

Design Guidelines
City of Osage Beach
SECTION 3 - SEWERAGE DESIGN

(Revised July 2024)

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 (MoDNR) 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 1,125 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-foot), 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.

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

REFERENCED CITY ORDINANCES

Chapter 400.110	Subdivision Regulations
Chapter 410.130	Contents
Chapter 410.190	Basic Standards
Chapter 410.260	Location of Utilities in Right-of-Ways
Chapter 410.330	Sanitary Sewers
Chapter 710	Sewers and Sewerage Systems

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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 MoDNR regulations as supplemented herein.

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Hydraulic Design

Hydraulic Design shall be based upon the following criterion:

Wastewater design shall be in accordance with MoDNR'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 include, 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 be SCH 40 with SCH 40 fittings or ASTM D3034 DR 26 PVC with sanitary sewer DR 26 PVC fittings.
 - d. 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. ASTM D3034, SDR 26, with SDR 26 PVC sanitary fittings. For depths greater than 8-feet.
 - ii. ASTM D3034, SDR 35, with SDR 35 fittings where maximum depth of cover is 8-feet or less.
 - 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.
 - e. 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.

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5. Bedding:
 - a. Shall be installed around the pipe from 6-inches below to 12-inches above the pipe. Bedding shall be crushed rock conforming to MoDOT Type 5 aggregate, Section 1007. Trench backfill shall not contain any material with a nominal particle size greater than 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, 1-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 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.
 - 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. The 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 Public Works Operations Manager
8. The minimum depth of cover for gravity sewers:
 - a. Shall be not less than 24-inches above the top of pipe.
9. The maximum depth of cover shall be 8-feet unless specifically authorized in writing by the 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 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 with cast iron bonnet and cover marked "sewer".

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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 $0.43 \times$ 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:

<u>Pipe Size, Inches</u>	<u>Time</u>
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 MoDNR 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

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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, SDR 21 class 200, or DR9 CTS.
 - b. 4-inches and larger shall be: AWWA C900 DR 18 Class 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 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. All fittings shall be neoprene gasket push-on type or as approved by the 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.
6. The maximum depth of cover for pressure sewers is 4-feet unless specifically authorized in writing by the 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 6-inches below to 12-inches above the pipe. Bedding shall be crushed rock conforming to MoDOT Type 5 aggregate, Section 1007. Trench shall not contain any material with a nominal particle size greater than 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 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.
 - 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.

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9. 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.
10. 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-inches 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.
11. 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 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 Operations Manager or designee.
12. Leakage testing procedure is as follows:
 - a. Upon completion of the 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. The 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

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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 MoDNR requirements. To reduce maintenance and operational costs, 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. 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.

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.
 - 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.
 - 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.

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Additional Limitations or Specifications for Grinder Pumps

1. No more than two residences may be served by a simplex grinder station.
2. No more than 10 single-family residences, or their equivalent, may be served by a single duplex grinder station. Multiple dwellings being served by a single simplex or duplex station are subject to review and approval by the Public Works Operations Manager.
3. All commercial facilities shall have a duplex grinder pump station.
4. Triplex package units or custom-built lift stations are subject to the review and approval of the City Public Works Operations Manager.
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 stainless steel.
 - c. A concrete anti-floatation ring shall be cast around the basin base.
 - d. The basin cover (lid) shall be of steel with minimum thickness of 1/4-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. The 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 and be a minimum of 2-inch diameter.
8. The minimum distance from the top of grinder basin cover to the top of inlet pipe shall be 24-inches.
9. The minimum distance from the top of grinder basin to the bottom of discharge pipe(s) shall be 48-inches.
10. The maximum depth of the grinder station basin shall be 12-feet.
11. 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.
12. 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. Ameren Missouri is the provider for electrical service. The owner, developer, or contractor shall make arrangements with Ameren Missouri 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.

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3. The use of "Add-a-Phase" or other artificial phasing devices is prohibited.
4. When three phase service is required the owner or developer shall make all necessary arrangements with Ameren Missouri to provide the required service.

Grinder Station Electrical Panel

1. ABS 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 units or as directed by the Public Works Operations Manager.
3. Shall be mounted on galvanized steel rack at a height of 4-feet as measured from the top of station lid to the bottom of the station panel and 4-feet as measured horizontally away from the edge of the station.
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 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. The 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) Tnemec #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. A minimum of two conduits shall be run to the station, 1 conduit for pump wires and 1 conduit for communication controls.

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14. All bends and fittings shall be long radius bends. A maximum of 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 Public Works Operations Manager or designee.
19. Electric meter, meter base, disconnect, and panel shall comply with Ameren Missouri Service Manual, latest edition.
20. 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. The design and materials shall conform to 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 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.

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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.

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 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

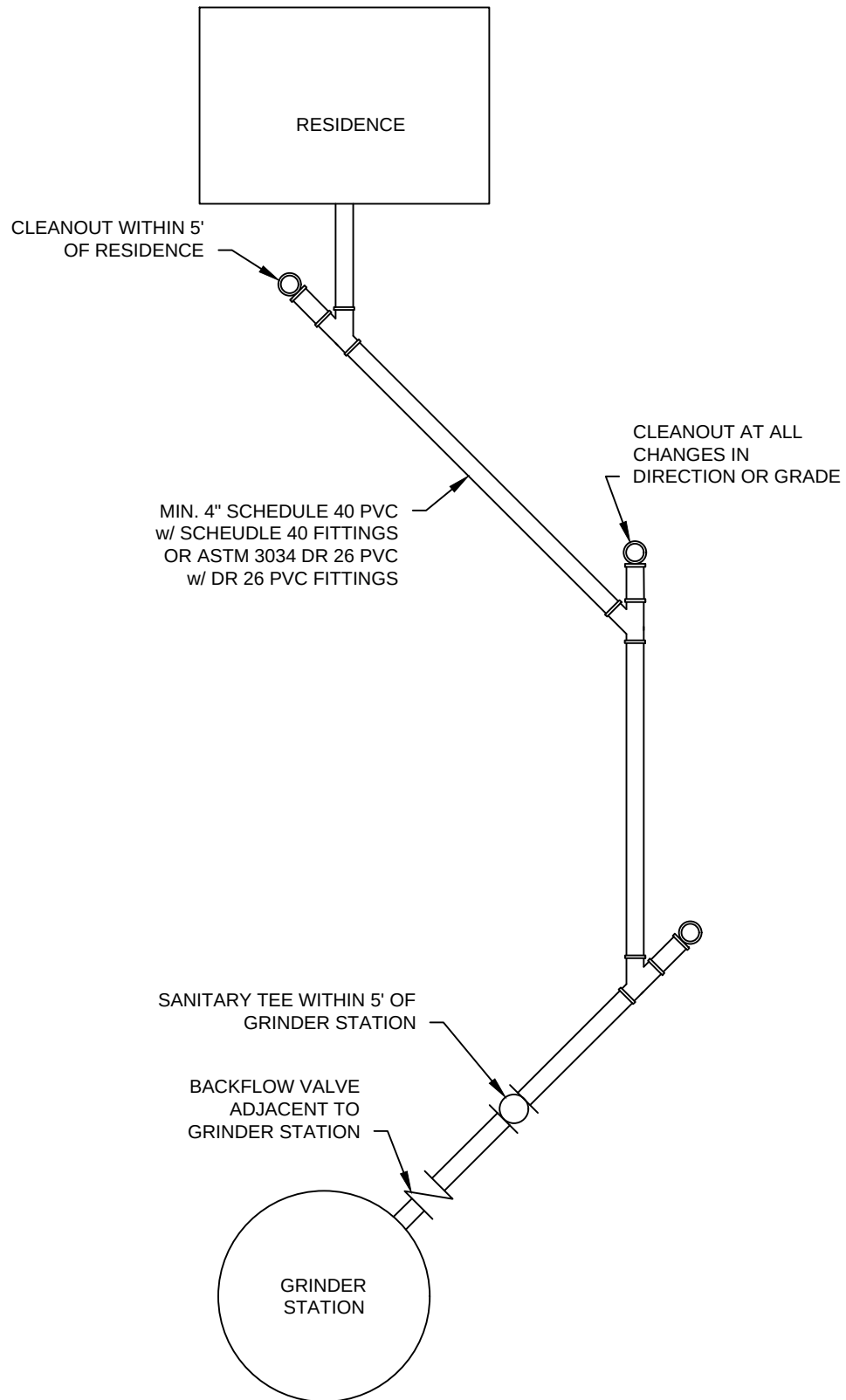
A Septic Tank Permit from the City is required prior to construction. Approved soil morphology, permeability tests and soil percolation tests, site topography, septic tank, and absorption system, designed by a Registered Professional Engineer in the State of Missouri are required for the permit.

1. The system must be designed by a Registered Professional Engineer in accordance with Missouri Department of Health Regulations, 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.
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.

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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.

END



Date Revised:

MARCH, 2007

By:

sh

Checked By:

JB

CITY OF OSAGE BEACH
TYPICAL DETAIL
RESIDENTIAL SERVICE CONNECTION

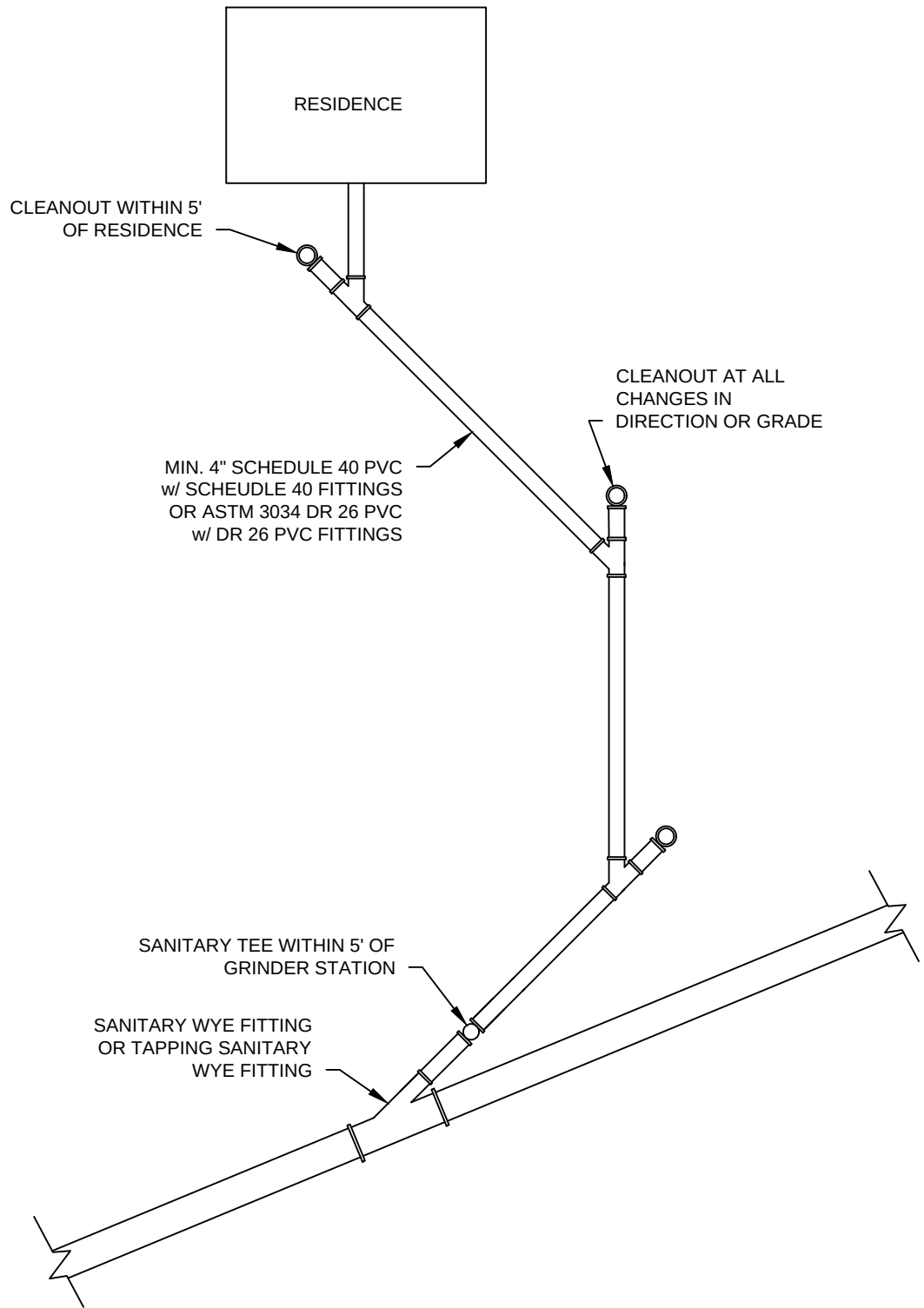
Design Guideline:

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Drawing No.:

III-1



Date Revised:

MARCH, 2007

By:

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Checked By:

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CITY OF OSAGE BEACH
TYPICAL DETAIL
RESIDENTIAL SERVICE CONNECTION

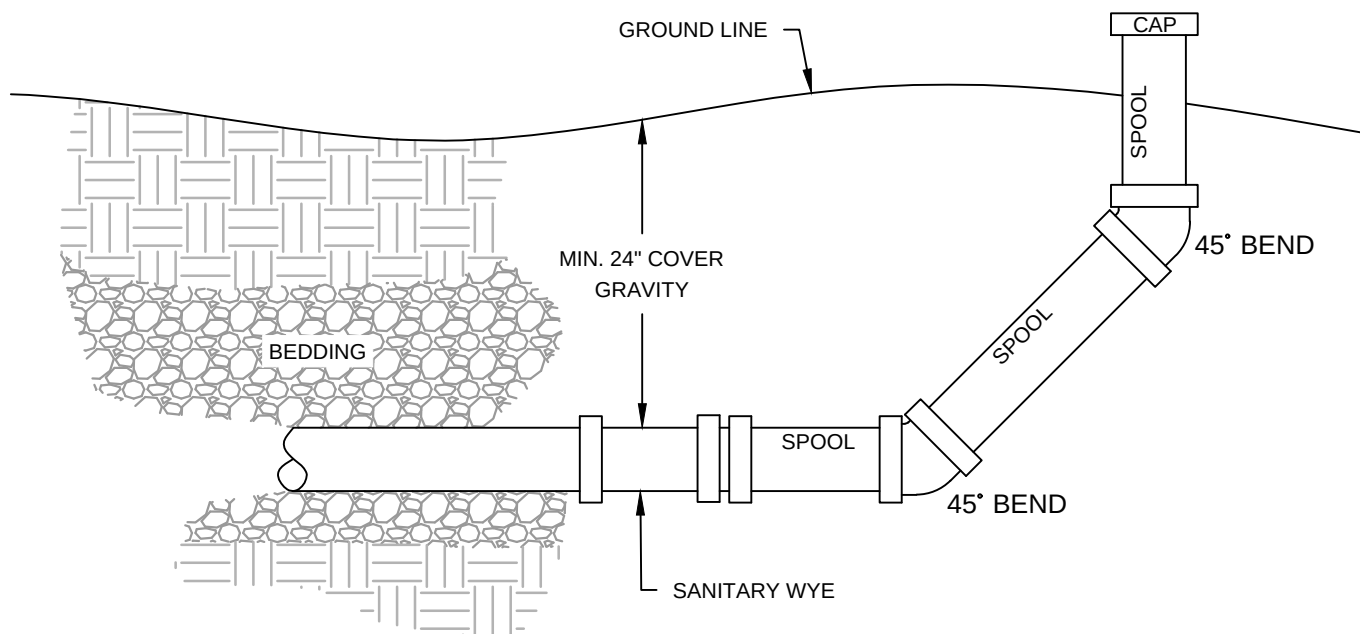
Design Guideline:

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Drawing No.:

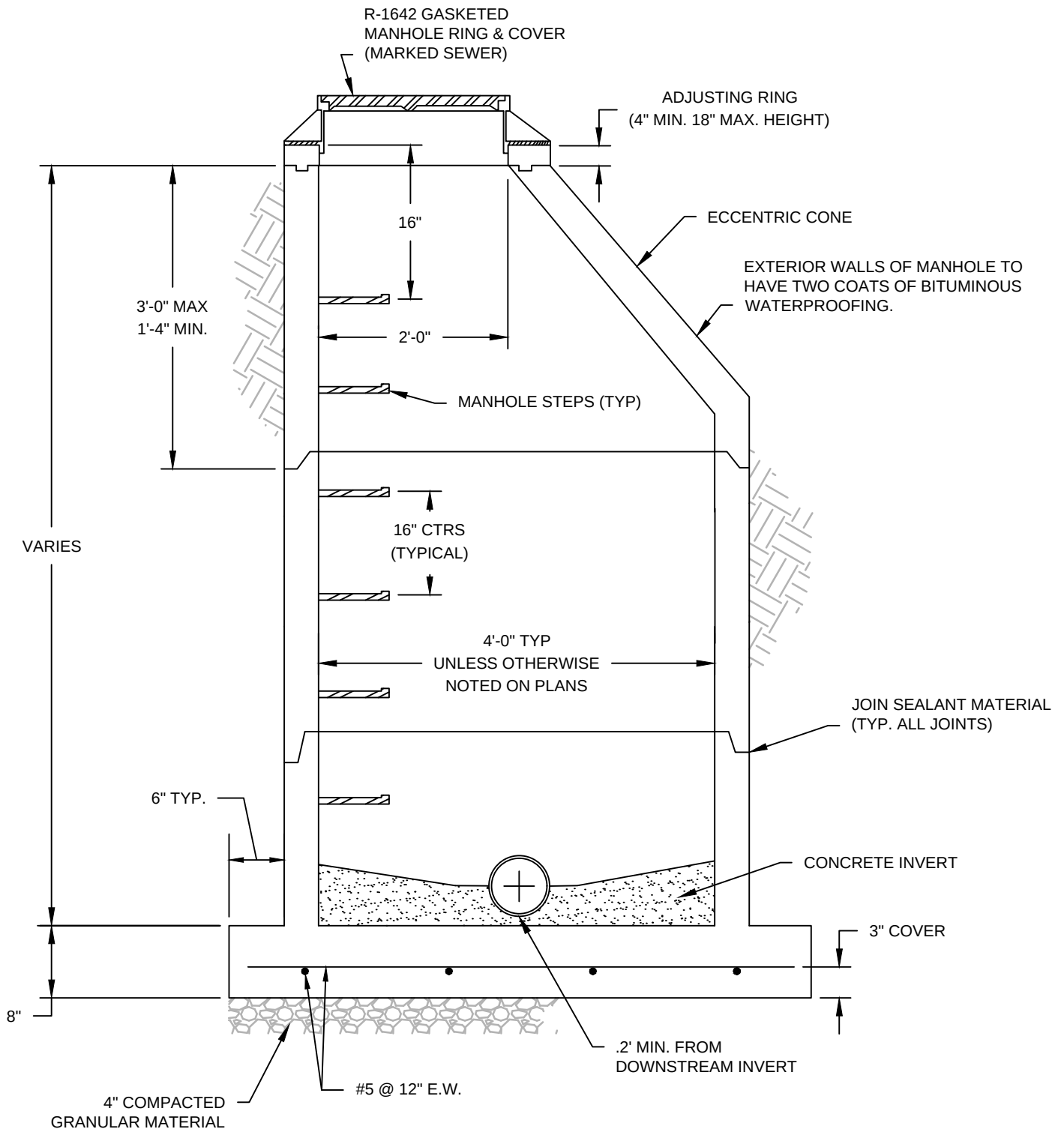
III-2



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

CITY OF OSAGE BEACH
TYPICAL DETAIL
SANITARY SEWER CLEANOUT DETAIL

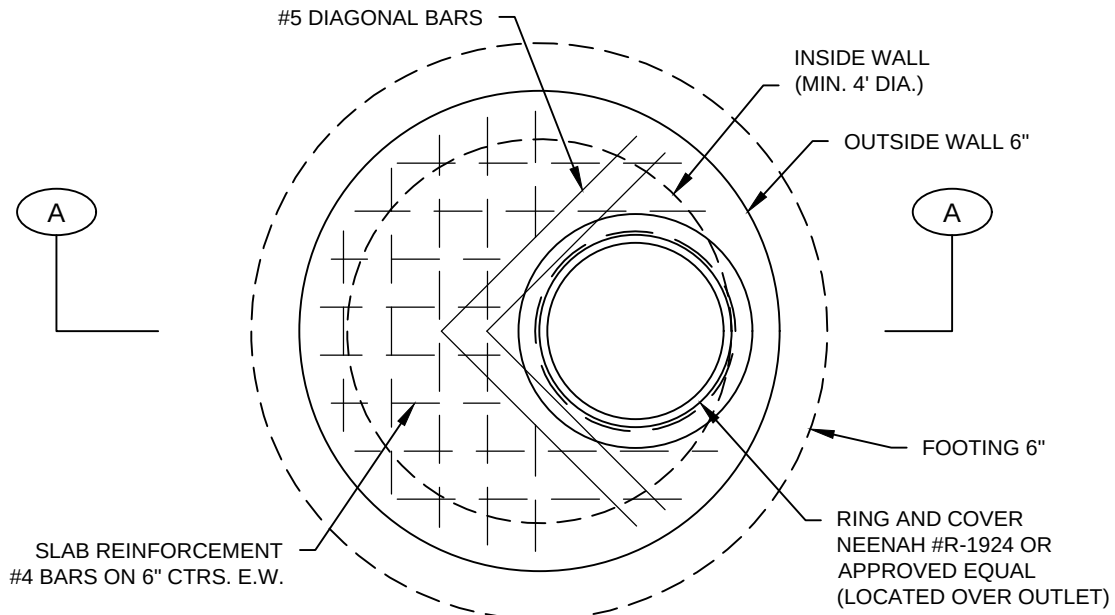
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	SEWERAGE DESIGN
Drawing No.:	III-3



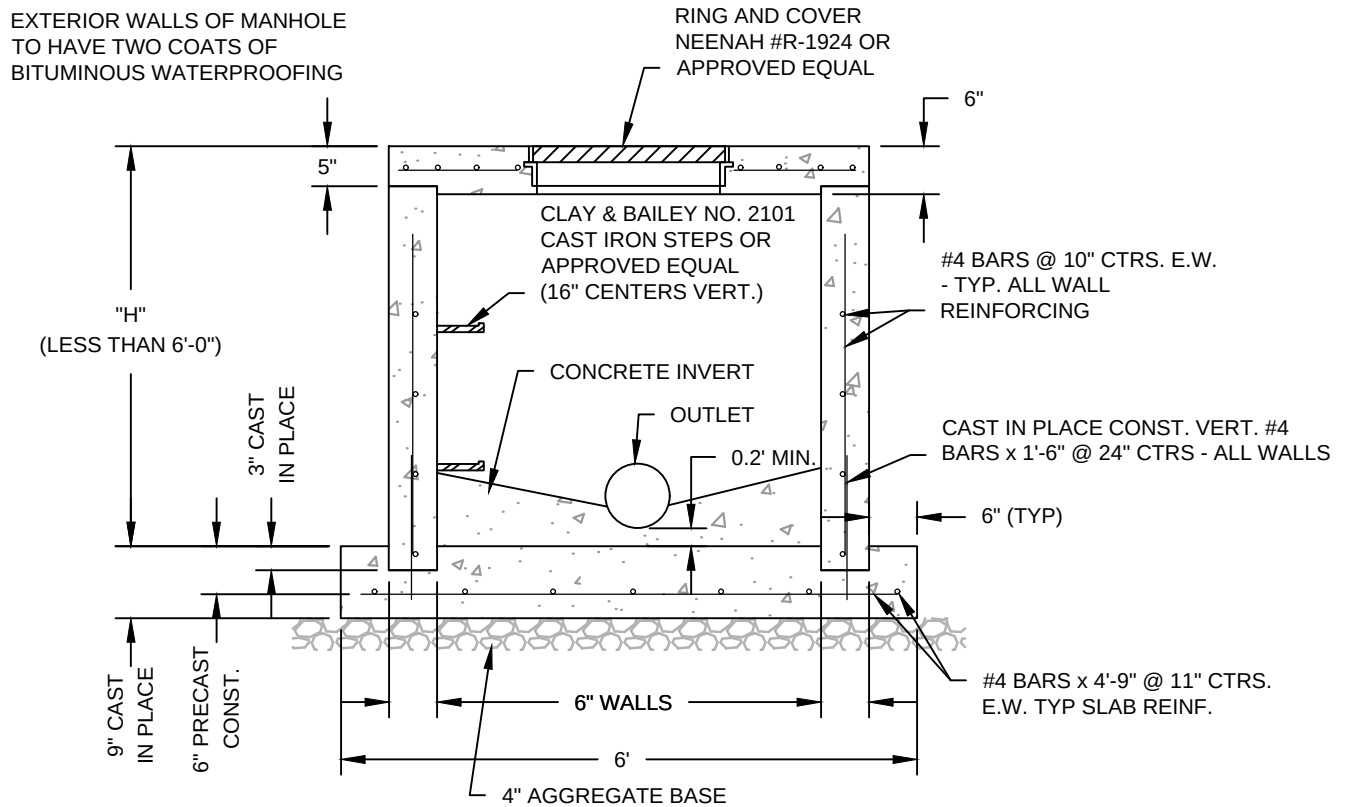
Date Revised:	MARCH, 2023
By:	NCW
Checked By:	DPV

CITY OF OSAGE BEACH
TYPICAL DETAIL
STANDARD PRECAST MANHOLE

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



PLAN VIEW



SECTION A-A

Date Revised:

AUG., 2008

By:

jdb

Checked By:

nle

CITY OF OSAGE BEACH TYPICAL DETAIL FLAT TOP MANHOLE

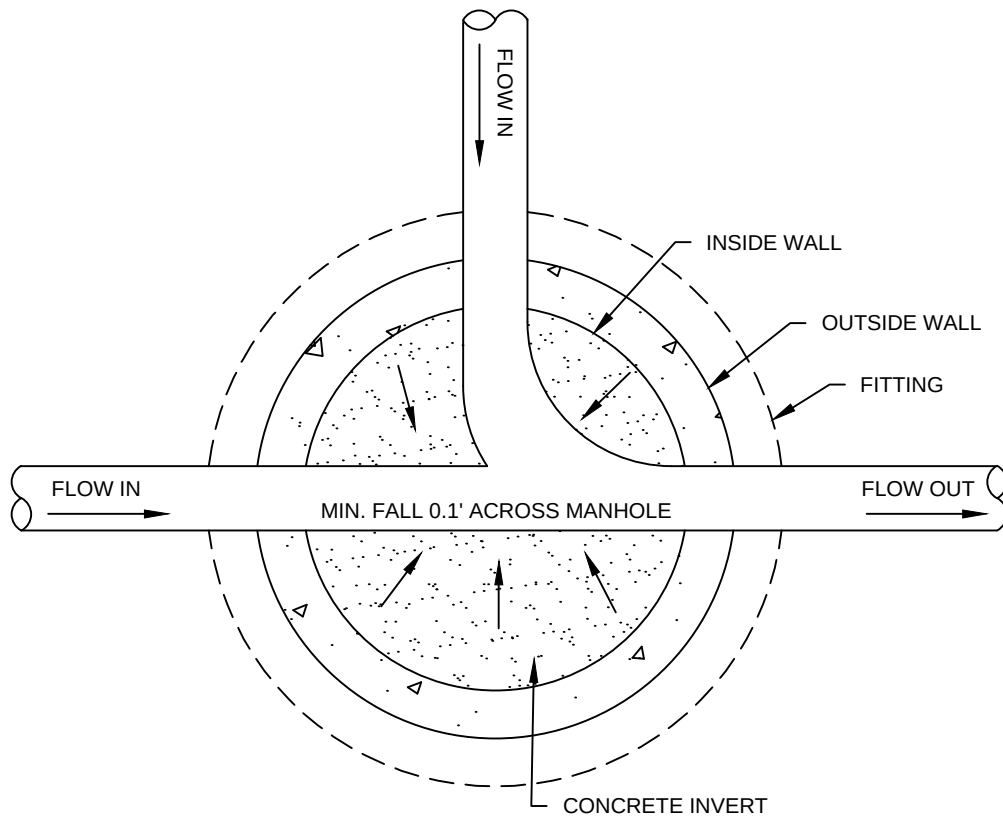
Design Guideline:

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:

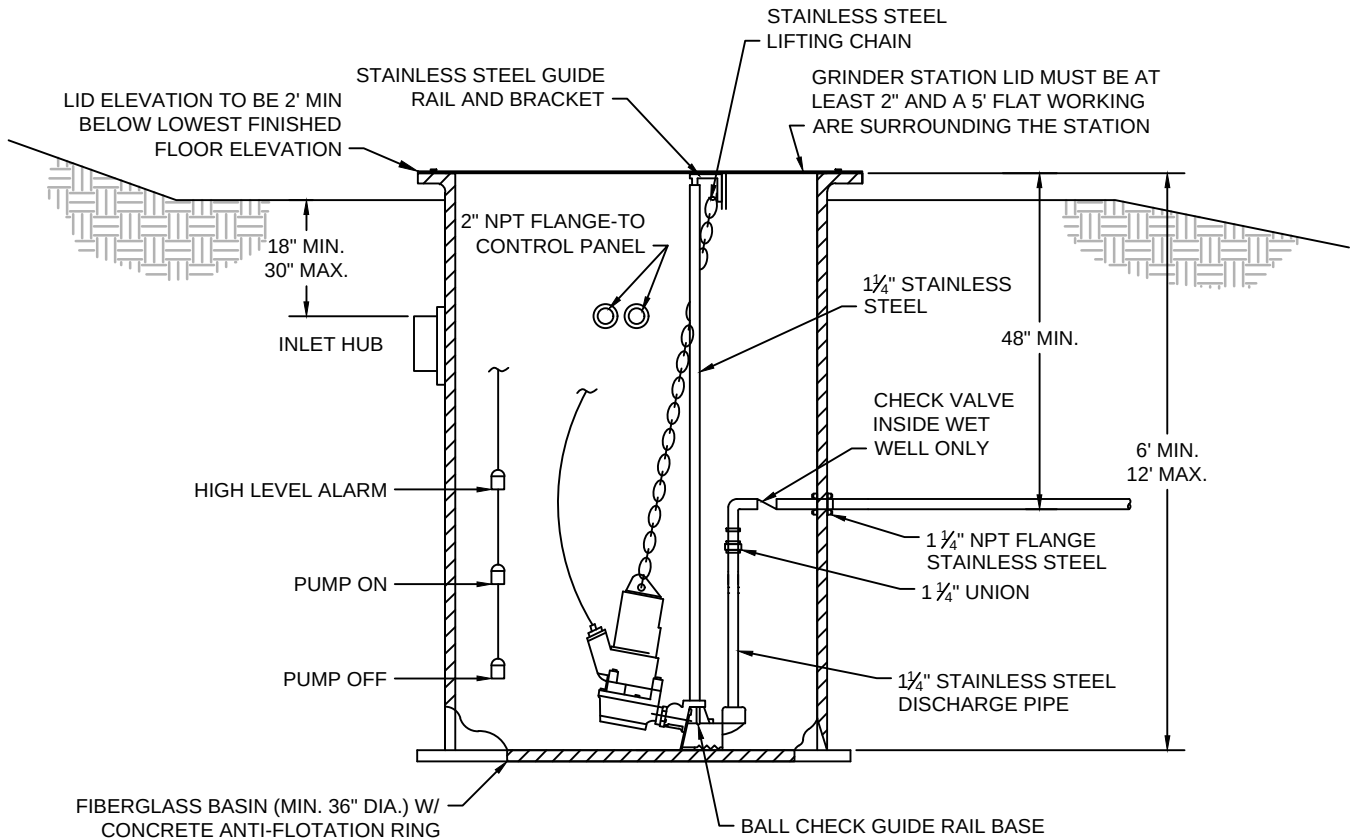
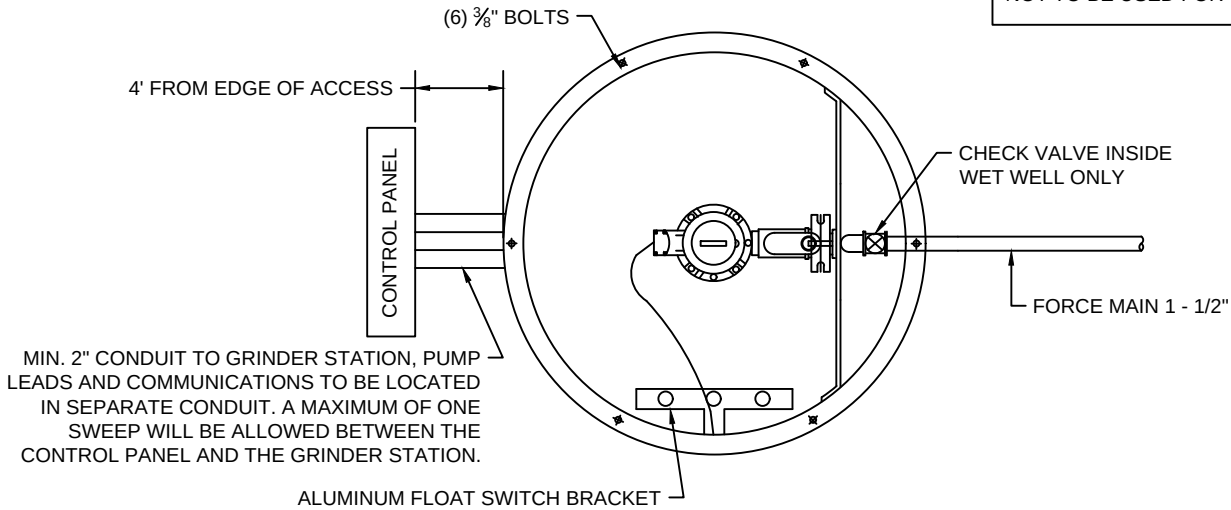
SECTION 3

SEWERAGE DESIGN

Drawing No.:

III-6

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



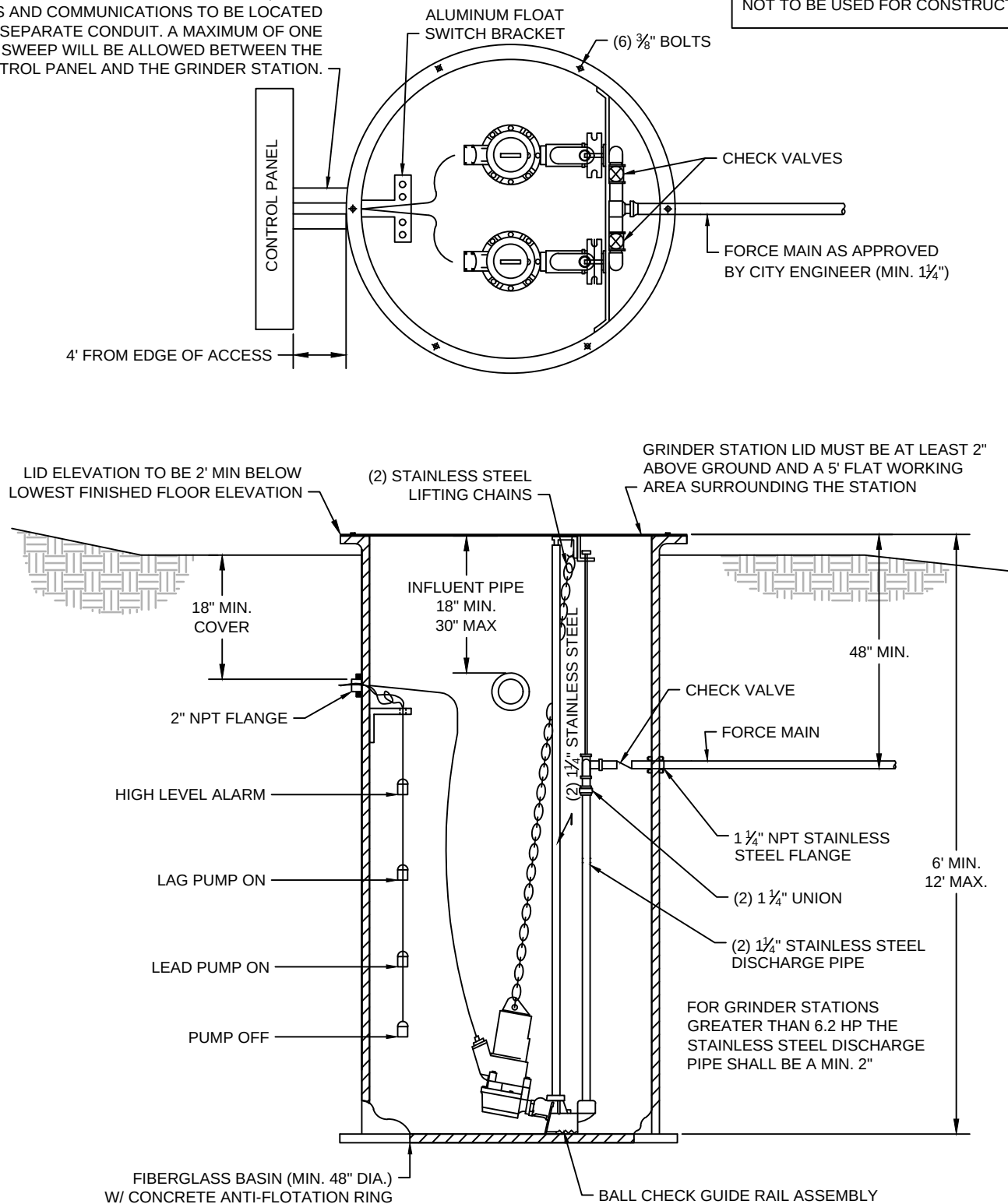
Date Revised:	MARCH, 2023
By:	NCW
Checked By:	DPV

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

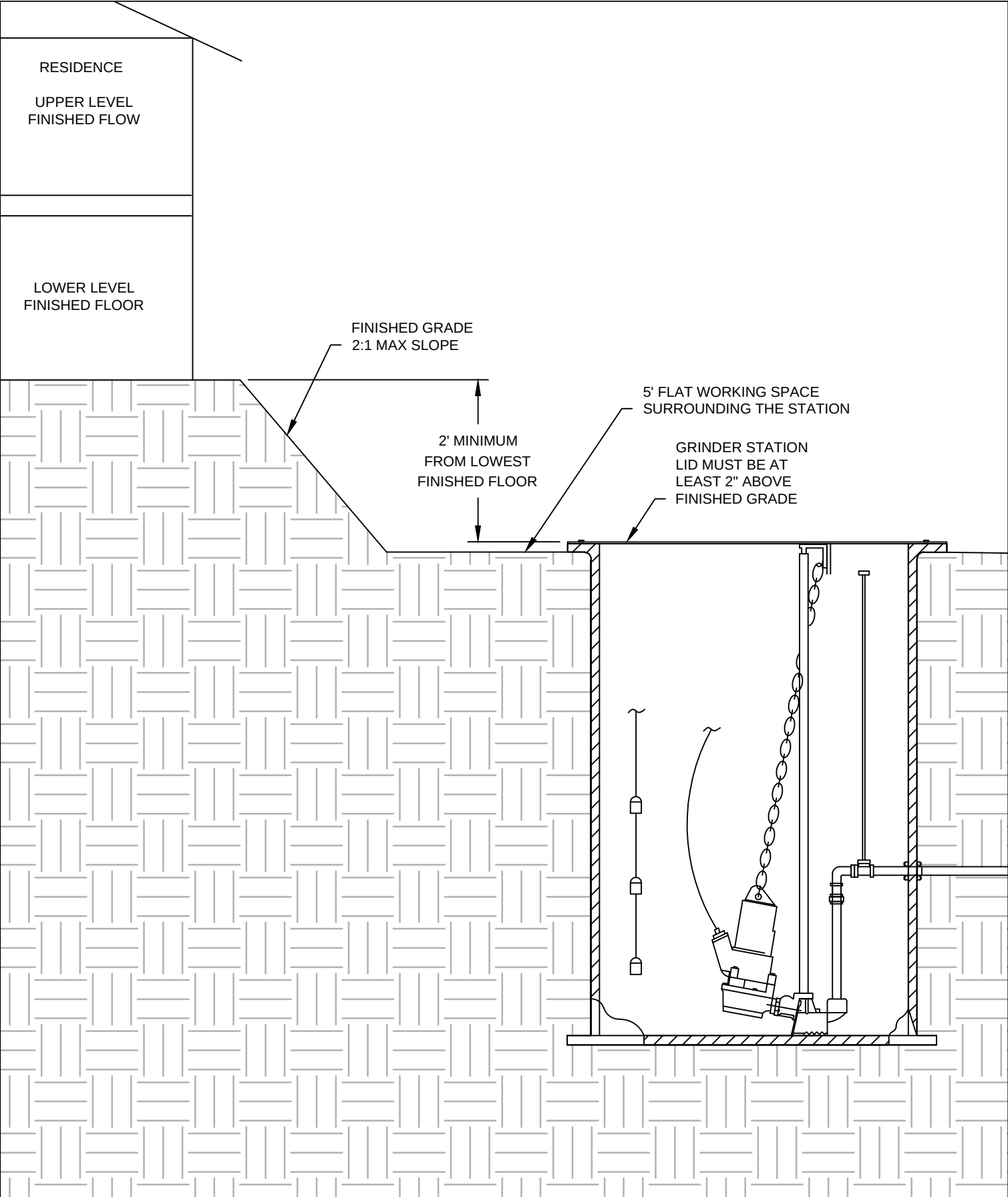
Design Guideline:

SECTION 3

SEWERAGE DESIGN

Drawing No.:

III-8



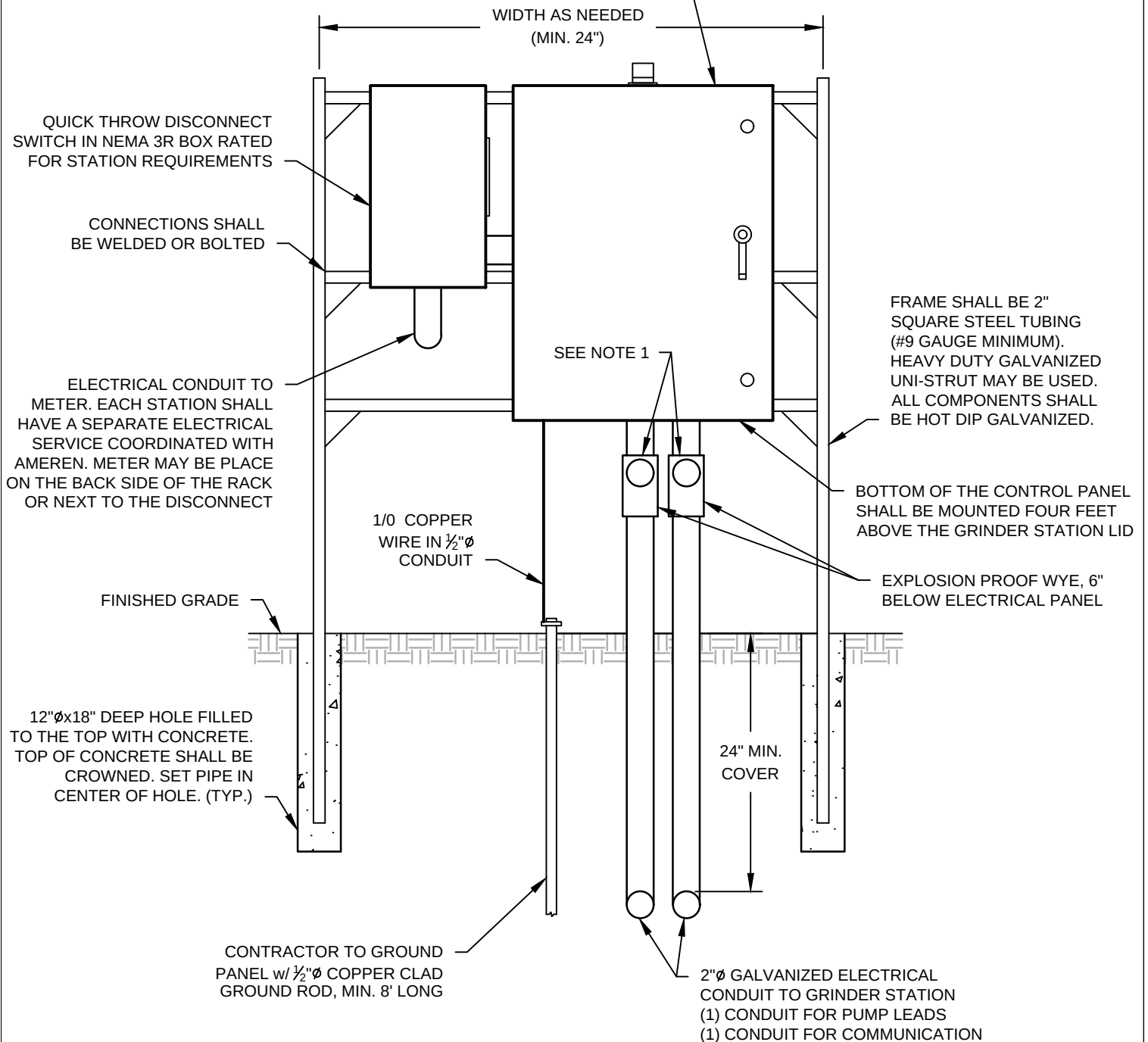
Date Revised:	NOV.,2009
By:	cps
Checked By:	

CITY OF OSAGE BEACH
TYPICAL DETAIL
WET WELL ELEVATION

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:

OCT., 2004

By:

sh

Checked By:

JB

CITY OF OSAGE BEACH
TYPICAL DETAIL
GRINDER STATION RACK

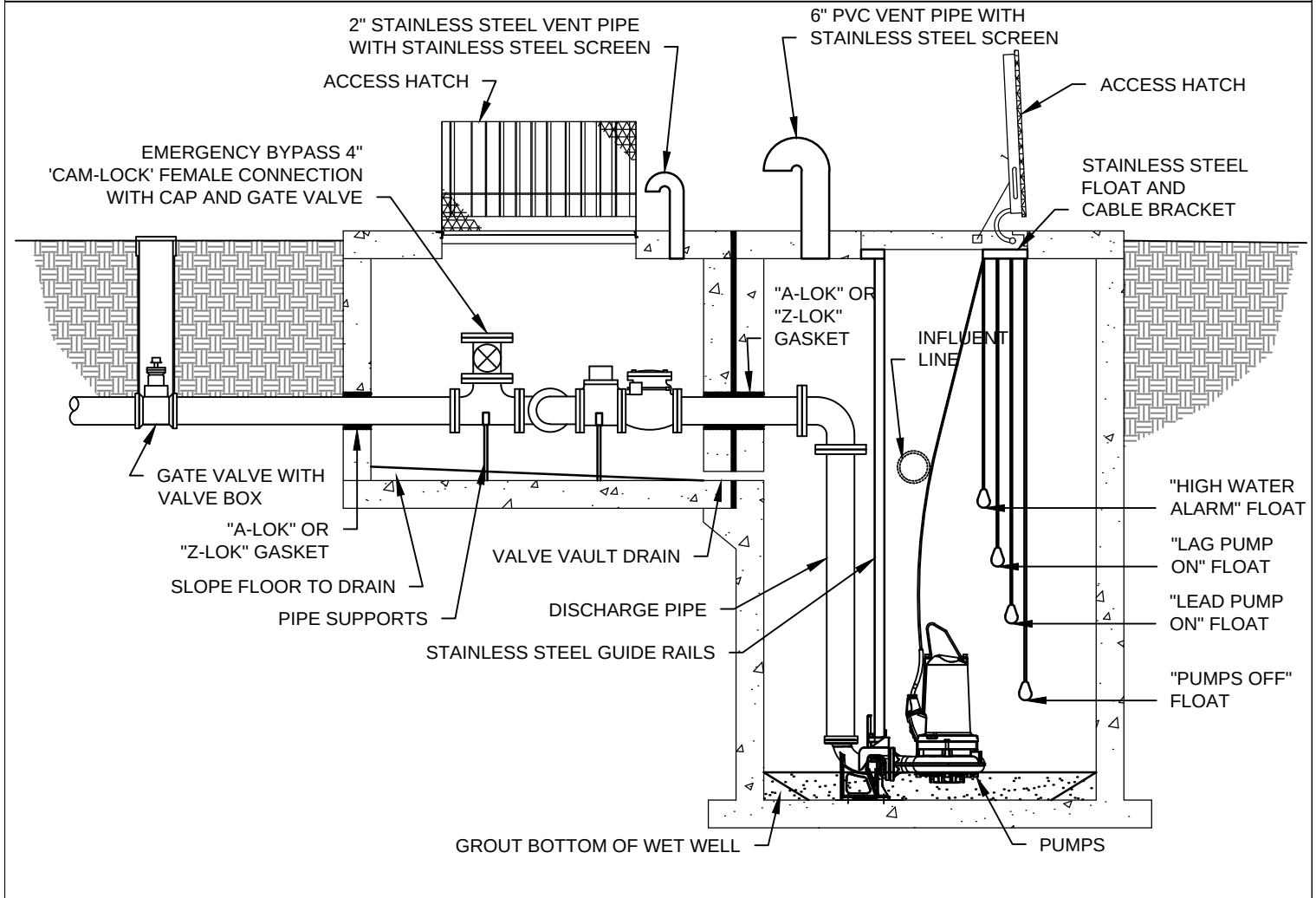
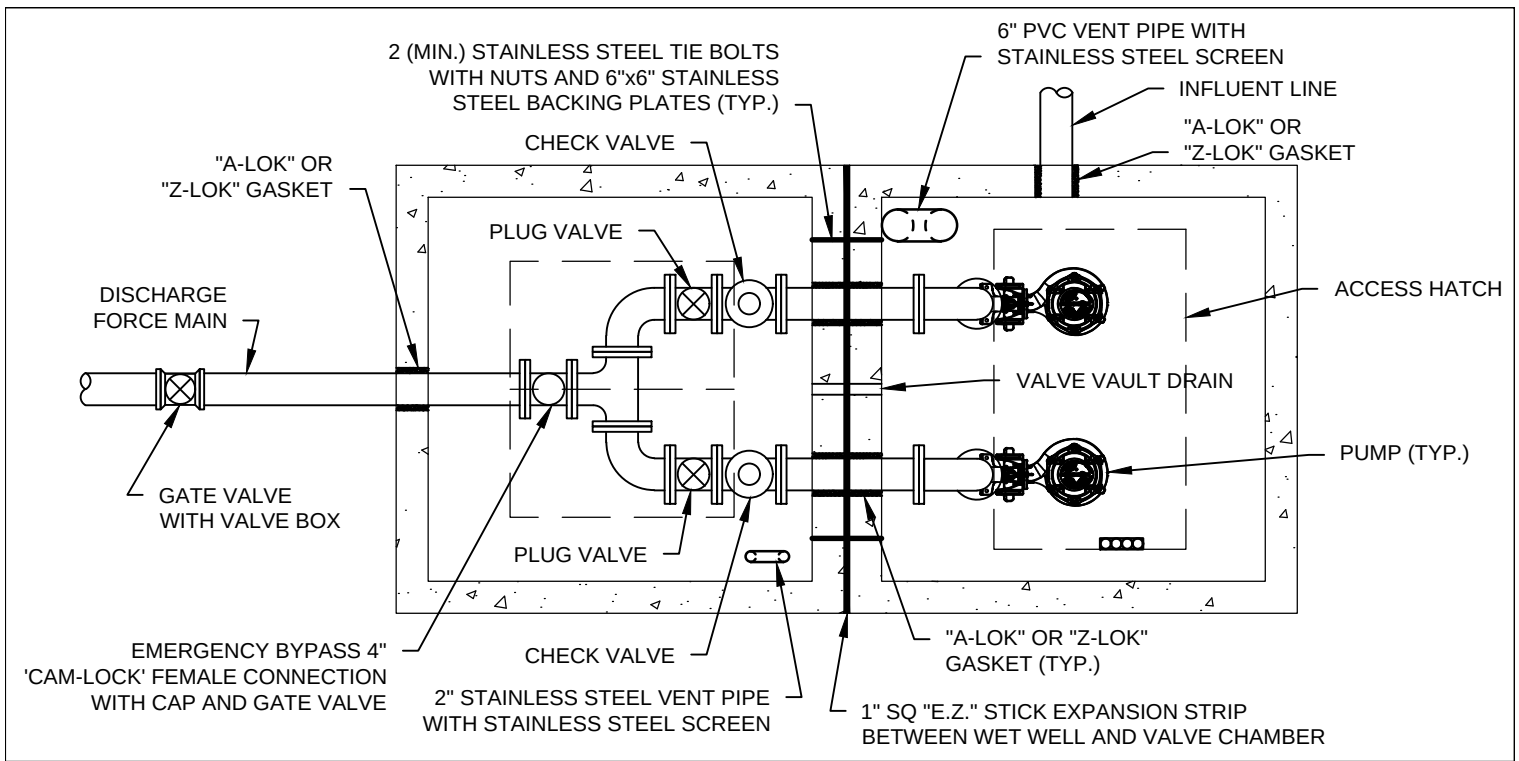
Design Guideline:

SECTION 3

SEWERAGE DESIGN

Drawing No.:

III-10



Date Revised: APRIL 2023	CITY OF OSAGE BEACH TYPICAL DETAIL LIFT STATION	Design Guideline: SECTION 3
By: NCW		SEWERAGE DESIGN
Checked By: DPV		Drawing No.: III-11