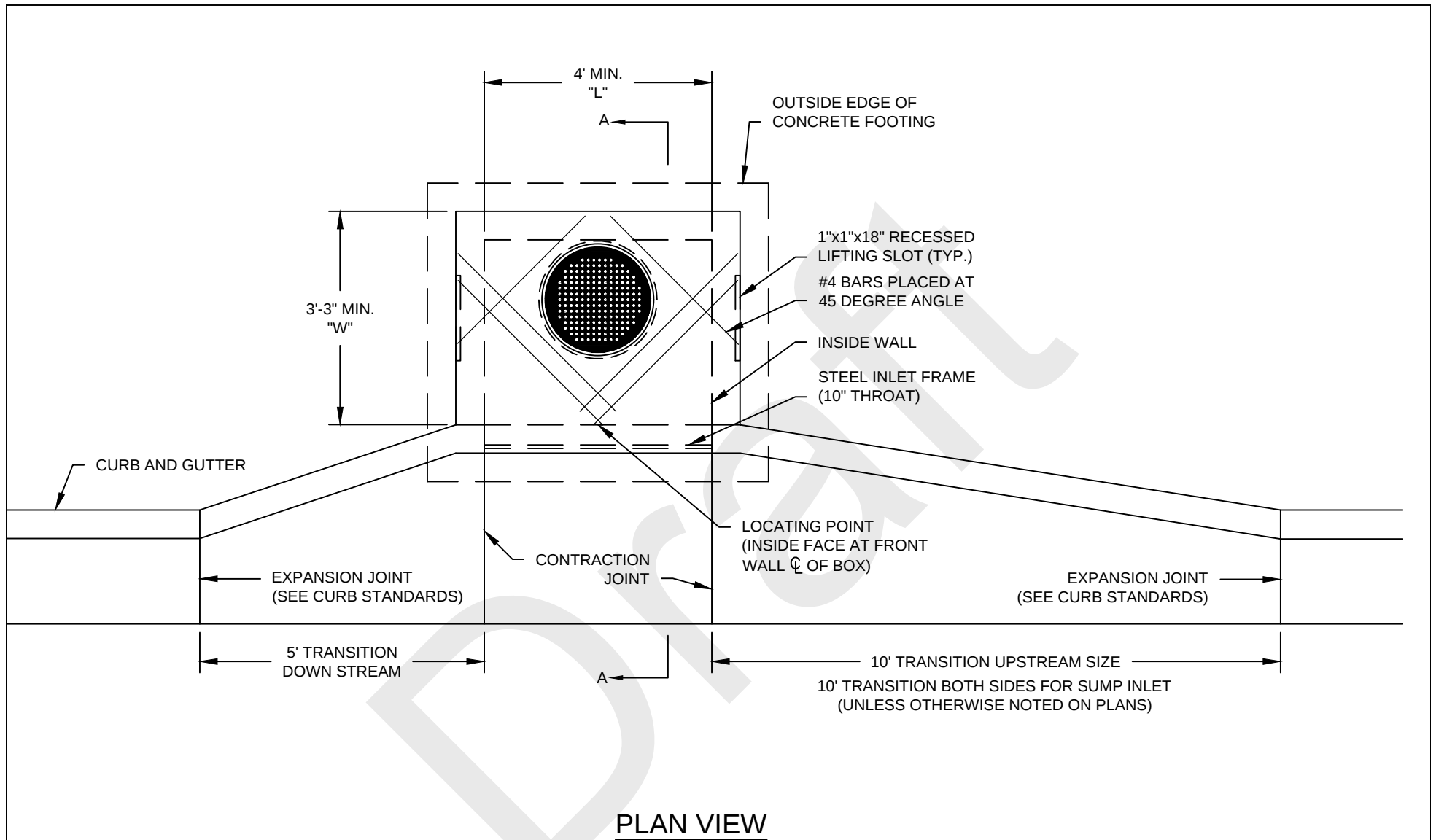


Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL SWALE LOCATION	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-9

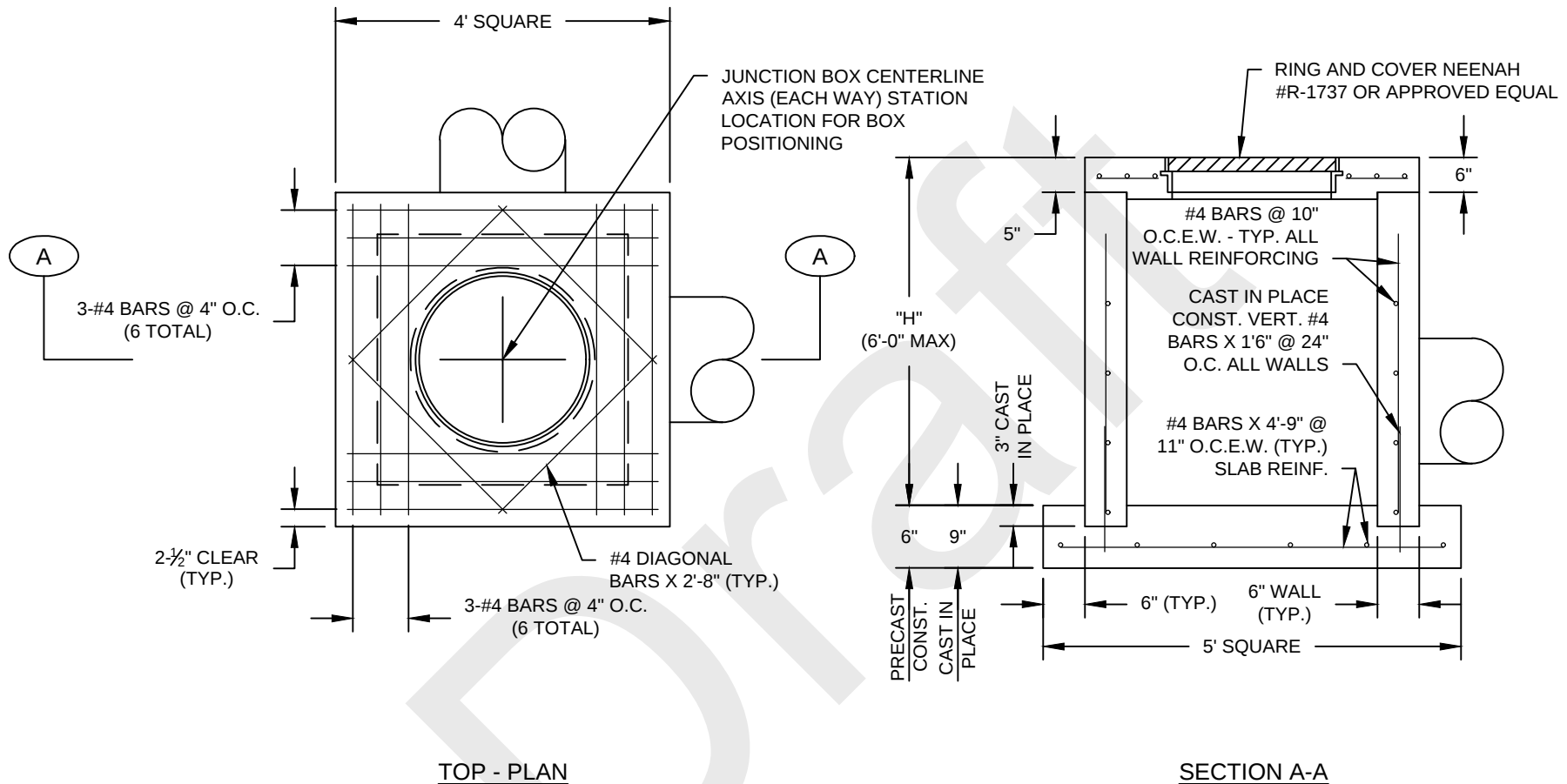


SPACING GUIDE:	
SLOPE (%)	SPACING (FT)
33-50	20
25-33	40
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10-15	80
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3-6	200

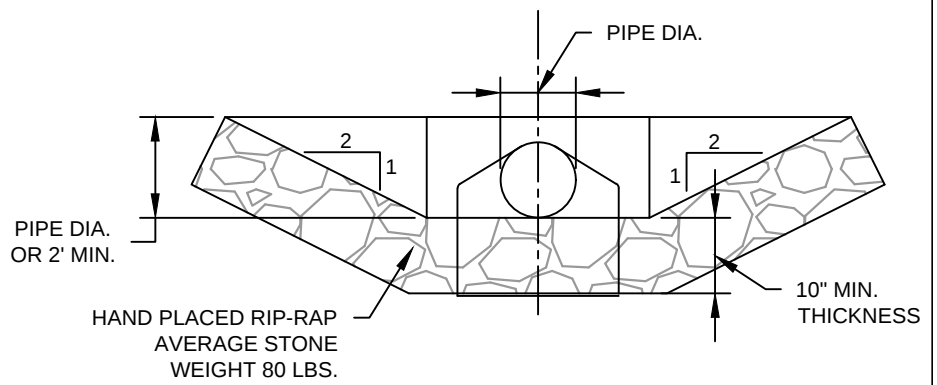
Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL VEGETATION BARRIER LOCATION	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-10



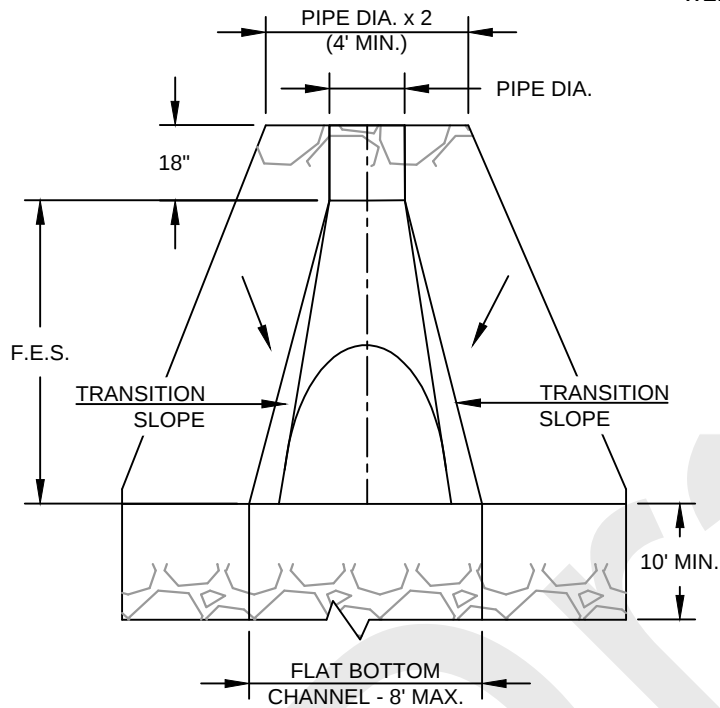
Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL CURB INLET	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-11



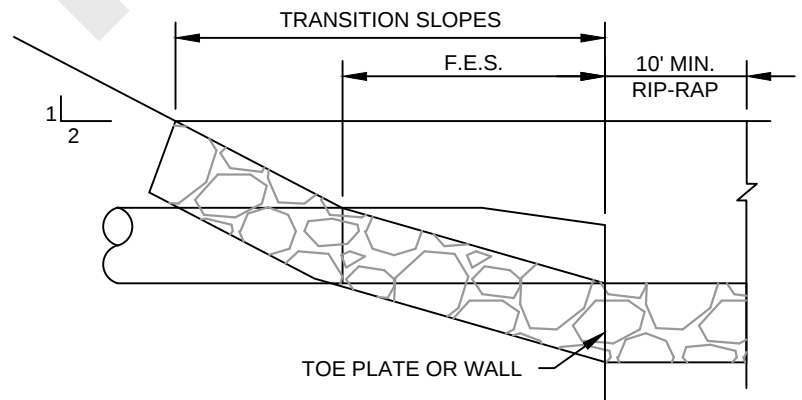
Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL JUNCTION BOX	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-13



END

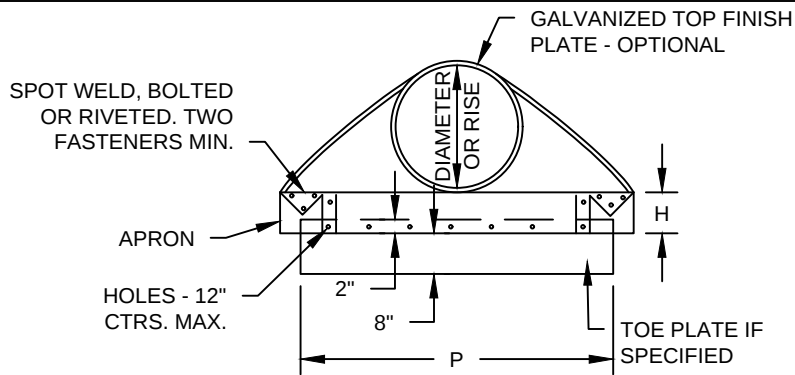


PLAN

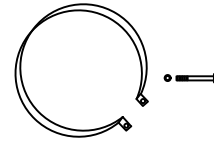


SECTION

Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL FLARED END SECTION w/ RIP RAP	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-14

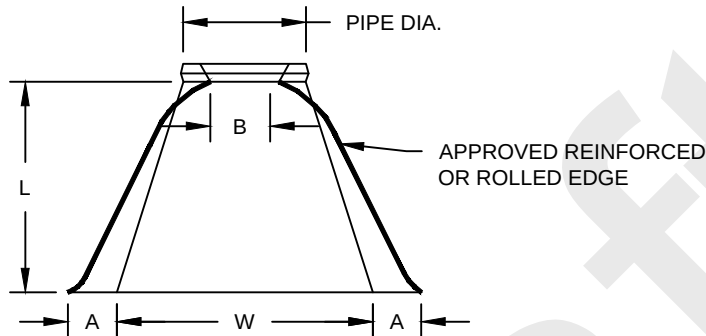


ELEVATION



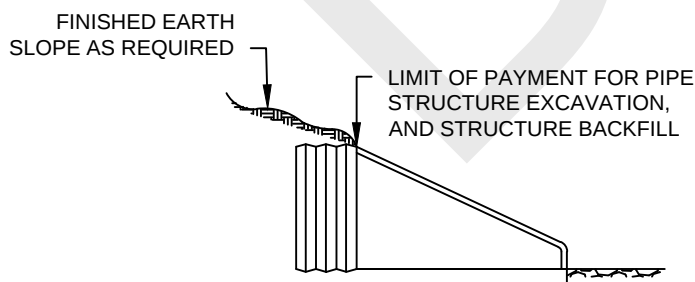
1 INCH WIDE 0.109" THICK CONNECTOR STRAP OF COMMERCIAL QUALITY STEEL. GALVANIZED WITH SAME WEIGHT COATING AS PIPE, AND 6" x 1/2" GALVANIZED BAND BOLT AND NUT. USE AS ALTERNATE ON CONNECTION.

CONNECTOR STRAP

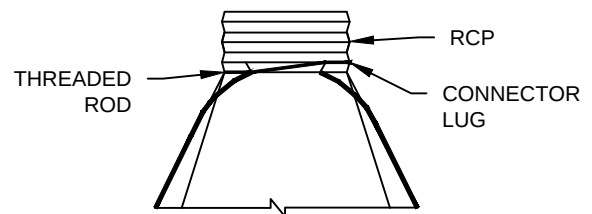


PLAN

END SECTION FOR ROUND PIPE								
PIPE DIA. (IN)	GALV. SHEET THICK (IN)	DIMENSIONS (IN)					APPROXIMATE SLOPE (V:H) (1:SLOPE)	TOE PLATE IF SPECIFIED P (IN)
		A 1" TOL.	B MAX.	H 1" TOL.	L 1-1/2" TOL.	W 2" TOL.		
18	0.064	8	10	6	31	36	2 - 1/2	46
21	0.064	9	12	6	36	42	2 - 1/2	52
24	0.064	10	13	6	41	48	2 - 1/2	58



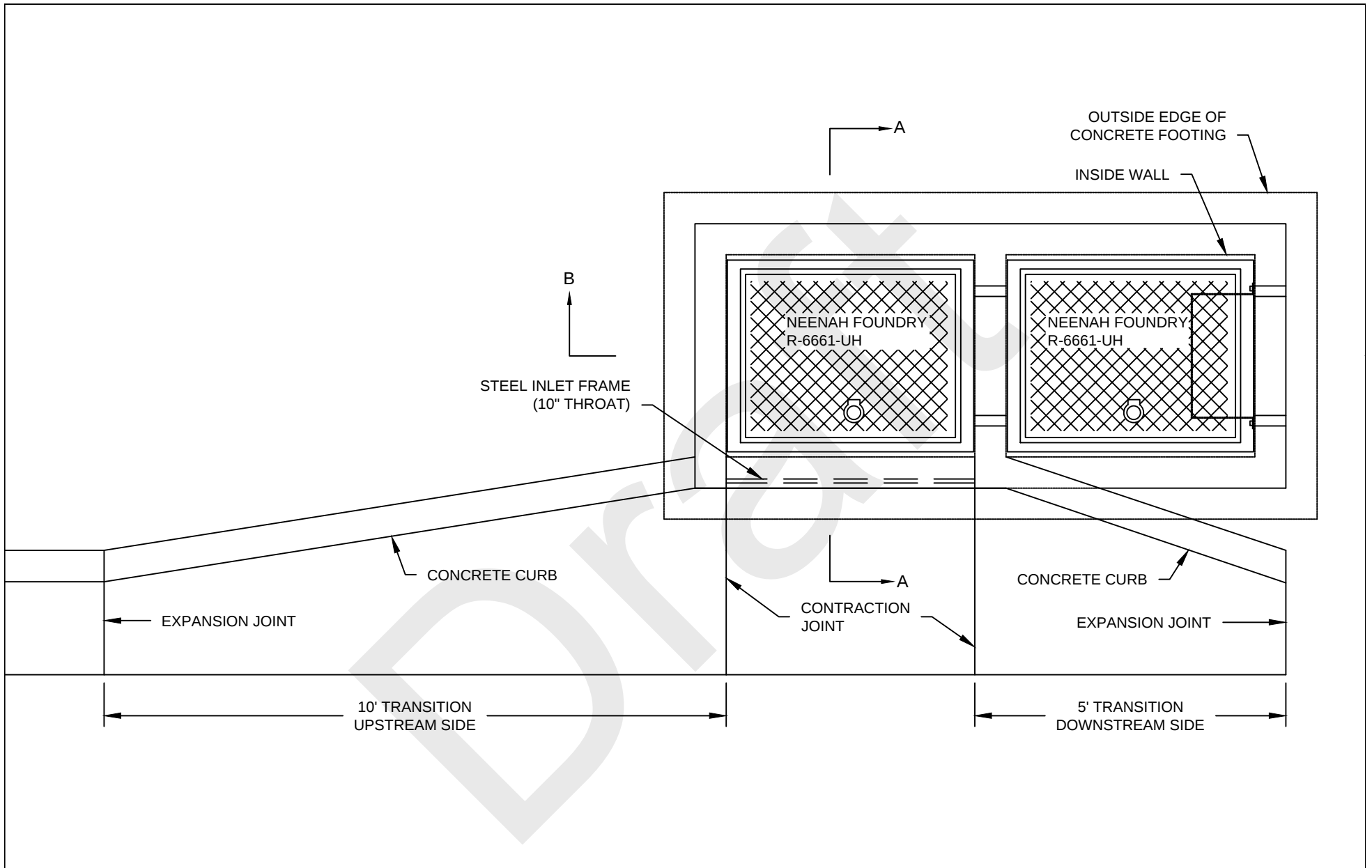
TYPICAL CROSS-SECTION



FOR 12" THRU 24" ROUND PIPE ONLY

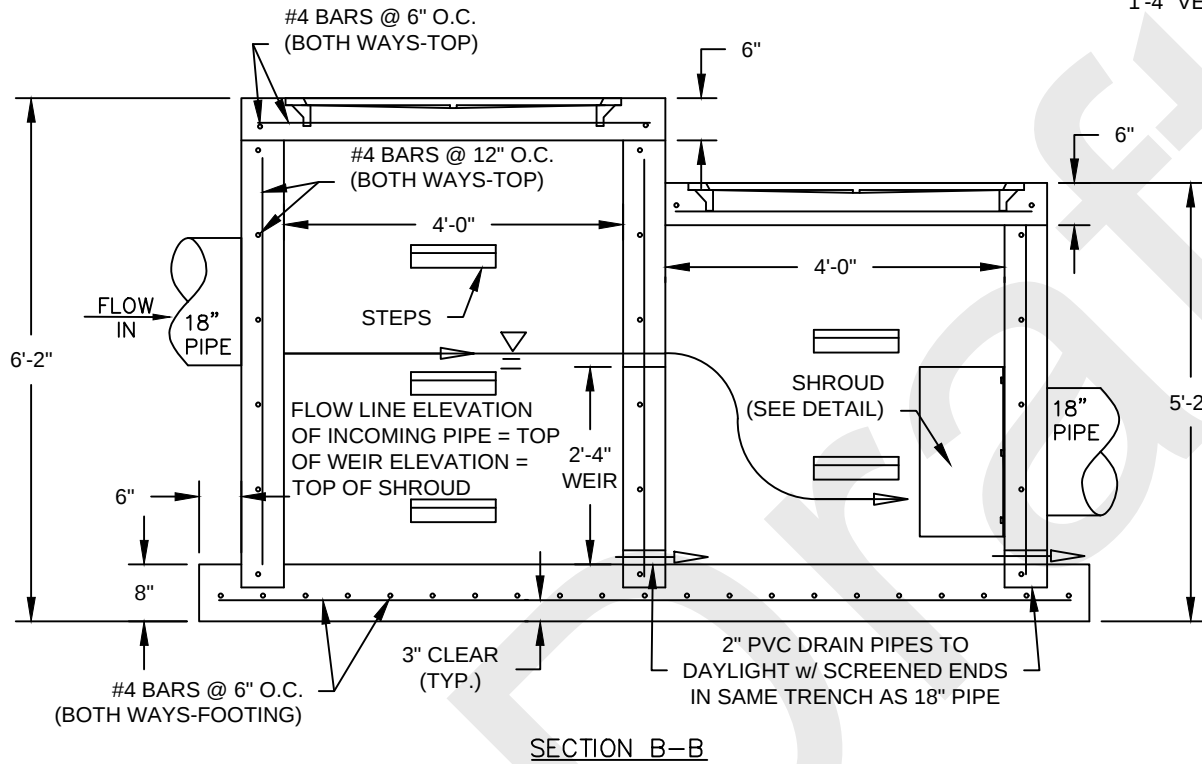
CONNECTION

Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL FLARED END SECTION	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-15

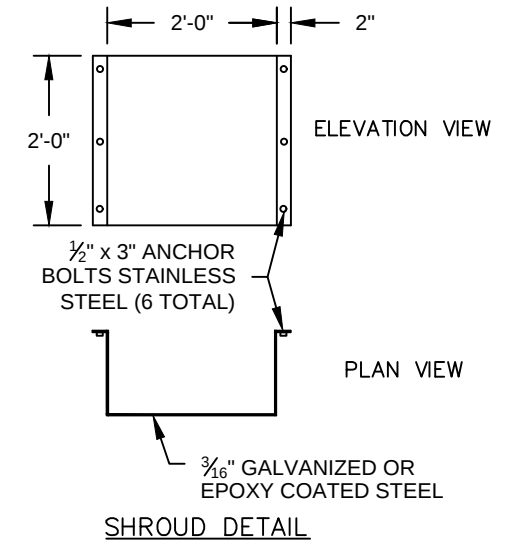
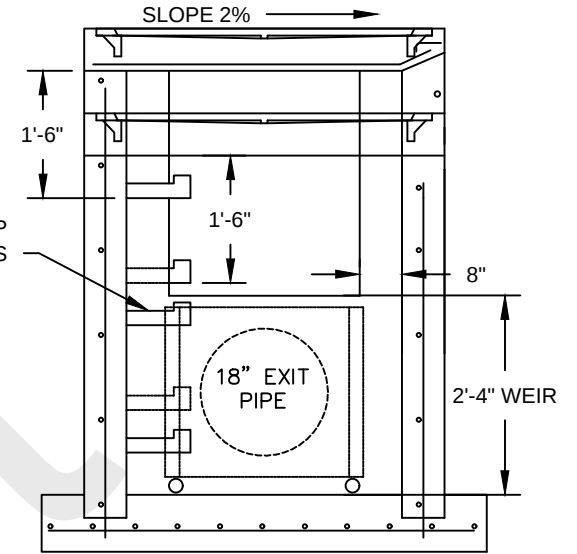


Date Revised: March, 2014	CITY OF OSAGE BEACH TYPICAL DETAIL DISSIPATION BOX	Design Guideline: SECTION 4
By: SH		STORM DRAINAGE
Checked By: JB		Drawing No: IV-16

- NOTE:
1. BEVEL ALL EXPOSED EDGES WITH
 $\frac{3}{4}$ " CHAMFER OR $\frac{1}{2}$ " TOOLED EDGE.



CAST IRON STEP
1'-4" VERT. CTRS



Date Revised:
March, 2014

By:
SH

Checked By:
JB

CITY OF OSAGE BEACH TYPICAL DETAIL DISSIPATION BOX

Design Guideline:
SECTION 4

STORM DRAINAGE

Drawing No:
IV-17

Design Guidelines
City of Osage Beach
SECTION 6 – ROAD CUT, UTILITY TRENCH AND EXCAVATION PERMIT
(Revised October 2023)

OVERVIEW

This guideline pertains to all encroachments into the City of Osage Beach street right-of-ways, street easements and utility easements including: intersections with new roadways to be dedicated to the city, private roadways or parking areas, driveways, trenches for underground utilities such as water or sewer lines and any other underground utility, aerial utility lines, and roadway appurtenances.

PERMITS

- A. A City of Osage Beach Road Cut and Utility Trench Permit is required prior to any encroachments into or over city right-of-ways or easements.
- B. A City of Osage Beach Excavation Permit is required for any excavation of more than 50 cubic yards and/or cut or fill which change existing elevations by more than two feet.

GENERAL

- A. Timely notice of work is required:
 - 1. The applicant shall notify the city Building Official not less than twenty-four (24) hours in advance of any work in the city right-of-way or easements.
 - 2. Additional notice shall be given to the City Building Official by telephone (573-302-2030) four (4) hours prior to actual excavation so that a City Inspector can be dispatched to carry out the required inspection.
 - 3. As a general rule inspections will not be made on weekends or official city holidays. In the case of an emergency good judgment shall rule.
- B. Timely completion of the work is required:
 - 1. Disruption of public access or use shall be minimized to the maximum extent practicable.
 - 2. Work within the city right-of-way or easement shall be done on a continuous basis, i.e.: once work is started it shall be continuous during normal work hours on a continual basis until completed.
 - 3. Leaving open trenches or other excavations for more than forty-eight (48) hours is prohibited.
- C. Traffic control, signs, and barricades:
 - 1. All open trenches or excavations within street right-of-ways or easements shall be provided with appropriate warning signs and barricades.

SECTION 6 – ROAD CUT, UTILITY TRENCH AND EXCAVATION PERMIT

2. If street traffic is interfered with appropriate flagman shall be provided.
3. All traffic control activities and devices shall conform to the U. S. Department of Transportation Manual of Uniform Control Devices.
4. If the excavated trench is to remain open or surface repairs to the street not completed prior to darkness appropriate warning lights shall be provided.
5. The applicant shall maintain all traffic control devices for the duration of the work.
6. At least one traffic lane shall be maintained in usable condition at all times.
7. All trenches within the traveled way shall be closed during nighttime hours.
8. No work will be permitted within the city right-of-way or easements over weekends or holiday periods.

INTERSECTIONS, PARKING AREAS, AND DRIVEWAYS

- A. Prior to construction for all proposed intersections with new streets, parking areas and driveways the applicant shall:
 1. Obtain an encroachment permit.
 2. Submit a drawing showing horizontal and vertical alignment of the intersecting facility and all storm drainage facilities.
- B. Intersecting streets and parking areas shall conform to the City of Osage Beach Design Standards for width, alignment, and grade.
 1. Intersecting streets and parking areas shall have curb and gutters.
 2. Streets, parking areas and driveways shall intersect perpendicular to the city street to the maximum extent practicable.
- C. Minimum width for driveway entrances to commercial properties shall be twelve (12) feet for a one-way entrance and twenty-four (24) feet for two-way entrances. Minimum radius for flares shall be fifteen (15) feet.
- D. Driveways for private residences shall be a minimum of ten (10) feet of driving surface exclusive of flares. Minimum radius for flares shall be ten (10) feet.
- E. All entrances into city streets shall be designed and constructed to accommodate storm drainage run-off.
 1. Appropriate catch drains shall be provided to accommodate run-off from or into driveways.
 2. Where roadway ditches exist on the city street appropriate culverts, swales, or slotted drains shall be provided.

UTILITY TRENCHES

A. Utility trenches traversing under a city roadway.

1. Saw cut all pavement surfaces.
2. All utility lines, except storm sewer, across city right-of-ways shall be incased in Schedule 40 or SDR 21 PVC sleeve.
3. The sleeve shall be not less two inches in inside diameter larger than the maximum outside diameter of the widest dimension of the utility duct or pipe to be run through the sleeve.
4. The minimum depth of cover of the sleeve shall be:
 - a. In accordance with Section 2 - Water Systems for waterlines
 - b. In accordance with Section 3 - Sewerage Design for sanitary sewer
 - c. In accordance with Section 4 - Storm Drainage for storm sewer
 - d. 36 inches below finished pavement grade for all others or as described in this Section.
- ~~5. The maximum depth of cover shall be in accordance with the appropriate section for the utility. The maximum depth of cover for all water and sewer lines shall be eight (8) feet unless specifically authorized in writing by the City Engineer.~~
 - ~~a. In accordance with Section 2 - Water Systems for waterlines~~
 - ~~b. In accordance with Section 3 - Sewerage Design for sanitary sewer~~
6. Select Backfill shall be installed:
 - a. From six inches below the utility to eighteen inches below the finished pavement grade for water, pressure sewer and primary power lines.
 - b. From four inches below the utility to 9 inches below the finished pavement grade for storm sewer and secondary power lines.

Select backfill shall be 95% of maximum density ~~nominal ½ inch minus~~ crushed rock conforming to MoDOT ~~Type V aggregate, Section 1007. 1004, Grade D, Chat, pea gravel or Osage River Sand. Any material used shall have a PI of six or less.~~ Trench backfill material shall not contain any material with a nominal particle size greater than six (6) inches.

7. Concrete Backfill:
 - a. Shall be installed from three inches below finished pavement grade to the top of the Select Backfill.
 - b. The top six inches of the concrete backfill shall be extended not less than twelve inches on each side of the utility trench.
 - c. Shall conform to MDOT Section 501, Concrete.

SECTION 6 – ROAD CUT, UTILITY TRENCH AND EXCAVATION PERMIT

- 1) Concrete shall be Class A-1
- 2) Course aggregate shall be Gradation B
- 3) Fine aggregate shall be Class A
- 4) Cement shall be either Type I or III.
- 5) An accelerator may be used in conformance with MoDOT Section 1054.5.

8. Asphalt Pavement

- a. Shall be installed from the surface to three (3) inches below finished grade.
- b. Asphalt pavement shall conform to MoDOT Section 403; Type 1B
- c. Asphalt cement shall be AC-30
- d. Concrete backfill as specified above maybe utilized in lieu of asphalt pavement with prior permission of the City Engineer.
- e. Finish Tolerance the surface of the finished roadcut shall not exceed ¼ inch below a ten (10) foot straight edge as measured below the straight edge.

B. Utility trenches paralleling under a city roadway or parking area.

1. Saw cut all pavement surfaces.
2. The minimum depth of cover shall be:
 - a. In accordance with Section 2 - Water Systems for waterlines
 - b. In accordance with Section 3 - Sewerage Design for sanitary sewer
 - c. In accordance with Section 4 - Storm Drainage for storm sewer
 - d. 24 inches below finished pavement grade for all others or as described in this Section.
3. Select Backfill shall be installed:
 - a. From six inches below the utility to three (3) inches below the finished pavement grade.
 - b. Select backfill shall be 95% of maximum density ~~nominal ½ inch minus~~ crushed rock conforming to MoDOT Type V aggregate, Section 1007. ~~1004, Grade D, Chat, pea gravel or Osage River Sand. Any material used shall have a PI of six or less. Trench backfill material shall not contain any material with a nominal particle size greater than six (6) inches.~~
4. Asphalt Pavement
 - a. Shall be installed from the surface to three (3) inches below finished grade.
 - b. Asphalt pavement shall conform to MoDOT Section 403; Type 1B
 - c. Asphalt cement shall be AC-30

SECTION 6 – ROAD CUT, UTILITY TRENCH AND EXCAVATION PERMIT

- d. Concrete backfill as specified above maybe utilized in lieu of asphalt pavement with prior permission of the City Engineer.
- e. Finish Tolerance the surface of the finished roadcut shall not exceed ¼ inch below a ten (10) foot straight edge as measured below the straight edge.

C. Utility trenches out of traffic area

1. The minimum depth of cover shall be:
 - a. In accordance with Section 2 - Water Systems for waterlines
 - b. In accordance with Section 3 - Sewerage Design for sanitary sewer
 - c. In accordance with Section 4 - Storm Drainage for storm sewer
 - d. 24 inches below finished pavement grade for all others or as described in this Section.
3. Select Backfill shall be installed:
 - a. In accordance with Section 2 - Water Systems for waterlines
 - b. In accordance with Section 3 - Sewerage Design for sanitary sewer
 - c. In accordance with Section 4 - Storm Drainage for storm sewer
 - d. 6 inches below the utility line to 12 inches above the utility line for all others.
4. Backfill shall be granular material or select soil excavated from the trench, free of rocks over ½ 6 inch in least dimension, foreign material or frozen earth.
 - a. Backfill shall be compacted to 95% of optimum density at optimum moisture content.
 - b. The surface shall be graded to smooth flowing lines blending into surrounding slopes.
5. Restore disturbed surface area to pre-construction condition (seed & mulch, decorative rock, etc.).

~~D. Utility trenches more than 150 feet in length shall have an impervious clay or bentonite plug constructed at each terminus or intersection with other trenches to prevent water from following the trench line and creating drainage problems.~~

E. Underground Primary Power Trenches. All electrical power of 480 volts AC or more is considered “primary power”.

1. See Ameren Missouri Specifications for requirements.
2. Where underground primary power crosses city utilities, the primary power shall be a minimum of one-foot below.
3. Where primary power line parallels a city utility line it shall be separated by a minimum of four feet.

Design Guidelines
City of Osage Beach
SECTION 6 – ROAD CUT, UTILITY TRENCH AND EXCAVATION PERMIT

- F. Underground Secondary Power Trenches, all electrical power less than 480 volts.
1. See Ameren Missouri Specifications for requirements. Where secondary power will be owned by the City, the following shall apply:
 - a. Secondary power trenches shall be a minimum of twenty-four (24) inches of cover in depth.
 - b. An approved warning tape shall be installed twelve inches above the duct.
 - c. Underground secondary power ducts can be co-located with water or sewer lines if they are placed not less than one foot to the side and at or below the elevation of the water or sewer line.
 - d. Where secondary power crosses water or sewer lines, the power shall be in conduit and shall be a minimum of one-foot below water or sewer lines.

ROAD BORES

In all location where the utility is to be installed under a paved area that has been constructed within the previous five (5) years, as determined by the city engineer, a road bore shall be constructed. The minimum depth of the bore shall be thirty-six (36) inches. All bores shall be sleeved as specified above.

AERIAL UTILITIES

- A. Minimum vertical clearance for aerial utilities shall be a minimum of eighteen feet (18 ft. 0 in.) at the lowest point of crossing above the finished pavement grade of any city street.
- B. Utility poles shall not be located less than three (3) feet from the edge of pavement on city streets or parking areas.

ROADWAY APPURTENANCES

- A. Traffic control signs shall be installed in accordance with US Department of Transportation and Federal Highway Administrations Uniform Manual of Traffic Control Devices.
- B. Other signs.
 1. A City of Osage Beach Sign Permit is required for all signs within city right-of-ways or easements except traffic control signs.
- C. No sign shall be installed within three (3) feet of the edge of pavement.

Design Guidelines
City of Osage Beach
SECTION 6 – ROAD CUT, UTILITY TRENCH AND EXCAVATION PERMIT

D. Mailbox.

1. Mailboxes and/or newspaper boxes shall not be located within twelve (12) inches of the edge of pavement on city streets.
2. If the street has concrete curb and gutter the face of the mailbox shall not protrude into the roadway past the back of the curb.
3. Mail and newspaper boxes shall be removed within thirty days of cessation of delivery service. If the box is unused and not removed the city will remove it at the owner's expense.

E. Guard Rail or Crash Barrier

1. Shall only be installed at locations where a severe traffic safety hazard exists and only with the approval of the City Engineer.
2. Installation shall conform to MoDOT Specifications.

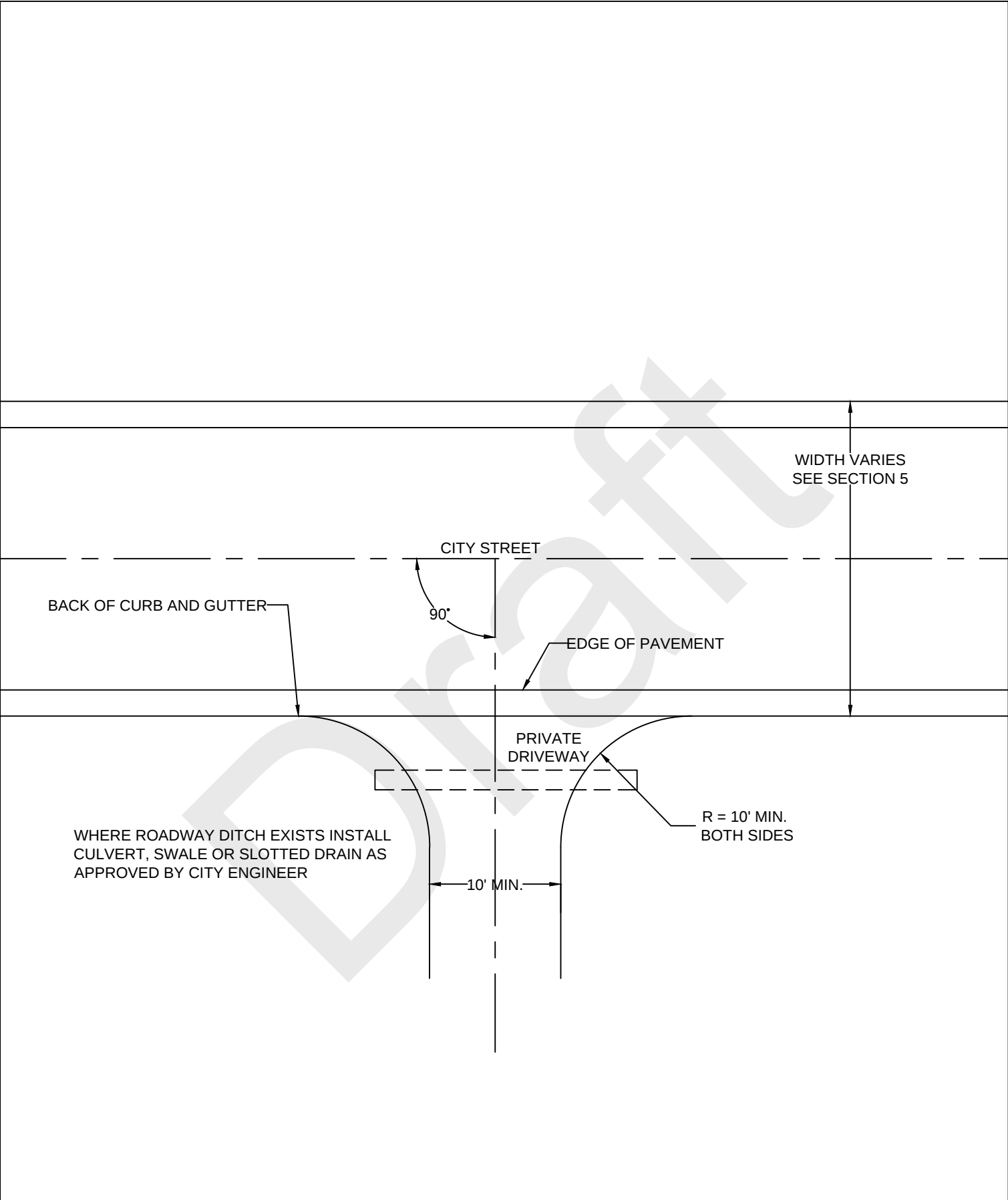
INSPECTIONS

During the progress of the work each utility line shall be inspected by the Engineering Department prior to trench backfill.

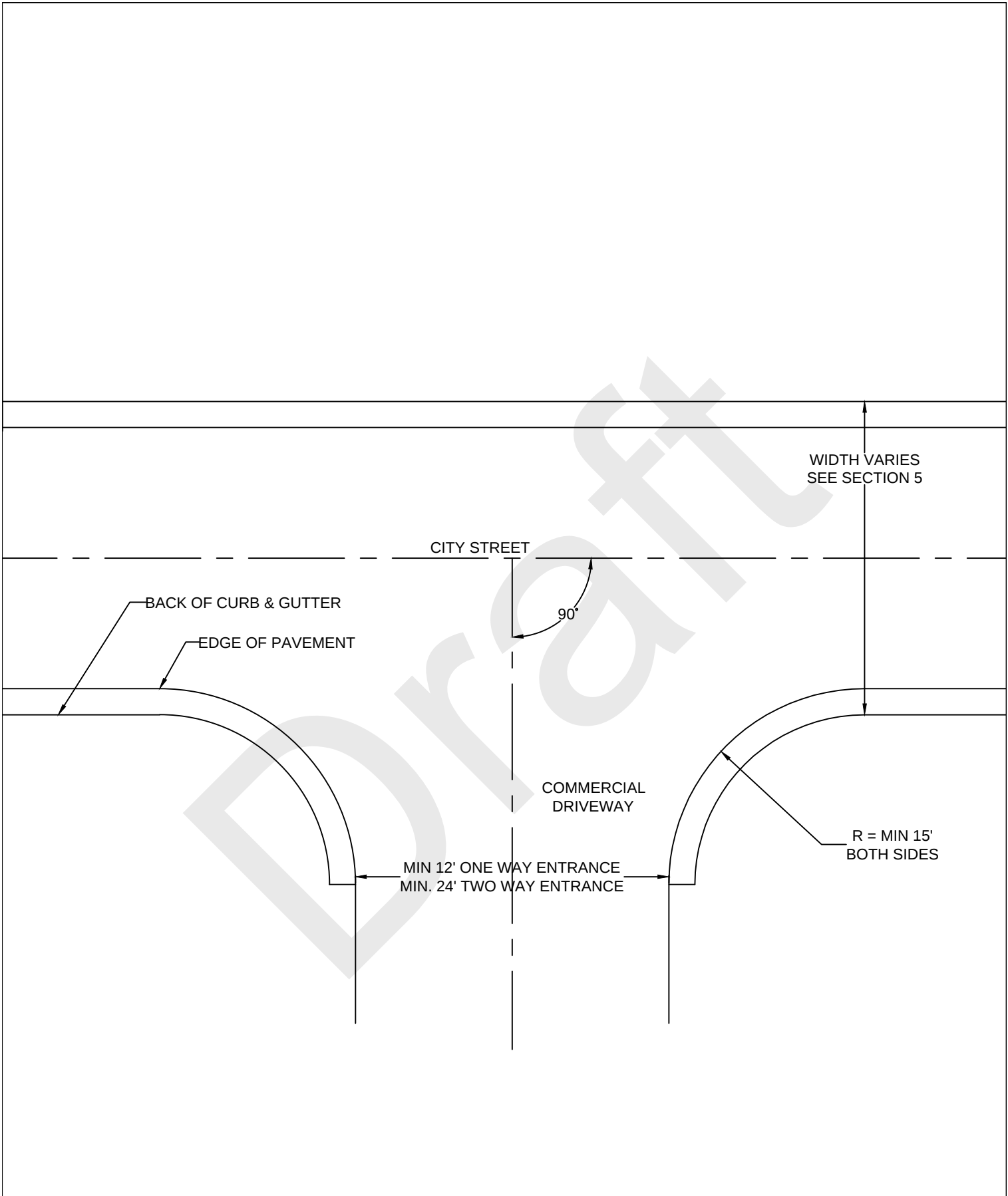
ROADCUT AND UTILITY TRENCH CONSTRUCTION DETAIL DRAWINGS

Construction details and sketches are attached.

END



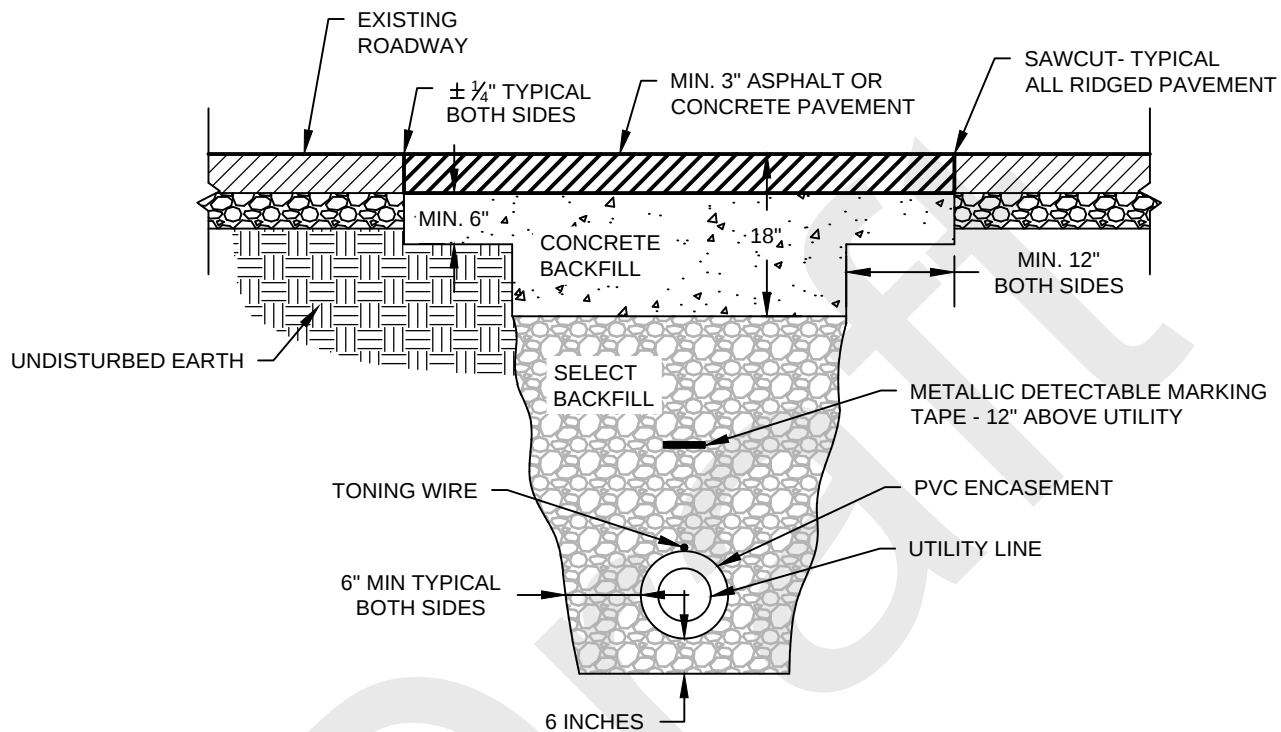
Date Revised: APRIL 2014	CITY OF OSAGE BEACH TYPICAL DETAIL PRIVATE RESIDENCE ENTRANCE INTERSECTING CITY STREET	Design Guideline: SECTION 6
By: JMY		ROAD CUTS, UTILITY TRENCHES, AND EXCAVATION
Checked By: SLB		Drawing No.: VI-1



Date Revised:	APRIL 2014
By:	JMY
Checked By:	SLB

CITY OF OSAGE BEACH TYPICAL DETAIL COMMERCIAL ENTRANCE INTERSECTING CITY STREET	Design Guideline:
	SECTION 6
	ROAD CUTS, UTILITY TRENCHES, AND EXCAVATION
May 9, 2024 Public Hearing: Design Guidelines and Code Ordinances Proposed Changes	

Drawing No.:	VI-2
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NOTE: SAWCUT SHALL BE CONTINUOUS WITH SMOOTH, TAPERED TRANSITIONS IN WIDTH IN ORDER TO MAINTAIN A CONSISTENT PAVEMENT RESTORATION WIDTH.

Date Revised:
APRIL 2014

By:
JMY

Checked By:
SLB

CITY OF OSAGE BEACH
TYPICAL DETAIL
UTILITY TRENCH TRAVERSING A
CITY ROADWAY

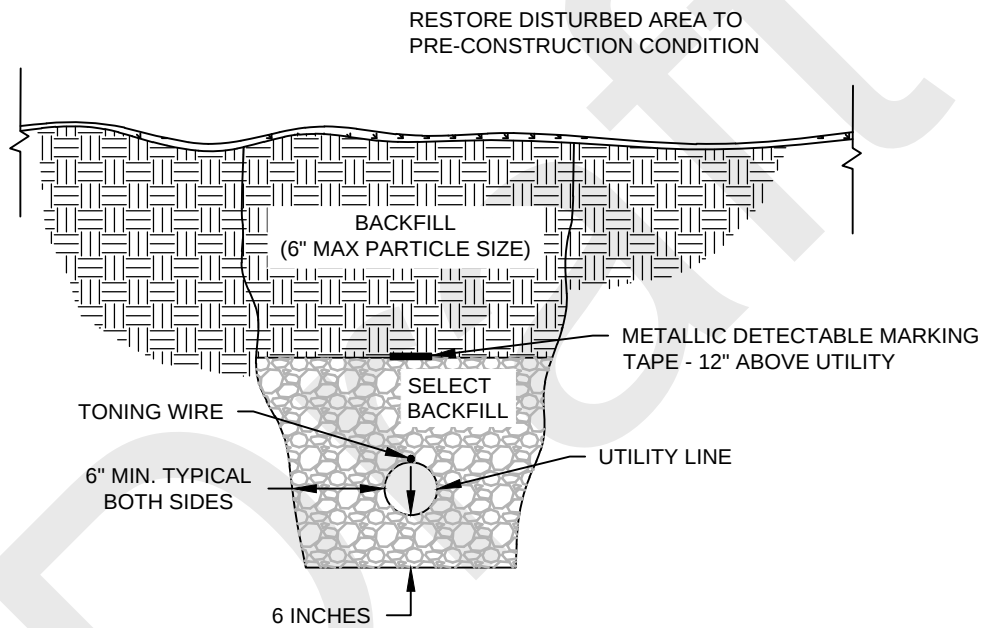
May 9, 2024 Public Hearing: Design Guidelines and Code Ordinances Proposed Changes

Design Guideline:
SECTION 6

ROAD CUTS, UTILITY
TRENCHES, AND EXCAVATION

Drawing No.:
VI-3

NOTE: THE MINIMUM DEPTH OF COVER VARIES
PER UTILITY. REFER TO INDIVIDUAL
SECTION FOR COVER REQUIREMENTS.



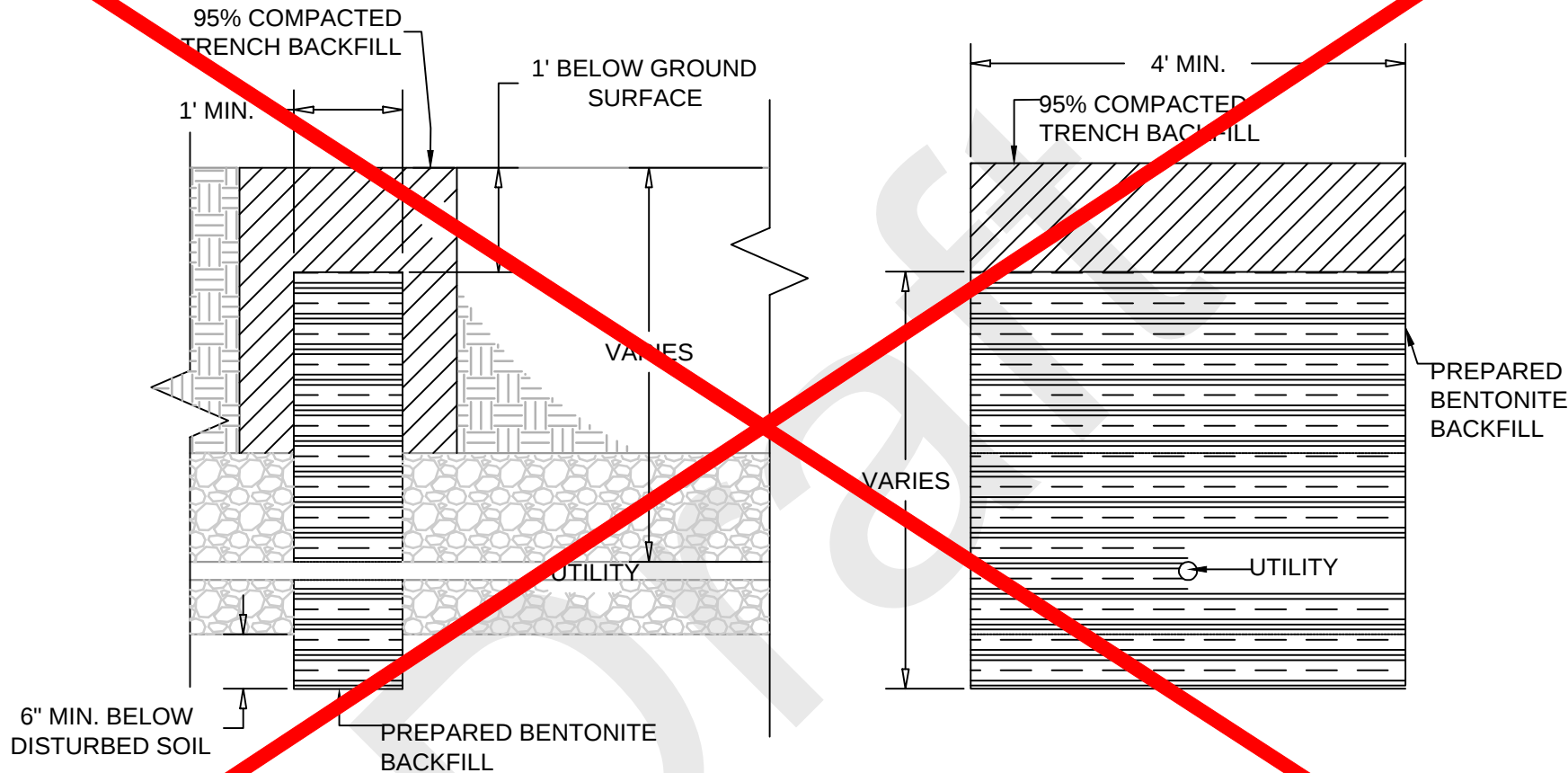
Date Revised:
APRIL 2014

By:
JMY

Checked By:
SLB

CITY OF OSAGE BEACH
TYPICAL DETAIL
UTILITY TRENCH OUT OF TRAFFIC AREA
May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes

Design Guideline:
SECTION 6
ROAD CUTS, UTILITY
TRENCHES, AND EXCAVATION
Drawing No.:
VI-5



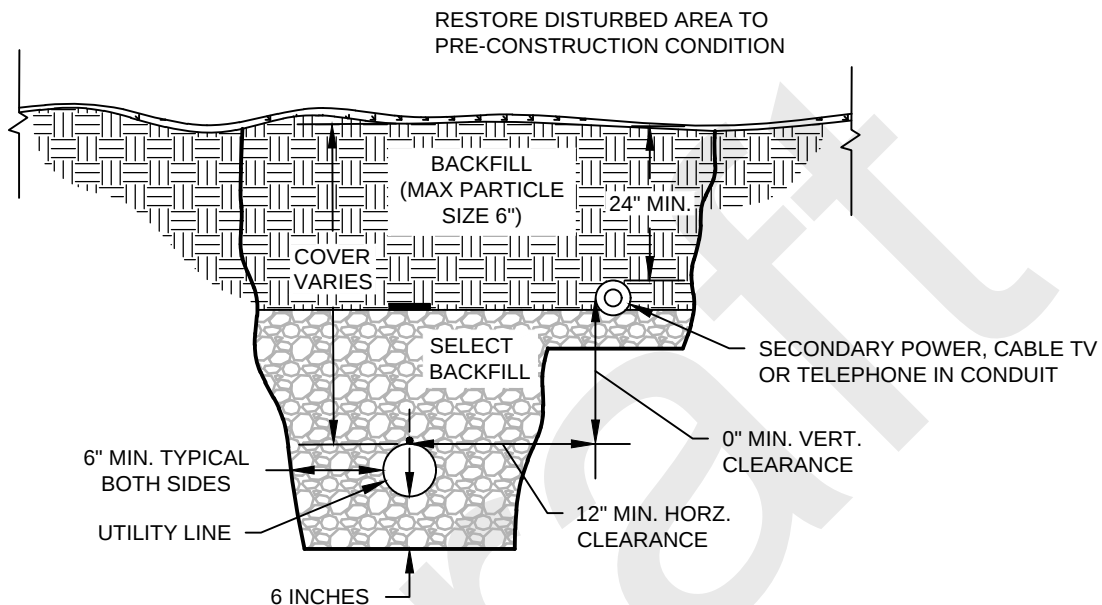
Date Revised:	APRIL 2014
By:	JMY
Checked By:	SLB

CITY OF OSAGE BEACH
TYPICAL DETAIL
BENTONITE PLUG

May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes

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Design Guideline:	SECTION 6
	ROAD CUTS, UTILITY TRENCHES, AND EXCAVATION
Drawing No:	VI-6



- NOTES:
1. WARNING TAPE TO BE PLACED 12" ABOVE BOTH UTILITIES.
 2. TONING WIRE TO BE PLACED TAPED TO THE TOP OF THE WATER/SEWER UTILITY.
 3. DETAIL IS FOR OUT OF TRAFFIC AREAS. IF UTILITIES ARE LOCATED WITHIN THE CITY STREET BACKFILL SHALL BE AS DETAILED IN TRAVERSING OR PARALLELING CITY ROADWAY WHICH EVER MAY APPLY.

Date Revised:
APRIL 2014

By:
JMY

Checked By:
SLB

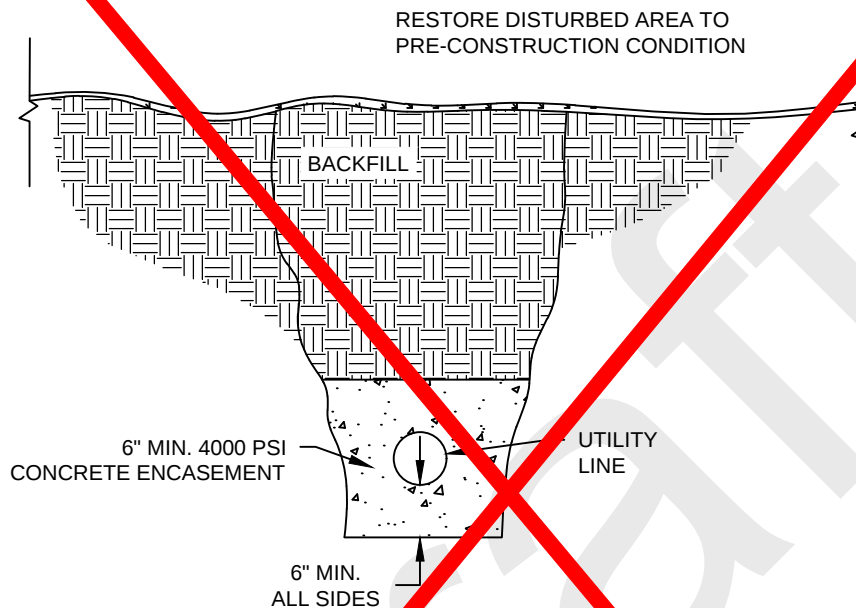
CITY OF OSAGE BEACH
TYPICAL DETAIL
WATER & SEWER IN SAME TRENCH AS
SECONDARY POWER

May 9, 2024 Public Hearing Design Guidelines and Code of Ordinances Proposed Changes

Design Guideline:
SECTION 6

ROAD CUTS, UTILITY
TRENCHES, AND EXCAVATION

Drawing No.:
VI-7



- NOTES:
1. BLOCK PIPE TO PROVIDE MINIMUM CLEARANCE INDICATED.
 2. INSTALL TIE DOWNS TO PREVENT FLOATING.
 3. MINIMUM DEPTH OF COVER VARIES PER UTILITY. REFER TO INDIVIDUAL SECTION FOR COVER REQUIREMENTS.
 4. DETAIL IS FOR OUT OF TRAFFIC AREAS. IF UTILITY IS LOCATED WITHIN THE CITY STREET BACKFILL SHALL BE AS DETAILED IN TRAVERSING OR PARALLELING CITY ROADWAY WHICH EVER MAY APPLY.

Date Revised:
APRIL 2014

By:
JMY

Checked By:
SLB

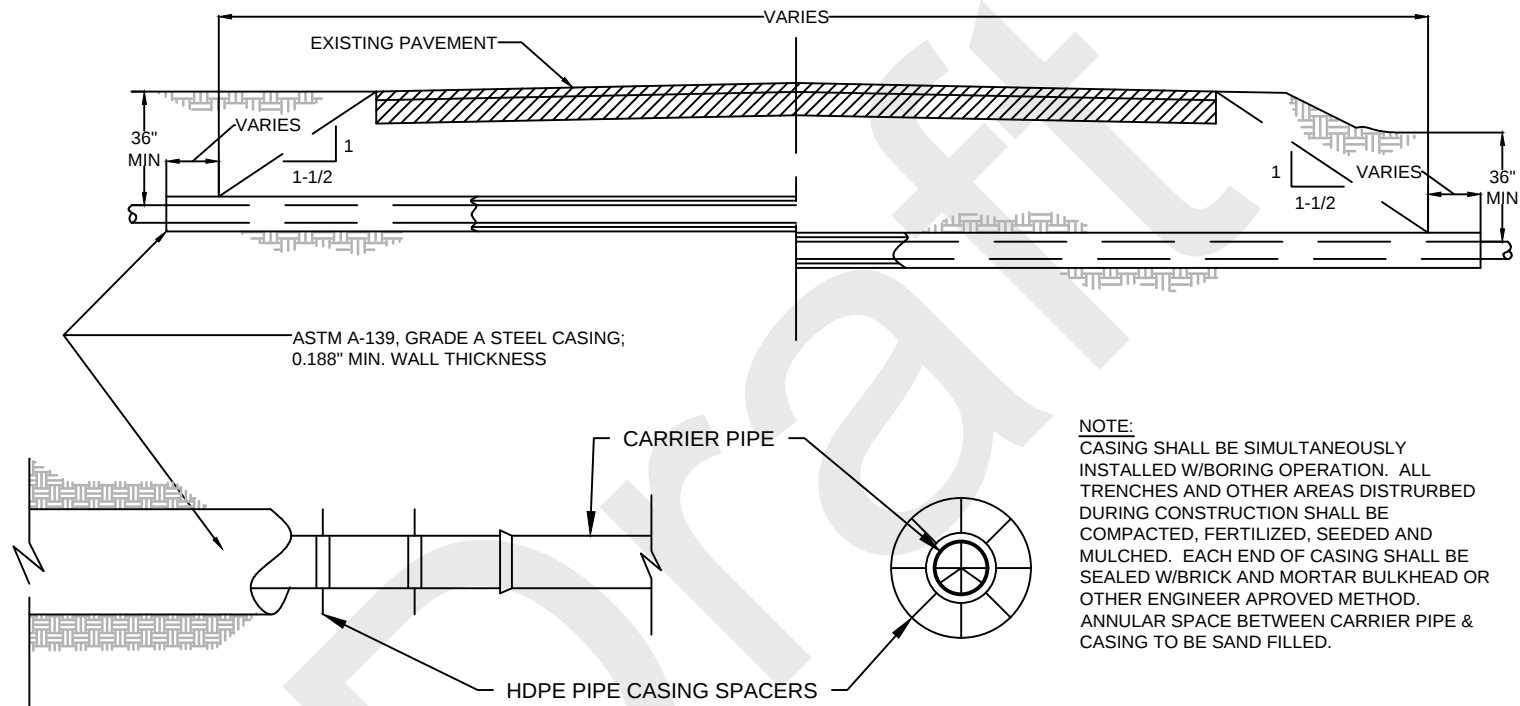
CITY OF OSAGE BEACH TYPICAL DETAIL CONCRETE ENCASEMENT

May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes

Design Guideline:
SECTION 6

ROAD CUTS, UTILITY
TRENCHES, AND EXCAVATION

Drawing No.:
VI-8



NOTE:
CASING SHALL BE SIMULTANEOUSLY
INSTALLED W/BORING OPERATION. ALL
TRENCHES AND OTHER AREAS DISTURBED
DURING CONSTRUCTION SHALL BE
COMPACTED, FERTILIZED, SEEDED AND
MULCHED. EACH END OF CASING SHALL BE
SEALED W/BRICK AND MORTAR BULKHEAD OR
OTHER ENGINEER APPROVED METHOD.
ANNULAR SPACE BETWEEN CARRIER PIPE &
CASING TO BE SAND FILLED.

Date Revised:
APRIL 2014

By:
JMY

Checked By:
SLB

CITY OF OSAGE BEACH TYPICAL DETAIL

HIGHWAY CROSSING BORE/ENCASEMENT

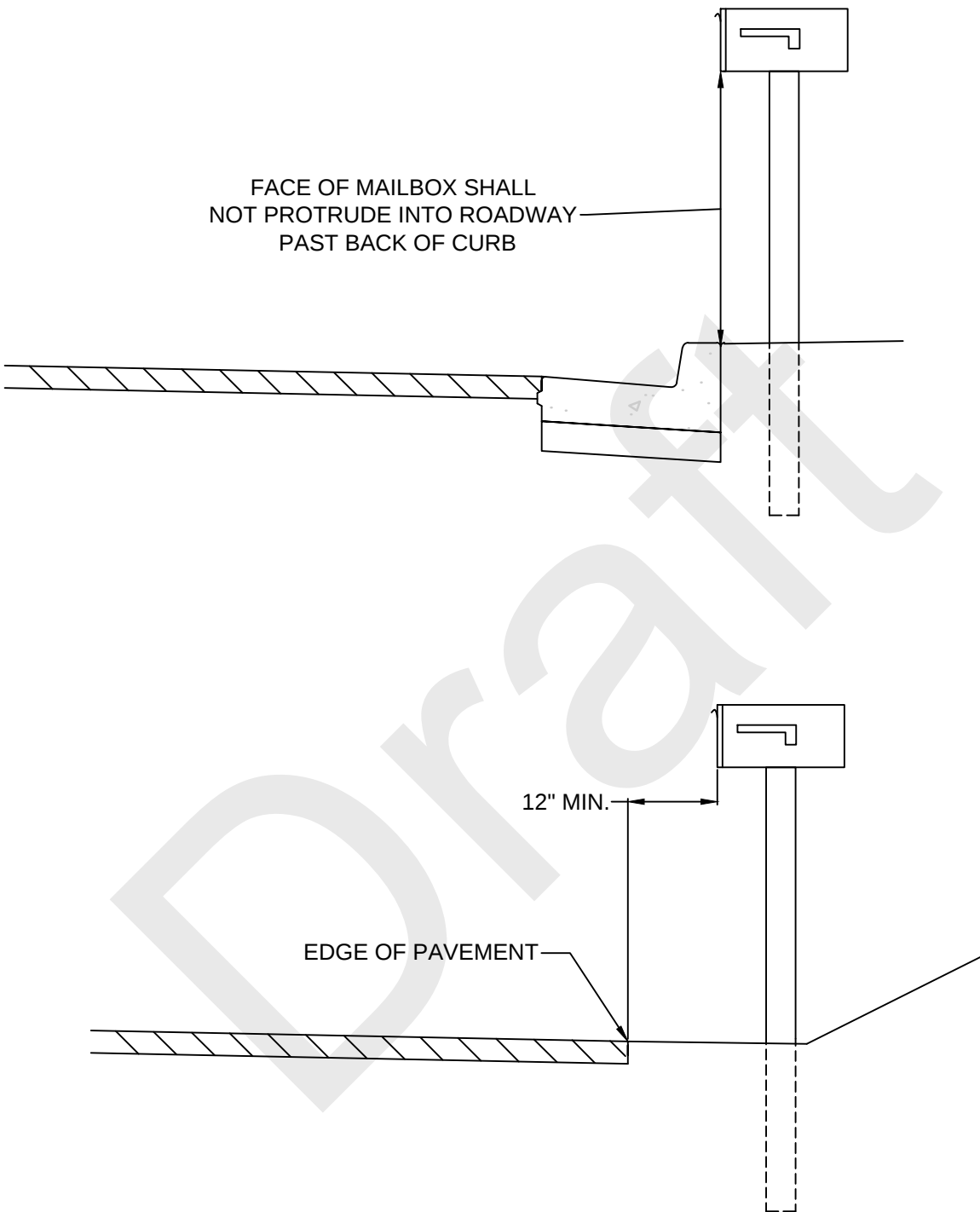
May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes

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Design Guideline:
SECTION 6

ROAD CUTS, UTILITY
TRENCHES, AND EXCAVATION

Drawing No:
VI-9



Date Revised:	APRIL 2014
By:	JMY
Checked By:	SLB

CITY OF OSAGE BEACH TYPICAL DETAIL MAILBOX LOCATION	
May 9, 2024 Public Hearing: Design Guidelines and Code of Ordinances Proposed Changes	

Design Guideline:	SECTION 6
	ROAD CUTS, UTILITY TRENCHES, AND EXCAVATION
Drawing No.:	VI-10

City Code Title VII Utilities – Article III Water Service Connection To City Water System

Section 705.250 Meter Installation and Maintenance.

- A. The City shall determine the location of the meter to be installed. The location of the meter must be in a location that is acceptable, convenient, and as close as possible to the customer's property line.
- B. The City will provide and install the water meter.
- C. The costs and expenses to provide an acceptable tap on the City's water main shall be borne by the applicant. A meter fee shall be paid by the applicant for each water connection and includes the cost of ~~materials, the meter and meter setting,~~ and labor provided by the City. The applicant shall perform all work, including excavation, backfill, restoration, and installation of the building service line.
- D. Unless otherwise determined by the City, each premises shall be supplied through a separate meter or, if necessary and at the option of the Building Official, through a separate battery of meters. Where a battery of meters is installed, the registration of such meters shall be combined for billing purposes and shall be subject to a minimum charge equal to the sum of the minimum charged for the meters comprising the battery setting. Where, however, a premises is supplied through more than one (1) service, unless otherwise provided for in contracts entered into therefor, the registration of the meter installed on each such service shall be billed separately, subject to the minimum charge for each meter.
- E. The customer shall promptly notify the City of any defect in or damage to the meter or its connection.

City Code Title VII Utilities – Article IV Rates and Charges

Section 705.310 Water Fees.

- A. Meter fees shall be paid by the applicant for each water connection.
- B. The fee includes cost of ~~the meter materials and labor provided by the City which includes the meter and meter setting.~~ The applicant shall perform all work, including excavation, backfill, restoration, and installation of the building service line.
- C. Meter fees are based on the actual cost of the meter.

City Code Title VII Utilities – Article III Building Sewers and Connections

Section 710.190 Connection Costs and Liabilities.

- A. The costs and expense incidental to the building sewer installation and connection to the City's wastewater facilities shall be borne by the owner. The owner shall indemnify the City from any loss or damage that may directly or indirectly be occasioned by the installation of the building sewer.
- B. All pumps and equipment shall meet the requirements of the City of Osage Beach Design Guidelines. The Public Works Department, in its sole discretion, may offer for sale approved equipment and/or materials at not more than the manufacturer's suggested retail price. Equipment and/or materials may also be purchased from a supplier.

Tara Berreth

From: Matthew Marschke <matt.m@mwec.us>
Sent: Tuesday, April 30, 2024 5:32 PM
To: Tara Berreth
Cc: davek@cdoc.net
Subject: comments on proposed city of Osage Beach code changes

Mrs. Berreth,

Comments on proposed code changes

Water,

Page 1 or 15, Dave Krehbiel of Krehbiel Engineering, Inc with offices in Camdenton, Missouri designed the initial water systems for the City of Osage Beach. Regardless of what Mike Zimmerman said. 500 ft spacing of water valves may not be practical to the operations of the system. Consider allowing more discretion by the designer.

Sewer

Grinder Station Electrical Panel 1. ABS/Electric Control Company panel supplier shall provide the standard panel developed for the City, of the correct model to match the pump(s). This is single source supplier lacking American competition.

Storm Water Section

If a project is located on the lake's edge or connected with a deeded access for water drainage, will they be required to include storm water detention? I hope that any project can drain directly to the lake without detention and allow the lake to continue to act as our detention basin. Provided the storm water is properly treated to remove pollution per the stormwater code. Via filtered inlets and a post sediment basin.

POST CONSTRUCTION WATER QUALITY, Are all new inlets required to have filters? (parking lots, roads, and area drains), Filters seem problematic with leaves. Or is this only required during construction?

CONSTRUCTION MATERIALS, Is PVC allowed for drop inlets?

Drawing IV-17, when is a dissipation box required?

I appreciated the opportunity to review the code. Keep up the great work of making our City great.

Matt

Matthew J. Marschke, P.E.

Midwest Engineering Company, LLC

DBA Marschke Engineering Company, LLC

Matt.m@mwec.us

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Edwardsville, IL 62025

5625 Alona Point

Osage Beach, MO 65065

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City of Osage Beach
Agenda Item Summary

Date of Meeting: May 9, 2024
Originator: Jeana Woods, City Administrator
Presenter: Mike Welty, Assistant City Administrator

Agenda Item:

Discussion - City Code changes to Design Guidelines relating to the Water and Sewerage System, Storm Drainage, and Road Cut, Utility Trench, and Excavation Permit

Requested Action:

Discussion

Ordinance Referenced for Action:

Not Applicable

Deadline for Action:

None

Budgeted Item:

Not Applicable

Budget Line Information (if applicable):

Not Applicable

Department Comments and Recommendation:

A press release was published on April 9, 2024, to invite the public to review and comment on the proposed Design Guidelines and City Code changes relating to the Water and Sewerage System, Storm Drainage, and Road Cut, Utility Trench, and Excavation Permit. Public comments are accepted through Tuesday, April 30, 2024.

The Public Hearing precedes this discussion.

City Attorney Comments:

Not Applicable

City Administrator Comments:

Not Applicable

City of Osage Beach
Agenda Item Summary

Date of Meeting: May 9, 2024
Originator: Jeana Woods, City Administrator
Presenter: Jeana Woods, City Administrator

Agenda Item:

Discussion - Proposed Water & Sewer User Charge Rates

Requested Action:

Discussion

Ordinance Referenced for Action:

Not Applicable

Deadline for Action:

None

Budgeted Item:

Not Applicable

Budget Line Information (if applicable):

Not Applicable

Department Comments and Recommendation:

Not Applicable

City Attorney Comments:

Not Applicable

City Administrator Comments:

The previous rate increases were effective May 2023, based on financial and forecast data leading up to mid-late 2022. The financial activity that has been realized since mid-2022 has proved to outpace historical expenditure trends, affected the data used for forecasting the previous rate research, and the use of reserves and other unrestricted monies were needed to fill financial gaps. For both water and sewer, rate increases are required to replenish reserves and to continue to appropriately fund system repairs and improvements to accommodate increased usage of current customers and the system's aging. Economic factors, such as inflation, supply-chain issues, etc., as well as unexpected system breakages/failures have contributed to the unprecedented increase

in expenditure trends since mid-late 2022 to present day.

In January 2024, rate increases proposed at that time were based on bringing reserves back to previous levels needed, accommodating an increase in funds for appropriate system improvements and updates, and would have eliminated/dramatically decreased any CIT subsidy over any debt service requirements (a direction by the Board following discussions in late 2023). The rates as outlined in January assumed an effective date mid-year 2024. Since the inception of the CIT (Capital Improvement Tax), water and sewer operations have been subsidized by said tax, above debt service obligations (within defined uses per ordinance). Since 2013, CIT subsidy to combined Water and Sewer Funds has averaged \$1.9 million (data calculated since 2013 per audit); this includes both debt coverage and operation expenditure coverage, but varied each year.

Following further discussion last month, the Board directed a re-evaluation of rates in relationship to capital needs and CIT subsidy, and to consider phasing in increases over a few years. Enclosed are the details of two options, and both options are structured as percentage increases to current rate structure to substantially meet forecasted cash flow needs.

Water and Sewer User Charges (Rates) - Proposed Options as of May 2024

Option #1 - Full Rate Increase July 1, 2024

	CURRENT		July 1, 2024	
	In-City	Out-of-City	In-City	Out-of-City
5/8"	22.73	98.00	28.24	122.17
1"	31.35	136.67	38.85	170.50
1 1/2"	39.94	175.35	49.59	218.85
2"	63.60	281.67	79.17	351.75
3"	237.96	1,064.68	297.12	1,330.52
4"	302.36	1,354.68	377.62	1,693.02
6"	366.90	1,644.68	458.29	2,055.52
Volumetric (1,000 gal)	1.34		1.34	

Option #2 - Rate Increases July 1, 2024 & January 1, 2025

Water User Charges (Rates)

	July 1, 2024	
	In-City	Out-of-City
5/8"	26.09	112.50
1"	35.85	156.97
1 1/2"	45.73	201.45
2"	72.94	323.72
3"	273.45	1,224.18
4"	347.51	1,557.68
6"	421.73	1,891.18
Volumetric (1,000 gal)	1.34	

	January 1, 2025	
	In-City	Out-of-City
5/8"	28.07	121.39
1"	38.61	169.42
1 1/2"	49.28	217.46
2"	78.67	349.51
3"	295.22	1,322.01
4"	375.20	1,682.19
6"	455.36	2,042.37
Volumetric (1,000 gal)	1.34	

Sewer User Charges (Rates) - Metered

	CURRENT		July 1, 2024	
	In-City	Out-of-City	In-City	Out-of-City
5/8"	18.20	39.58	28.36	62.57
1"	24.45	54.41	38.36	86.30
1 1/2"	30.74	69.25	48.43	110.04
2"	47.98	110.02	76.01	175.28
3"	174.98	410.28	279.21	655.69
4"	222.02	521.48	354.48	833.61
6"	269.06	632.71	429.74	1,011.58
Volumetric (1,000 gal)	2.52		3.28	

	July 1, 2024	
	In-City	Out-of-City
5/8"	22.97	50.33
1"	30.97	69.32
1 1/2"	39.02	88.31
2"	61.09	140.50
3"	223.65	524.83
4"	283.86	667.17
6"	344.07	809.54
Volumetric (1,000 gal)	2.90	

	January 1, 2025	
	In-City	Out-of-City
5/8"	28.42	62.62
1"	38.42	86.36
1 1/2"	48.49	110.10
2"	76.07	175.34
3"	279.27	655.75
4"	354.54	833.67
6"	429.80	1,011.64
Volumetric (1,000 gal)	3.34	

Sewer User Charges (Rates) - Non-Metered

	CURRENT		July 1, 2024	
	In-City	Out-of-City	In-City	Out-of-City
A	33.34	52.58	53.34	84.13
B	211.05	332.85	337.68	532.56
C	343.40	541.53	549.44	866.45
D	738.84	1,165.14	1,182.14	1,864.22
E	1,433.15	2,260.09	2,293.04	3,616.14
F	4,001.51	6,310.47	6,402.42	10,096.75
G	5,939.55	9,366.76	9,503.28	14,986.82

	July 1, 2024	
	In-City	Out-of-City
A	42.68	67.30
B	270.14	426.05
C	439.55	693.16
D	945.72	1,491.38
E	1,834.43	2,892.92
F	5,121.93	8,077.40
G	7,602.62	11,989.45

	January 1, 2025	
	In-City	Out-of-City
A	53.34	84.13
B	337.68	532.56
C	549.44	866.45
D	1,182.14	1,864.22
E	2,293.04	3,616.14
F	6,402.42	10,096.75
G	9,503.28	14,986.82

Option #1 - Full Rate Increase July 1, 2024**July 1, 2024 Examples - Full Rate Increases 2024****Sample Billing - Residential, In-City - 5/8" Meter**

	Current 5/1/2023	Proposed 7/1/2024		Monthly Increase	Annual Increase
Gallons	5,000				
Water	28.09	33.60	20%	5.51	66.12
Sewer	<u>28.28</u>	<u>41.48</u>	47%	<u>13.20</u>	<u>158.40</u>
TOTAL	56.37	75.08	33%	18.71	224.52

Sample Billing - Residential, Out-of-City - 5/8" Meter

	Current 5/1/2023	Proposed 7/1/2024		Monthly Increase	Annual Increase
Gallons	5,000				
Water	103.36	127.53	23%	24.17	290.04
Sewer	<u>49.66</u>	<u>75.69</u>	52%	<u>26.03</u>	<u>312.36</u>
TOTAL	153.02	203.22	33%	50.20	602.40

Sample Billing - Residential Multi-Family, In-City - Metered

	Current 5/1/2023	Proposed 7/1/2024		Monthly Increase	Annual Increase
Units	16				
Gallons	60,000				
Water	422.64	510.80	21%	88.16	1,057.92
Sewer	<u>402.08</u>	<u>598.08</u>	49%	<u>196.00</u>	<u>2,352.00</u>
TOTAL	824.72	1,108.88	34%	284.16	3,409.92
Per Unit	51.55	69.31		17.76	213.12

Sample Billing - Commercial, In-City -1" Meter

	Current 5/1/2023	Proposed 7/1/2024		Monthly Increase	Annual Increase
Gallons	18,000				
Water	54.13	61.63	14%	7.50	90.00
Sewer	<u>67.29</u>	<u>94.12</u>	40%	<u>26.83</u>	<u>321.96</u>
TOTAL	121.42	155.75	28%	34.33	411.96

Option #2 - Rate Increases July 1, 2024 & January 1, 2025**July 1, 2024 Examples - Partial Rate Increases 2024****Sample Billing - Residential, In-City - 5/8" Meter**

	Current 5/1/2023	Proposed 7/1/2024		Monthly Increase	Annual Increase
Gallons	5,000				
Water	28.09	31.45	12%	3.36	40.32
Sewer	<u>28.28</u>	<u>34.57</u>	22%	<u>6.29</u>	<u>75.48</u>
TOTAL	56.37	66.02	17%	9.65	115.80

Sample Billing - Residential, Out-of-City - 5/8" Meter

	Current 5/1/2023	Proposed 7/1/2024		Monthly Increase	Annual Increase
Gallons	5,000				
Water	103.36	117.86	14%	14.50	174.00
Sewer	<u>49.66</u>	<u>61.93</u>	25%	<u>12.27</u>	<u>147.24</u>
TOTAL	153.02	179.79	17%	26.77	321.24

Sample Billing - Residential Multi-Family, In-City - Metered

	Current 5/1/2023	Proposed 7/1/2024		Monthly Increase	Annual Increase
Units	16				
Gallons	60,000				
Water	422.64	476.40	13%	53.76	645.12
Sewer	<u>402.08</u>	<u>495.12</u>	23%	<u>93.04</u>	<u>1,116.48</u>
TOTAL	824.72	971.52	18%	146.80	1,761.60
Per Unit	51.55	60.72		9.18	110.10

Sample Billing - Commercial, In-City -1" Meter

	Current 5/1/2023	Proposed 7/1/2024		Monthly Increase	Annual Increase
Gallons	18,000				
Water	54.13	58.63	8%	4.50	54.00
Sewer	<u>67.29</u>	<u>80.27</u>	19%	<u>12.98</u>	<u>155.76</u>
TOTAL	121.42	138.90	14%	17.48	209.76

January 1, 2025 Examples - Partial Rate Increases 2025**Sample Billing - Residential, In-City - 5/8" Meter**

	Current 7/1/2024	Proposed 1/1/2025		Monthly Increase	Annual Increase
Gallons	5,000				
Water	31.45	33.43	6%	1.98	23.76
Sewer	<u>34.57</u>	<u>41.78</u>	21%	<u>7.21</u>	<u>86.52</u>
TOTAL	66.02	75.21	14%	9.19	110.28

Sample Billing - Residential, Out-of-City - 5/8" Meter

	Current 7/1/2024	Proposed 1/1/2025		Monthly Increase	Annual Increase
Gallons	5,000				
Water	117.86	126.75	8%	8.89	106.68
Sewer	<u>61.93</u>	<u>75.98</u>	23%	<u>14.05</u>	<u>168.60</u>
TOTAL	179.79	202.73	13%	22.94	275.28

Sample Billing - Residential Multi-Family, In-City - Metered

	Current 7/1/2024	Proposed 1/1/2025		Monthly Increase	Annual Increase
Units	16				
Gallons	60,000				
Water	476.40	508.08	7%	31.68	380.16
Sewer	<u>495.12</u>	<u>601.68</u>	22%	<u>106.56</u>	<u>1,278.72</u>
TOTAL	971.52	1,109.76	14%	138.24	1,658.88
Per Unit	60.72	69.36		8.64	103.68

Sample Billing - Commercial, In-City -1" Meter

	Current 7/1/2024	Proposed 1/1/2025		Monthly Increase	Annual Increase
Gallons	18,000				
Water	58.63	61.39	5%	2.76	33.12
Sewer	<u>80.27</u>	<u>95.20</u>	19%	<u>14.93</u>	<u>179.16</u>
TOTAL	138.90	156.59	13%	17.69	212.28

City of Osage Beach FY2022 - FY2028 Forecast

Revised Water Sewer User Charges (rates) - Full Change effective July 1, 2024

December 31, 2023

CAPITAL IMPROVEMENT FUND (CIT)	FY2022 Actual	FY2023 Y/E Estimate	FY2024 Budget	FY2025 Forecast	FY2026 Forecast	FY2027 Forecast	FY2028 Forecast
Beginning Balances (includes Restricted \$\$)	2,362,611	2,897,059	2,582,559	1,792,487	2,089,108	2,832,952	3,830,645
Revenues	\$ 3,031,341	\$ 3,107,500	\$ 3,233,000	\$ 3,378,485	\$ 3,530,517	\$ 3,689,390	\$ 3,855,413
Personnel	-	-	-	-	-	-	-
Operations & Maintenance	81,893	101,000	103,250	106,864	111,673	116,698	121,949
Capital	-	-	-	-	-	-	-
Debt Service	-	-	-	-	-	-	-
Transfers to Other Funds*	2,415,000	3,321,000	3,919,822	2,975,000	2,675,000	2,575,000	2,575,000
Total Expenditures	\$ 2,496,893	\$ 3,422,000	\$ 4,023,072	\$ 3,081,864	\$ 2,786,673	\$ 2,691,698	\$ 2,696,949
NET Revenues/Expenditures	\$ 534,448	\$ (314,500)	\$ (790,072)	\$ 296,621	\$ 743,844	\$ 997,692	\$ 1,158,463
Ending Balances (includes Restricted \$\$)	2,897,059	2,582,559	1,792,487	2,089,108	2,832,952	3,830,645	4,989,108
Restricted - Fund Reserves	-	-	-	-	-	-	-
Restricted - Other	227,924	125,000	125,000	-	-	-	-
Unrestricted	2,669,135	2,457,559	1,667,487	2,089,108	2,832,952	3,830,645	4,989,108
WATER FUND	FY2022 Actual	FY2023 Y/E Estimate	FY2024 Budget	FY2025 Forecast	FY2026 Forecast	FY2027 Forecast	FY2028 Forecast
Beginning Balances (includes Restricted \$\$)	2,562,816	2,166,410	2,942,345	1,994,088	2,772,298	567,676	1,607,188
Rate Collection (*add'l 2024 vs Adopted Budget)			270,000	2,725,000	2,766,000	2,807,000	2,849,000
CIT Subsidy (Rate Subsidy)				375,000	375,000	375,000	375,000
Other Incoming (may include add'l CIT for CAP)				147,000	797,000	148,000	149,000
Total Revenues	\$ 2,760,207	\$ 4,483,683	\$ 2,814,880	\$ 3,247,000	\$ 3,938,000	\$ 3,330,000	\$ 3,373,000
Personnel	464,438	530,597	519,800	545,790	567,622	587,488	608,050
Operations & Maintenance	772,678	1,403,231	1,178,890	1,220,000	1,242,000	1,264,000	1,287,000
Capital	90,999	657,735	1,241,147	528,000	4,158,000	439,000	320,000
Debt Service	1,828,498	1,116,185	173,300	175,000	175,000	-	-
Transfers to Other Funds	-	-	650,000	-	-	-	-
Total Expenditures	\$ 3,156,613	\$ 3,707,748	\$ 3,763,137	\$ 2,468,790	\$ 6,142,622	\$ 2,290,488	\$ 2,215,050
NET Revenues/Expenditures	\$ (396,406)	\$ 775,935	\$ (948,257)	\$ 778,210	\$ (2,204,622)	\$ 1,039,512	\$ 1,157,950
Ending Balances (includes Restricted \$\$)	2,166,410	2,942,345	1,994,088	2,772,298	567,676	1,607,188	2,765,138
Restricted - Fund Reserves	1,245,223	1,186,273	1,293,493	1,970,000	400,000	1,600,000	2,750,000
Restricted - Other	697,678	875,565	425,500	225,000	135,000	-	-
Unrestricted	223,509	880,507	275,095	577,298	32,676	7,188	15,138

SEWER FUND	FY2022 Actual	FY2023 Y/E Estimate	FY2024 Budget	FY2025 Forecast	FY2026 Forecast	FY2027 Forecast	FY2028 Forecast
Beginning Balances (includes Restricted \$\$)	3,409,217	3,740,076	2,950,296	3,587,610	2,735,609	3,041,038	3,555,751
Rate Collection (*add'l 2024 vs Adopted Budget)			825,000	4,825,000	4,922,000	5,020,000	5,120,000
CIT Subsidy (Rate Subsidy)				2,300,000	2,000,000	2,000,000	2,000,000
Other Incoming (may include add'l CIT for CAP)				504,000	489,000	389,000	389,000
Revenues	\$ 4,695,839	\$ 5,068,825	\$ 9,738,806	\$ 7,629,000	\$ 7,411,000	\$ 7,409,000	\$ 7,509,000
Personnel	691,337	760,097	942,800	999,368	1,039,343	1,080,916	1,124,153
Operations & Maintenance	2,777,071	3,755,980	3,517,037	3,374,133	3,361,228	3,299,871	3,561,366
Capital*	550,215	1,012,631	4,321,960	3,777,500	2,055,000	2,513,500	2,485,000
Debt Service	346,357	329,897	319,695	330,000	-	-	-
Transfers to Other Funds	-	-	-	-	650,000	-	-
Total Expenditures	\$ 4,364,980	\$ 5,858,605	\$ 9,101,492	\$ 8,481,001	\$ 7,105,571	\$ 6,894,287	\$ 7,170,520
NET Revenues/Expenditures	\$ 330,859	\$ (789,780)	\$ 637,314	\$ (852,001)	\$ 305,429	\$ 514,713	\$ 338,480
Ending Balances (includes Restricted \$\$)	3,740,076	2,950,296	3,587,610	2,735,609	3,041,038	3,555,751	3,894,231
Restricted - Fund Reserves	992,303	457,908	238,379	330,000	600,000	1,025,000	1,250,000
Restricted - Other	2,128,620	2,136,523	2,495,849	2,340,000	2,421,900	2,506,667	2,594,400
Unrestricted	619,153	355,865	853,382	65,609	19,138	24,084	49,831

Notes:

CIT Transfer to Other Funds = 2025-2028 to Water & Sewer Funds

*Water Capital (2026) on CAP SCHEDULE \$4.4m = Water Treatment Plan / \$2.2 m alternative included in Forecast

*Sewer Capital projects on CAP SCHEDULE not included in CAP 2025-2028:

(2025-2028) requested 6.7 m = TTA Est Reconstruction

(2025-2028) requested 2.5 m = Infrastructure Reconstruction (D&R-but D&R bal does not include)

Refer to Deprec & Replace Capital Schedule TRANS WATER SEWER

City of Osage Beach FY2022 - FY2028 Forecast

Revised Water Sewer User Charges (rates) - Rates Effective July 1, 2024 / January 1, 2025

December 31, 2023

CAPITAL IMPROVEMENT FUND (CIT)	FY2022 Actual	FY2023 Y/E Estimate	FY2024 Budget	FY2025 Forecast	FY2026 Forecast	FY2027 Forecast	FY2028 Forecast
Beginning Balances (includes Restricted \$\$)	2,362,611	2,897,059	2,582,559	1,792,487	2,089,108	2,832,952	3,830,645
Revenues	\$ 3,031,341	\$ 3,107,500	\$ 3,233,000	\$ 3,378,485	\$ 3,530,517	\$ 3,689,390	\$ 3,855,413
Personnel	-	-	-	-	-	-	-
Operations & Maintenance	81,893	101,000	103,250	106,864	111,673	116,698	121,949
Capital	-	-	-	-	-	-	-
Debt Service	-	-	-	-	-	-	-
Transfers to Other Funds*	2,415,000	3,321,000	3,919,822	2,975,000	2,675,000	2,575,000	2,575,000
Total Expenditures	\$ 2,496,893	\$ 3,422,000	\$ 4,023,072	\$ 3,081,864	\$ 2,786,673	\$ 2,691,698	\$ 2,696,949
NET Revenues/Expenditures	\$ 534,448	\$ (314,500)	\$ (790,072)	\$ 296,621	\$ 743,844	\$ 997,692	\$ 1,158,463
Ending Balances (includes Restricted \$\$)	2,897,059	2,582,559	1,792,487	2,089,108	2,832,952	3,830,645	4,989,108
Restricted - Fund Reserves	-	-	-	-	-	-	-
Restricted - Other	227,924	125,000	125,000	-	-	-	-
Unrestricted	2,669,135	2,457,559	1,667,487	2,089,108	2,832,952	3,830,645	4,989,108
WATER FUND	FY2022 Actual	FY2023 Y/E Estimate	FY2024 Budget	FY2025 Forecast	FY2026 Forecast	FY2027 Forecast	FY2028 Forecast
Beginning Balances (includes Restricted \$\$)	2,562,816	2,166,410	2,942,345	1,924,088	2,697,298	487,676	1,422,188
Rate Collection (*add'l 2024 vs Adopted Budget)			200,000	2,720,000	2,761,000	2,802,000	2,844,000
CIT Subsidy (Rate Subsidy)				375,000	375,000	375,000	375,000
Other Incoming (may include add'l CIT for CAP)				147,000	797,000	48,000	149,000
Total Revenues	\$ 2,760,207	\$ 4,483,683	\$ 2,744,880	\$ 3,242,000	\$ 3,933,000	\$ 3,225,000	\$ 3,368,000
Personnel	464,438	530,597	519,800	545,790	567,622	587,488	608,050
Operations & Maintenance	772,678	1,403,231	1,178,890	1,220,000	1,242,000	1,264,000	1,287,000
Capital	90,999	657,735	1,241,147	528,000	4,158,000	439,000	320,000
Debt Service	1,828,498	1,116,185	173,300	175,000	175,000	-	-
Transfers to Other Funds	-	-	650,000	-	-	-	-
Total Expenditures	\$ 3,156,613	\$ 3,707,748	\$ 3,763,137	\$ 2,468,790	\$ 6,142,622	\$ 2,290,488	\$ 2,215,050
NET Revenues/Expenditures	\$ (396,406)	\$ 775,935	\$ (1,018,257)	\$ 773,210	\$ (2,209,622)	\$ 934,512	\$ 1,152,950
Ending Balances (includes Restricted \$\$)	2,166,410	2,942,345	1,924,088	2,697,298	487,676	1,422,188	2,575,138
Restricted - Fund Reserves	1,245,223	1,186,273	1,293,493	1,970,000	350,000	1,400,000	2,550,000
Restricted - Other	697,678	875,565	425,500	225,000	135,000	-	-
Unrestricted	223,509	880,507	205,095	502,298	2,676	22,188	25,138

SEWER FUND	FY2022 Actual	FY2023 Y/E Estimate	FY2024 Budget	FY2025 Forecast	FY2026 Forecast	FY2027 Forecast	FY2028 Forecast
Beginning Balances (includes Restricted \$\$)	3,409,217	3,740,076	2,950,296	3,187,610	2,370,609	2,687,038	3,213,751
Rate Collection (*add'l 2024 vs Adopted Budget)			425,000	4,860,000	4,933,000	5,032,000	5,132,000
CIT Subsidy (Rate Subsidy)				2,300,000	2,000,000	2,000,000	2,000,000
Other Incoming (may include add'l CIT for CAP)				504,000	489,000	389,000	389,000
Revenues	\$ 4,695,839	\$ 5,068,825	\$ 9,338,806	\$ 7,664,000	\$ 7,422,000	\$ 7,421,000	\$ 7,521,000
Personnel	691,337	760,097	942,800	999,368	1,039,343	1,080,916	1,124,153
Operations & Maintenance	2,777,071	3,755,980	3,517,037	3,374,133	3,361,228	3,299,871	3,561,366
Capital*	550,215	1,012,631	4,321,960	3,777,500	2,055,000	2,513,500	2,485,000
Debt Service	346,357	329,897	319,695	330,000	-	-	-
Transfers to Other Funds	-	-	-	-	650,000	-	-
Total Expenditures	\$ 4,364,980	\$ 5,858,605	\$ 9,101,492	\$ 8,481,001	\$ 7,105,571	\$ 6,894,287	\$ 7,170,520
NET Revenues/Expenditures	\$ 330,859	\$ (789,780)	\$ 237,314	\$ (817,001)	\$ 316,429	\$ 526,713	\$ 350,480
Ending Balances (includes Restricted \$\$)	3,740,076	2,950,296	3,187,610	2,370,609	2,687,038	3,213,751	3,564,231
Restricted - Fund Reserves	992,303	457,908	238,379	330,000	330,000	700,000	1,000,000
Restricted - Other	2,128,620	2,136,523	2,495,849	2,340,000	2,421,900	2,506,667	2,594,400
Unrestricted	619,153	355,865	453,382	(299,391)	(64,862)	7,084	(30,169)

Notes:

CIT Transfer to Other Funds = 2025-2028 to Water & Sewer Funds

*Water Capital (2026) on CAP SCHEDULE \$4.4m = Water Treatment Plan / \$2.2 m alternative included in Forecast

*Sewer Capital projects on CAP SCHEDULE not included in CAP 2025-2028:

(2025-2028) requested 6.7 m = TTA Est Reconstruction

(2025-2028) requested 2.5 m = Infrastructure Reconstruction (D&R-but D&R bal does not include)

Refer to Deprec & Replace Capital Schedule TRANS WATER SEWER

Schedule of Capital, including Depreciation & Replacement (D&R)

Water & Sewer Funds

	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32
WATER FUND:									
Vehicles	\$ 192,500.00	\$ 75,000.00	\$ 75,000.00	\$ 75,000.00	\$ -	\$ 75,000.00	\$ -	\$ -	\$ 75,000.00
Mowers/Tractors/Trailers	\$ -	\$ 30,000.00	\$ 15,000.00		\$ 15,000.00	\$ -	\$ -	\$ 30,000.00	\$ -
Misc. Equipment	\$ 120,947.00	\$ 10,000.00	\$ 10,000.00	\$ -	\$ 10,000.00	\$ -	\$ 10,000.00	\$ -	\$ -
Misc. Computer Equipment/Software	\$ 3,500.00	\$ 7,500.00	\$ 7,500.00	\$ -	\$ -	\$ 5,000.00	\$ 5,000.00	\$ -	\$ -
Water Expansion/Repair/New Connections	\$ 366,710.00	\$ 100,000.00	\$ 350,000.00	\$ 200,000.00	\$ 200,000.00	\$ 200,000.00	\$ 200,000.00	\$ 100,000.00	\$ 100,000.00
Water Treatment Plant	\$ -	\$ 150,000.00	\$ 4,400,000.00	\$ 100,000.00	\$ -	\$ 100,000.00	\$ -	\$ -	\$ -
Well & Tower Improv/Cleaning/Painting	\$ 567,700.00	\$ 150,000.00	\$ 1,500,000.00	\$ 60,000.00	\$ 45,000.00	\$ 45,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00
Scada (WS)	\$ -	\$ -	\$ -	\$ -	\$ 50,000.00	\$ -	\$ -	\$ -	\$ -
Office Furniture (NA)	\$ -	\$ 1,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 4,500.00
AED Unit (TWS)	\$ -	\$ 500.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 500.00	\$ -
Misc. Building Improvements (TWS)	\$ 18,200.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
PW Office (TWS)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,330,000.00	\$ -	\$ -
HVAC (Ceiling units, Heat Pumps. Etc) (TWS)	\$ -	\$ 3,500.00	\$ -	\$ 3,500.00	\$ -	\$ -	\$ -	\$ -	\$ -
Server Room Upgrades (TWS)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 20,000.00	\$ -	\$ -	\$ -
SEWER FUND:									
Vehicles	\$ 482,633.00	\$ 140,000.00	\$ 75,000.00	\$ -	\$ 75,000.00	\$ -	\$ -	\$ 75,000.00	\$ 75,000.00
Mowers/Tractors/Trailers	\$ -	\$ 15,000.00	\$ -	\$ 30,000.00	\$ -	\$ 15,000.00	\$ -	\$ -	\$ 15,000.00
Misc. Equipment	\$ 306,500.00	\$ 35,000.00	\$ 50,000.00	\$ 50,000.00	\$ 35,000.00	\$ 50,000.00	\$ 50,000.00	\$ 35,000.00	\$ 50,000.00
Misc. Computer Equipment/Software	\$ 4,167.00	\$ 7,500.00	\$ 5,000.00	\$ -	\$ -	\$ -	\$ 7,500.00	\$ 5,000.00	\$ 5,000.00
Grinder/LiftStation Improvement	\$ 2,112,620.00	\$ 4,500,000.00	\$ 4,500,000.00	\$ 3,500,000.00	\$ 3,500,000.00	\$ 3,000,000.00	\$ 2,500,000.00	\$ 2,500,000.00	\$ 2,500,000.00
Sewer Expansion/Rehab	\$ 1,397,840.00	\$ 1,000,000.00	\$ 1,000,000.00	\$ 1,000,000.00	\$ 500,000.00	\$ 500,000.00	\$ 500,000.00	\$ 500,000.00	\$ 500,000.00
Scada (WS)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Office Furniture (NA)	\$ -	\$ 1,000.00	\$ -	\$ 5,000.00	\$ -	\$ 5,000.00	\$ -	\$ -	\$ -
AED Unit (TWS)	\$ -	\$ 500.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 500.00	\$ -
Misc. Building Improvements (TWS)	\$ 18,200.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
PW Office (TWS)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,330,000.00	\$ -	\$ -
HVAC (Ceiling units, Heat Pumps. Etc) (TWS)	\$ -	\$ 3,500.00	\$ -	\$ 3,500.00	\$ -	\$ -	\$ -	\$ -	\$ -
Server Room Upgrades (TWS)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 20,000.00	\$ -	\$ -	\$ -
Total Water Fund	\$ 1,269,557.00	\$ 527,500.00	\$ 6,357,500.00	\$ 438,500.00	\$ 320,000.00	\$ 445,000.00	\$ 1,575,000.00	\$ 160,500.00	\$ 209,500.00
Total Sewer Fund	\$ 4,321,960.00	\$ 5,702,500.00	\$ 5,630,000.00	\$ 4,588,500.00	\$ 4,110,000.00	\$ 3,590,000.00	\$ 4,387,500.00	\$ 3,115,500.00	\$ 3,145,000.00

Cash Flow & User Charge Reconciliation:

Less Proj. not included in cash flow	\$ -	\$ (2,200,000.00)	\$ -	\$ -	\$ -	\$ -	\$ -
sub total	\$ 527,500.00	\$ 4,157,500.00	\$ 438,500.00	\$ 320,000.00	\$ 445,000.00	\$ 1,575,000.00	
Less CAP Expansion	\$ (100,000.00)	\$ (350,000.00)	\$ (200,000.00)	\$ (200,000.00)	\$ (200,000.00)	\$ (200,000.00)	
Less Othe Cap (non-D&R)	\$ (12,500.00)	\$ (7,500.00)	\$ (3,500.00)	\$ -	\$ (25,000.00)	\$ (1,335,000.00)	
D&R Reserve Exp	\$ 415,000.00	\$ 3,800,000.00	\$ 235,000.00	\$ 120,000.00	\$ 220,000.00	\$ 40,000.00	
Less Proj. not included in cash flow (TTA Est Projs.)	\$ (1,925,000.00)	\$ (1,925,000.00)	\$ (1,425,000.00)	\$ (1,425,000.00)	\$ (1,425,000.00)	\$ (1,425,000.00)	
sub total	\$ 3,777,500.00	\$ 3,705,000.00	\$ 3,163,500.00	\$ 2,685,000.00	\$ 2,165,000.00	\$ 2,962,500.00	
Less CAP Expansion	\$ (300,000.00)	\$ (300,000.00)	\$ (300,000.00)	\$ (200,000.00)	\$ (200,000.00)	\$ (200,000.00)	
Less Other Cap (non-D&R)	\$ (12,500.00)	\$ (5,000.00)	\$ (8,500.00)	\$ -	\$ (25,000.00)	\$ (1,337,500.00)	
D&R Reserve Exp	\$ 3,465,000.00	\$ 3,400,000.00	\$ 2,855,000.00	\$ 2,485,000.00	\$ 1,940,000.00	\$ 1,425,000.00	