

LIBERTY REGIONAL WASTE DISTRICT

STANDARD SPECIFICATIONS & DETAILS

ADOPTED: MARCH 21, 2024

LIBERTY REGIONAL WASTE DISTRICT OFFICE:

(765) 282-9754

Table of Contents

Chapter 1 - General/Administrative.....	5
1.01 Introduction	5
1.02 Conformance to Liberty Regional Waste District Master Plan.....	5
1.03 Requirements for Acceptance into Liberty Regional Waste District System	5
1.04 Property / Easement Requirements.....	6
A. Sanitary Sewer Easement Requirements.....	6
B. Lift Station Property Requirements	7
Chapter 2 - Sanitary Sewer Materials	8
2.01 Introduction	8
2.02 Gravity Sanitary Sewer Materials.....	8
A. General.....	8
B. Polyvinyl Chloride (PVC) Pipe and Fittings.....	8
C. Non-Detectable Underground Utility Identification Tape	10
2.03 Forcemain Materials	10
A. General.....	10
B. Polyvinyl Chloride (PVC) Pressure Pipe and Fittings	11
C. Ductile Iron Pipe (DIP) and Fittings	12
D. High Density Polyethylene (HDPE) Pipe and Fittings	14
E. Couplings and Adapters	15
F. Non-Detectable Underground Utility Identification Tape	16
G. Location/Tracer Wire.....	17
H. Utility Marker	18
2.04 Sanitary Sewer Manhole Materials.....	19
A. General.....	19
B. Pre-cast Concrete Manhole	19
C. Compression Couplings	22
2.05 Sanitary Sewer Valves and Gates	22
A. Plug Valves (Forcemains Only).....	22
B. Plug Valves (Submerged Forcemains Only).....	24
C. Swing Check Valves	24
D. Sewage Combination Air/Vacuum Release Valves Manholes	25
E. Valve Boxes – Buried Valves (Except Sewage Combination Air/Vacuum Release Valves).....	26
F. Elastomeric (“Duckbill”) Check Valve (Wetwell Only – Valve Vault Drain Line).....	27
G. Stainless Steel Slide Gate (Wetwell Only).....	27
2.06 Grinder Pump Station	29
A. Manufacturer.....	29
B. General Requirements.....	29
C. Grinder Pump Station Connection to the Pressure Service Line	36
D. Check Valves	36
E. Service Line	37
Chapter 3 - Sewer Installation.....	38
3.01 Introduction	38
3.02 Wetwell & Meter Vault Piping Installation.....	38

A.	General	38
B.	Temporary Blind Flanges, Plugs, Caps and Bulkheads	38
C.	Piping Installation	38
D.	Joining Pipe.....	40
E.	Installing Valves and Accessories.....	44
F.	Unions	44
G.	Transitions from One Type of Pipe to Another	45
H.	Closures.....	45
3.03	Sanitary Sewer Installation (Gravity and Forcemain)	45
A.	Excavation for Pipeline Trenches	45
B.	Pipe Bedding.....	46
C.	Special Granular Fill	47
D.	Laying Pipe	47
E.	Backfilling Pipeline Trenches	47
F.	Installation of Identification Tape (Gravity and Forcemain)	49
G.	Installation of Location/Tracer Wire (Forcemain).....	50
H.	Installation of Utility Marker (Forcemain)	51
I.	Settlement of Trenches.....	51
J.	Pre-Fabricated Trench Baffles	51
K.	Concrete Highway, Street, and Drive Replacement.....	51
L.	Portland Cement Concrete Drive Replacement	52
M.	Concrete Curb and Gutter Replacement	52
N.	Mailbox, Culvert, Clothes Line Posts, Fences and other Replacements.....	52
O.	New Sanitary Sewer to Existing Manhole Connection (Gravity Sewer).....	52
3.04	Sanitary Sewer Manhole Installation.....	53
A.	Excavation for Manhole Installation.....	53
B.	Manhole Bedding.....	53
C.	Manhole Lining.....	54
D.	Converting Existing Pump Station to Manhole	55
E.	Concrete Highway, Street, and Drive Replacement.....	55
F.	Concrete Curb and Gutter Replacement	55
G.	Mailbox, Culvert, Clothes Line Posts, Fences and other Replacements.....	55
H.	Manhole Frame Installation	55
3.05	Grinder Pump Station Installation	55
A.	Installation.....	56
Chapter 4 -	Sanitary Sewer Inspection, Testing, and Acceptance	57
4.01	Introduction	57
4.02	Testing	57
A.	Gravity Sanitary Sewers.....	57
B.	Sanitary Sewer Forcemains.....	59
C.	Sanitary Sewer Manholes.....	63
Chapter 5 -	Sanitary Sewer Lift Stations	66
5.01	Introduction	66
5.02	Lift Station Site Requirements	66
A.	Security Fencing	66
B.	General Site.....	67

5.03 Type I Pump Station67
A. Scope of Work 67
B. Products..... 69
C. Execution 82
Appendices 86
Standard Liberty Regional Waste District Documents87
Standard Liberty Regional Waste District Details90

1.01 Introduction

The following Chapters provide a description of acceptable materials, installation and testing for the construction of gravity sanitary sewers, manholes, forcemains, sanitary lift stations, and their appurtenances within the **Liberty Regional Waste District (LRWD)** service area. Use of other materials, installation practices and testing not specified herein will be allowed only with the prior written approval and authorization from the **Liberty Regional Waste District** Superintendent. The Standard Specifications and Details may be revised by **Liberty Regional Waste District** without notice.

1.02 Conformance to Liberty Regional Waste District Master Plan

To ensure the continued development of an integrated and comprehensive sanitary sewer system, all new and extended facilities shall conform to the **Liberty Regional Waste District** Master Plan(s) in sizing and general location. Information provided by the Developer and Design Engineer will be used to verify the conformity of the proposed project to the Master Plan. **Liberty Regional Waste District** will then provide the Developer and Design Engineer with the required facility size for their use in design.

1.03 Requirements for Acceptance into Liberty Regional Waste District System

The following requirements shall be met prior to **Liberty Regional Waste District** accepting infrastructure into its System:

1. Infrastructure shall be constructed in accordance with the approved plans and specifications.
2. The infrastructure shall pass all testing described in the approved specifications and be witnessed by **Liberty Regional Waste District**.
3. The Developer shall tender donation of title and ownership of the system to **Liberty Regional Waste District**.
4. The Contractor shall present to **Liberty Regional Waste District** a three (3) year maintenance bond to protect the **Liberty Regional Waste District** against imperfections of the system.

5. Record Drawings shall be provided to **Liberty Regional Waste District** once construction is complete.
6. The Developer shall enter into an agreement with **Liberty Regional Waste District** per Indiana Utility Regulatory Commission (IURC) main extension rules.

1.04 Property / Easement Requirements

A. Sanitary Sewer Easement Requirements

Easements shall be exclusive Sanitary Sewer Easements and shall be dedicated and recorded solely for the benefit of the **Liberty Regional Waste District**. No building, structure, tree, landscaping or other obstruction shall be allowed to be placed, erected, maintained, or allowed to be within the easement.

Exclusive sanitary sewer easements shall not overlap other easements.

Easement boundaries shall be shown on the plans, referenced in the specifications, and shown on the plats as “Sanitary Sewer Easement” in lieu of “Utility Easement.” Common utility easements are prohibited for sanitary sewer facilities.

1. Minimum Requirements

- a. Sanitary Sewers Less than Twenty-Four inches in diameter (24”):

Depth of Sewer	Minimum Width (feet)
Up to and including 10 feet	20
Greater than 10 feet; up to and including 20 feet	30
Greater than 20 feet	40

All sanitary sewers shall be centered in the easement. For those sanitary sewers constructed in the public right-of-way, the easement shall extend the distance outside the right-of-way necessary to provide the required easement width.

In residential development, as approved by **Liberty Regional Waste District** on a case-by-case basis, if the sewer is located outside, but within five (5) feet of the

right-of-way, has 10 feet or less cover, and is fifteen (15) inches or less in diameter, then the easement may only be required to be ten (10) feet wide.

- b. Sanitary Sewers Twenty-Four Inches (24”) and Larger:

The easement width will be determined on a case-by-case basis by **Liberty Regional Waste District**, but shall not be less than a minimum of thirty (30) feet in width.

B. Lift Station Property Requirements

The minimum property requirements for lift stations are included in the attached Standard Details. The property requirements for lift stations may, at the discretion of **Liberty Regional Waste District**, be modified on a case-by-case basis.

2.01 Introduction

The following Chapter provides a description of materials acceptable for the construction of gravity sanitary sewers, force mains, manholes, gravity storm sewers, lift stations, and their appurtenances within the **Liberty Regional Waste District** service area. Use of other materials not specified herein will be allowed only with the written approval and authorization from **Liberty Regional Waste District** Executive Director.

2.02 Gravity Sanitary Sewer Materials

A. General

1. **Liberty Regional Waste District** currently allows the use of the following pipe materials meeting or exceeding the minimum requirements/specifications set forth herein for the construction of gravity sanitary sewers:
 - Polyvinyl Chloride Pipe (PVC)
2. Polyvinyl Chloride Pipe (PVC) may be used in the following locations:
 - a. All gravity sanitary sewer shall be Polyvinyl Chloride Pipe (PVC), unless otherwise noted or approved.
3. Each length of pipe shall be marked per the requirements of the respective ASTM standard. Upon request, the Contractor at his own expense shall furnish **Liberty Regional Waste District** with copies of all material tests required by applicable ASTM standards.

B. Polyvinyl Chloride (PVC) Pipe and Fittings

1. Pipe: PVC Pipe shall be installed where indicated on the Contract Drawings
2. Pipe shall be Green in color.
3. Fittings: PVC Fittings shall only be installed on sanitary service laterals and new sewer mains for service lateral wye fittings, as required.
4. Pipe must be delivered to job site by means which will adequately support it, and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Pipe shall not be stored

outside where subject to sunlight.

5. Jointing of PVC pipe shall be by a natural rubber ring inserted into the belled end of the pipe or double hub joints. Solvent weld joints are not acceptable.
6. The PVC pipe manufacturer shall provide special fittings, acceptable to **Liberty Regional Waste District** to make watertight connections to manholes.
7. Pipe manufacturer shall furnish notarized certificate of compliance with applicable specifications.
8. The cleaning and assembly of pipe and fittings shall be in accordance with the manufacturer's recommendation.
9. Small Diameter Gravity Sewer Application (15" and Smaller):
 - a. PVC gravity sewer shall be polyvinyl chloride plastic pipe, SDR-35 pipe. PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for ductile-iron fittings. All PVC pipe shall conform to the latest revisions of the following:
 - i. ASTM D3034 Standard Dimension Ratio (SDR) 35.
 - b. Pipe shall meet the extra strength minimum of SDR-35 (PS-46) for depths 15 ft. or less and SDR-26 (PS-115) for depths greater than 15 ft. Gasketed fittings shall conform to the same specifications and be supplied with the pipe.
10. Large Diameter Gravity Sewer Application (Greater than 15"):
 - a. Large diameter PVC pipe used for gravity sewer applications shall meet or exceed all performance requirements of the previous paragraph, except ASTM F679 shall be referenced instead of ASTM D3034.
 - b. All large diameter gravity sewer pipe (greater than 15") shall be ASTM F679, SDR-35 (PS-46) (depth of cover less than 15 feet) or SDR-26 (PS-115) (depth of cover 15 feet or greater).
11. All pipe and fittings shall be inspected at the factory and on the job site. Testing of PVC pipe and fittings shall be accomplished in conformance with the latest revision of ASTM D3034, ASTM D2444, ASTM D2412, and ASTM D2152. The manufacturer shall submit five (5) copies of certification of test for each lot of material represented by shipment to the job site.
12. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. The pipe shall be as uniform in color as commercially practical. PVC pipe shall have a ring painted around spigot ends in such a manner as

to allow field checking of setting depth of pipe in the socket.

13. Joints for polyvinyl chloride (PVC) mains shall be integral bell and spigot type joints with rubber-o-ring gasket. The cleaning and assembling of the pipe joints shall be in accordance with manufacturer’s recommendations.
14. PVC Gravity Lateral Service Connection Piping (6” minimum).
 - a. PVC gravity lateral service connection pipe (6”) shall be ASTM-3034, SDR 35 solid wall PVC pipe. All fittings shall be heavy wall, SDR-26.
 - b. New sanitary sewers shall have PVC wye fittings for service laterals installed.
 - a. For laterals with no existing stub out connection, use Inserta-Tee or approved equal when tapping into an existing sewer main.
 - b. The repair of laterals shall utilize the “Shear Guard” by Onset Pipe Products or approved equal. Fernco Repair fittings will not be acceptable.

C. Non-Detectable Underground Utility Identification Tape

1. Underground non-detectable utility warning tape shall be pigmented polyolefin film with a printed message on one side used to protect, identify, and locate underground utility lines.
2. Tape shall have minimum thickness of 4 mils and minimum width of 3 inches and maximum width of 6 inches. The material and ink shall be chemically inert and shall not degrade when exposed to acids, alkalis, and other destructive substances commonly found in soil. Ink used to print the material is permanent and cannot be removed by normal handling or upon burial.
3. The tape shall be color coded and imprinted with the message as follows:

Type of Utility	Color Code	Message
Sewer	Green	Caution Sewer Line Buried Below

4. Underground identification tape shall be “Terra Tape Standard” as manufactured by Reef Industries, Inc., or equal.

2.03 Forcemain Materials

A. General

1. **Liberty Regional Waste District** allows the use of the following pipe materials meeting or exceeding the minimum requirements set forth herein, for the construction of sanitary sewer forcemains.

- Polyvinyl Chloride Pipe (PVC)
 - Ductile Iron Pipe (DIP)
 - High Density Polyethylene Pipe (HDPE)
2. Polyvinyl Chloride Pipe (PVC) may be used in the following locations:
 - a. All sanitary forcemain pipe shall be Polyvinyl Chloride Pipe (PVC), unless otherwise noted or approved.
 3. Ductile Iron Pipe (DIP) may be used in the following locations:
 - a. The lift station wetwell, valve vault, and meter vault interior. Refer to Chapter 9 - Sanitary Sewer Lift Stations for requirements.
 - b. The lift station site.
 4. High Density Polyethylene Pipe (HDPE) may be used in the following locations:
 - a. Small diameter forcemain applications for grinder pumps.
 - b. Horizontal directional drill (HDD) locations as approved by **Liberty Regional Waste District**.

B. Polyvinyl Chloride (PVC) Pressure Pipe and Fittings

1. Pipe:
 - a. Pipe shall be Green in Color.
 - b. 4” through 12” Diameter – shall conform to one of the following:
 - i. PVC plastic IPS pipe shall conform to ASTM D2241, Pressure Class 200 (SDR 21). PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for cast-iron or ductile-iron fittings. Elastomeric gasket shall conform to the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe.
 - ii. PVC plastic DIPS pipe shall conform to ANSI/AWWA C-900, Pressure Class 235 (DR 18). PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for cast-iron or ductile-iron fittings. Elastomeric gasket shall conform to the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe.
 - c. 16” through 30” Diameter – shall conform to the following:
 - i. PVC plastic pipe shall conform to ANSI/AWWA C-900, Pressure Class 235 (DR 18). PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for cast-iron or ductile-iron fittings. Elastomeric gasket shall conform to the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory

- must appear on each pipe
- ii. Pipe shall be Green in color.

2. Joints:

- a. Joints for PVC mains shall be integral bell and spigot type joints with rubber-oring gasket. The cleaning and assembling of the pipe joints shall be in accordance with manufacturer's recommendations. Joints shall conform to ASTM D3139.
- b. Joints shall be restrained as required in the Restrained Joint Tables for PVC pipe included in the Standard Details.

3. Fittings:

- a. Fittings shall be ductile iron and conform to specifications noted herein under Ductile Iron Pipe (DIP) and Fittings.
- b. All fittings shall be restrained using mechanical restraints.

C. Ductile Iron Pipe (DIP) and Fittings

1. Ductile iron pipe shall conform to the current requirements of AWWA C151, Pressure Class 350 (16" pipe and smaller) or Pressure Class 250 (18" pipe and larger), with push-on joints and shall be restrained per EBAA Iron Restrained Joint Calculator or approved equal. To ensure uniformity of installation and appearance, all system piping components shall be the products of one manufacturer.
2. The interior of the pipe shall be double cement-mortar lined with bituminous seal coat in accordance with the current requirements of AWWA C104. Thickness of the lining shall be set forth in the aforementioned specification. The exterior of all pipe, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.
3. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or the word "DUCTILE". Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA specifications.
4. Fittings shall be ductile iron and rated for a minimum working pressure of 350 psi (4" through 24") or 250 psi (30" and larger) in accordance with the current requirements of AWWA C110 shown therein. Fittings shall have mechanical joints meeting the current requirements of AWWA C111. Fittings shall have interior cement-mortar lining as specified for the pipe. Compact ductile iron fittings meeting the current requirements of AWWA C153 will also be acceptable. Provide notarized certificate of compliance to the AWWA specifications.
5. Mechanical joints shall be bolted and of the stuffing box type and shall consist of a bell, with exterior flange and interior recess for the sealing gasket, a pipe or fitting plain end, a sealing gasket, a follower gland, tee-head bolts and hexagon nuts. All bolts and nuts

shall be high strength, heat treated ASTM A36 as a minimum requirement. After field installation, all steel surfaces shall have one coat of Sherwin-Williams Targuard; or equal, coal tar epoxy coating applied before backfill. Nuts and bolts shall meet the requirements of AWWA C111.

6. All Exposed Pipe shall be flanged joints.
 - a. Provide pipe flanges and accessories conforming to AWWA A21.15
 - i. Provide flat faced flanges.
 - ii. Provide 1/8-inch thick, full faced gaskets designed for exposure to liquid within pipe.
 - b. After field installation, all steel surfaces shall be coated as noted herein.
7. Gasket material for standard wastewater service up to 150°F shall be SBR (Styrene-Butadiene Rubber).
8. Provide AWWA C110 mechanical joint plugs and locked or restrained pipe joints where indicated on Drawings. Fittings under structures shall be mechanical joint with retainer glands. Retainer glands shall be of the “wedge action” design, where tightening the screws causes the wedge to lock onto the pipe.
9. All underground ductile iron pipes shall be encased with polyethylene film in tube form conforming to AWWA C105 (latest edition).
 - a. Polyethylene encasement for use with ductile iron pipe systems shall consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than eight (8) mils.
 - b. The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of antimicrobial compound to mitigate antibiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.
 - c. The polyethylene film shall have the following characteristics:
 - i. Impact Resistance: 600 grams per ASTM D1709 Method B
 - ii. Propagation Tear Resistance: 2,550 grams force per ASTM D1922
 - iii. Thickness: 0.008 inches minimum (8 mil)
 - d. Polyethylene encasement shall be installed per ANSI/AWWA C105 Modified Method A.
 - e. Polyethylene encasement shall be V-Bio as manufactured by DIPRA.

10. The cleaning and assembly of pipe and fitting joints shall be in accordance with the manufacturer's recommendations.

D. High Density Polyethylene (HDPE) Pipe and Fittings

1. High density polyethylene pipe shall be manufactured by the following:
 - a. Manufactured by JM Eagle,
 - b. “DriscoPlex” as manufactured by Chevron Phillips,
 - c. or Approved equal.
2. Pipe shall be black in color with a green striping.
3. All forcemain HDPE pipe shall be iron pipe size (IPS). All HDPE pipe for sewer forcemain applications shall be DR 11 (200 psi WPR). Pipe shall be upsized one (1) standard pipe diameter to match internal pipe diameter as close to the connecting pipe as possible.
4. HDPE pipe and fittings shall be made of polyethylene resins having a cell classified in ASTM D 3350 as 445574C/E, having specific base resin densities of at least 0.941 g/cc minimum and 0.955 g/cc maximum respectively; and having melt index less than 0.15 grams/10 min. The pipe shall be designed for a normal internal working pressure and earth cover over top of the pipe to suit the conditions of proposed use.
5. Pipe made from these resins must have a long-term strength rating of 1,600 psi or more.
6. The polyethylene resin shall contain antioxidants and shall be stabilized with carbon black against ultra-violet degradation to provide protection during processing and subsequent weather exposure.
7. The polyethylene resin compound shall have a resistance to environmental stress cracking as determined by the procedure detailed in ASTM D 1693, Condition B with sample preparation by procedure C of not less than 200 hours.
8. Each length of pipe shall be marked, at no more than 10 foot intervals, with the following information:
 - a. Nominal Pipe Size
 - b. Type Plastic Material – PE4710 Pipe Pressure Rating
 - c. Manufacturer’s Name, Trademark and Code

9. All pipe shall be made from virgin material. No rework compound. Pipe shall be homogenous throughout, and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
10. Fittings for the polyethylene pipeline shall be Ductile Iron Fittings per requirements noted above.
11. Fittings for bends 22-1/2° or greater shall be provided as shown on the Drawings. For alignment changes of less than 20° deflection, the pipe may be laid in curves with a radius of 100 feet or greater.
12. All run-of-the-pipe fittings shall be fusion welded into the pipeline.
13. Tee branches shall be of the size shown on the Drawings and shall be furnished with flanged ends per ANSI B-16.1. All fittings shall be factory made.
14. Fittings shall be capable of withstanding the same pressure and loading conditions specified for the pipe.
15. Pipe Jointing:
 - a. Pipe to be joined by leak proof, thermal, butt fusion joints. All fusion must be done by personnel trained by the pipe supplier using tools approved by the pipe supplier.
 - b. The fusion machine shall have hydraulic pressure control for fusing two (2) pipe ends together; it shall include pressure fusion indicating gauges to correctly monitor fusion pressures. The machines shall be equipped with a McElroy Datalogger to record fusion pressure and temperature. The machines shall be equipped with an electric or gasoline engine powered facing unit to trim irregularities from the pipe ends. The heating plate on the fusion machine shall be electrically heated and thermostatically controlled and shall contain a temperature gauge for monitoring temperature. All datalogger information shall be submitted electronically to **Liberty Regional Waste District**.
 - c. Joint strength must be equal to that of adjacent pipe as demonstrated by tensile test. In addition, results of tensile impact testing of joint should indicate a ductile rather than a brittle fracture. External appearance of fusion bead should be smooth without significant juncture groove.

E. Couplings and Adapters

1. Couplings and Adaptors:

- a. Couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel trackhead bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal.
- b. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed.
- c. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.
- d. Flanged adaptors shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adaptors shall be harnessed with full threaded rods spanning across the couplings or adaptors. The adaptors shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adaptor (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.
- e. Flexible couplings and flanged adaptors shall be as manufactured by Dresser, per the following, unless otherwise specified and/or noted on the Drawings:
 - i. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe:
 - Style 138 by Dresser
 - ii. Transition couplings for joining pipe of different outside diameters:
 - Style 162 by Dresser (4"-12")
 - Style 62 by Dresser (2"-24")
 - iii. Flanged adaptors for joining plain-end pipe to flanged pipe, fittings, valves and equipment:
 - Style 127 by Dresser cast (3"-12")
 - Style 128 by Dresser steel (3"-48" C.I. Pipe)
 - Style 128 by Dresser steel (2"-96" Steel pipe)

F. Non-Detectable Underground Utility Identification Tape

1. Underground non-detectable utility warning tape shall be pigmented polyolefin film with a printed message on one side used to protect, identify, and locate underground utility lines.
2. Tape shall have minimum thickness of 4 mils and minimum width of 3 inches and maximum width of 6 inches. The material and ink shall be chemically inert and shall not degrade when exposed to acids, alkalis, and other destructive substances commonly found in soil. Ink used to print the material is permanent and cannot be removed by normal handling or upon burial.
3. The tape shall be color coded and imprinted with the message as follows:

Type of Utility	Color Code	Message
Sewer	Green	Caution Sewer Line Buried Below

4. Underground identification tape shall be “Terra Tape Standard” as manufactured by Reef Industries, Inc., or equal.

G. Location/Tracer Wire

1. Open Cut Excavation:
 - a. Direct burial tracer wire shall be #10-AWG solid, copper-clad steel core (2,032 lb. average tensile break load) with 45 mil high density polyethylene “GREEN” color insulating jacket complying with ASTM D1248, 30-volt rating. The wire shall be continuous with no fabricated or field construction connections interrupting the wires continuity from end to end. Wire insulation shall be highly resistant to acids, alkalis, and other destructive substances commonly found in soil.
 - b. Tracer wire shall be 1030 HS as manufactured by Copperhead Industries LLC; or approved equal.
2. Horizontal Directional Drilling:
 - a. Directional drilling tracer wire shall be #10-AWG solid, copper-clad steel core (2,032 lb. average tensile break load) with 45 mil high density polyethylene “GREEN” color insulating jacket complying with ASTM D1248, 30-volt rating. The wire shall be continuous with no fabricated or field construction connections interrupting the wires continuity from end to end. Wire insulation shall be highly resistant to acids, alkalis, and other destructive substances commonly found in soil.
 - b. Two (2) wires shall be installed for all horizontal directional drill locations.
 - c. Tracer wire shall be 1045 EHS SoloShot as manufactured by Copperhead Industries LLC; or approved equal.
3. Open Cut Excavation Tracer Wire Splice Kit:
 - a. Open cut excavation splice kit shall be DryConn Direct Bury Lug Aqua Model #90220 as manufactured by King Innovation; or approved equal.

4. Tracer Wire Terminating Box:
 - a. Tracer wire terminating box shall be located along the sewage forcemain at the lift station valve vault conc. apron face. Tube material shall be of high grade ABS, or equivalent rigid plastic that meets or exceeds ASTM D-1788, Type 1 requirements. Lid material shall be of cast iron or ductile iron and shall be flush with the ground. Lid-locking bolt material shall be made of aluminum material equal or superior to ASTM B-253. Brass screw running through brass wire harness and lid will be used as connection for locator transmitter hook-up. Brass wire harness shall be used to secure tracer wire leads to brass screw enabling locator equipment hook-up. Petrolatum wax tape incorporated with magnetized tracer box to encapsulate tracer wire leads and brass wire harness. Petrolatum wax tape must be formed around brass wire harness connection after tracer wire leads are connected to prevent oxidation of wire ends. To ensure proper long term locatability and signal strength, the petrolatum wax tape must be utilized to prevent oxidation. Access Box shall be designed for operational access to underground tracer wire systems and shall include an anti-sink/pull-out restraint flange.
 - b. Tracer wire terminating box shall be “Snake Pit Roadway Box” as manufactured by Copperhead Industries, Inc.; or equal.
5. Grounding Rod:
 - a. Grounding rod for tracer wire shall be Model “ANO-12” as manufactured by Copperhead Industries LLC; or approved equal.

H. Utility Marker

1. Tracer Wire Marker Posts:
 - a. Pipeline marker posts with terminal connections to receive tracer wire shall be located along the sewage forcemain route. Marker posts shall be constructed of superior grade ABS plastic material, 3.5” outside diameter, 7 feet total height (with min. 4 feet above grade), with lid. Lettering shall be clearly printed on the marker post indicating: “**Liberty Regional Waste District**” and “Buried Sewage Forcemain” and “Emergency Contact: 765-282-9754”. Marker post shall be Model PMP-7CE with Lid C2 as manufactured by Handley Industries, Inc., or approved equal.
2. Utility Markers:
 - a. Utility marker shall be a single piece marker shall be constructed of a durable, UV resistant, continuous glass fiber and resin reinforced, thermosetting composite material which is resistant to impact, ozone, and hydrocarbons within a service temperature range of -40 deg. F to +140 deg. F. Marker shall be a constant flat “T” cross sectional design of 0.125” minimum thickness with reinforcing support ribs incorporate longitudinally along each edge to provide sheeting protection and

structural rigidity. The bottom end of the marker shall be pointed for ease of ground penetration and furnished with a fastened metal anchor barb for permanent anchoring into soil.

- b. Each marker shall be permanently identified with the manufacturer's name and month/year of fabrication. A black line shall be stamped horizontally across the front of the marker near the bottom to indicate proper burial depth. Marker shall have a minimum width of 3.75 inches and overall length of 72 inches.
- c. Each marker shall be green color throughout with a vinyl, non-reflective green background decal located at the top end of the marker with white vertical lettering "CAUTION SEWAGE FORCEMAIN". Decal shall be outdoor quality, UV resistant, with embedding graphics under a protective weather and fade resistant laminate cover.
- d. Utility marker shall be model "CRM3-072-07" as manufactured by Carsonite Composites; or approved equal.

2.04 Sanitary Sewer Manhole Materials

A. General

1. Sanitary sewer manholes shall be installed at the end of each line segment; at all changes in grade, size, materials, and/or alignment; at all intersections; and at distances not greater than 400 feet. Cleanouts shall not be substituted for manholes.
2. In unpaved/grassy areas manholes shall be designed and installed such that they extend a minimum of three (3) inches above finished grade to prevent water ponding. Positive drainage away from the manhole shall be provided. Manholes shall not to be buried.

B. Pre-cast Concrete Manhole

1. Circular manholes of the form and dimensions shown on the Drawings shall be constructed of ASTM C 478 precast reinforced concrete manhole sections erected on 4,000-psi concrete foundation. Precast concrete manhole bottom sections may be substituted for "cast-in-place" foundations subject to **Liberty Regional Waste District** review. The excavation shall be kept free of water while the manhole is being constructed and the manhole shall not be backfilled until inspected by the Engineer.
2. Standard manholes shall be 4' -0" inside diameter and greater than six (6) feet in depth, measured from the top of the cover frame to the invert of the outlet and shall be of eccentric cone top construction as shown on the Drawings. Shallow manholes of five (5) feet or less in depth, measured from the top of the cover frame to the invert of the

outlet and shall be of flat top construction. Refer to Standard Details for required manhole diameter for sanitary sewer pipe diameter.

3. Concrete Manhole Sections: Precast concrete manhole sections (risers and grade rings) shall conform to ASTM C478.
4. Precast Concrete Eccentric Cones: Precast concrete eccentric cones shall be of the size and shape shown on the Drawings and shall conform to ASTM C478.
5. Precast Manhole Section Joints:
 - a. Precast manhole section joints shall be jointed with ASTM C443 rubber o-ring gasket PLUS flexible butyl resin concrete sealant (rope) conforming to ASTM C 990. All internal manhole joints shall be grouted with non-shrink grout. All external manhole joints shall be wrapped with polyolefin backed exterior joint wrap; model CS-212 as manufactured by ConSeal, or approved equal. Manhole section joints shall be watertight. These requirements apply to all joints, including manhole risers and grade rings.
6. When making joints with mastic compound prime and seal all joints with primer supplied with the joint compound. Manhole section joints shall be watertight. These requirements apply to all joints, including manhole risers, cones, and grade rings.
7. Manhole Inverts: Manhole inverts shall be formed with 3,000 psi concrete. Inverts shall be constructed as shown on the Contract Drawings and shall form a smooth finish. The inverts shall be constructed on site after both inlet and outlet pipes are installed. With review and approval by **Liberty Regional Waste District**, the bench and trough may be precast as part of the base unit. Invert channel shall be smooth with a semi-circular bottom and vertical sides extending up to the height of the pipe crown. Changes of flow direction within manholes shall be made by a smooth curve having as large a radius as possible. The manhole bench shall be smooth and slope towards the channel not less than ½ inch per foot.
8. Manhole Steps: Steps shall be included in the structures.
9. Where indicated on the Drawings or in the Specifications, Traffic Weight Manhole frames and covers shall be provided. These shall weigh a minimum of 325 pounds.
10. Non-Traffic Weight: Manhole frame and cover weight to be minimum of 250 pounds.
11. Standard Manhole Frame and Covers:

Standard manhole castings shall consist of cast iron frames conforming to ASTM A48 Class 30 or better with a minimum clear opening of twenty-four (24) inches. Casting shall have a minimum of four (4) equally spaced bolt holes for the purpose of anchoring the casting to the manhole cone or grade ring.

Manhole covers must set neatly in the rings, with contact edges machined for even bearing and tops flush with ring edge. Covers shall have sufficient corrugations to prevent slipperiness and be marked in 2" large letters, "SANITARY SEWER". The covers shall have two concealed pick holes. Covers on sanitary sewer manholes shall not be perforated.

Acceptable manufacturer is EJ (Model 1045) or Neenah (Model R-1556).

12. Bolt Down Watertight Manhole Frame and Covers:

Bolt down watertight manhole covers shall be required for manholes installed within the floodplain and floodway.

Watertight manhole covers shall consist of cast iron frames conforming to ASTM A48 Class 30 or better with a minimum clear opening of twenty-four (24) inches. Casting shall have a minimum of four (4) equally spaced bolt holes for the purpose of anchoring the casting to the manhole cone or grade ring. Covers shall have machined bearing surfaces, continuous gasket seal preinstalled into slots with dovetail design and shall be of the "Self-Sealing" type as manufactured by EJ/East Jordan (Model 1040) or Neenah (Model R-1916-F). Watertight manhole covers shall have sufficient corrugations to prevent slipperiness and be marked in large letters "SANITARY SEWER".

13. Pipe Connections into Manholes: To connect a sanitary sewer to a manhole, either a flexible boot KOR-N-SEAL 1 or 2 flexible connector, cast-in-place Dura-Seal gasket, "A"-Lock gaskets or approved equal shall be used. Connections to an existing manhole shall be flexible boot KOR-N-Seal or approved equal.
14. All flexible connectors shall conform to ASTM C-923, and shall be resistant to ozone, weather elements, chemicals including acids and alkalis, animal and vegetable fats, oils and petroleum products.
15. The stainless steel elements of the connector shall be totally non-magnetic Series 305 stainless steel. The stainless steel clamp shall be capable of sustaining applied torque in excess of eighty (80) inch-pounds.

16. **Forcemain Discharge Manholes:** The forcemain shall connect to the manhole as close to the invert as possible and shall be directed to flow directly into the manhole effluent pipe. On a case-by-case basis, **Liberty Regional Waste District** shall require the forcemain discharge manhole, as well as the three (3) proceeding manholes downstream of the discharge manhole to be coated with an epoxy liner system. The liner system shall be Mainstay, or **Liberty Regional Waste District** approved equal.
17. **Precast Concrete Manhole Base Sections:** Precast concrete manhole base sections shall be "monolithic", consisting of base slab and base riser section.
18. **Drop Connections into Manholes:** Where indicated on the Drawings, drop connections into manholes shall be installed. Drop connections shall be cast-in-place or precast, and shall conform to the requirements shown on the Details
19. **Buoyancy Calculations:**
 - a. Buoyancy calculations shall be provided for all manholes. All manholes shall include a minimum factor of safety of 2.0 included in calculations and shall have a base extension of 6" minimum.

C. Compression Couplings

1. When joining different types of pipe together or new pipe to existing pipe, the Contractor shall use Shear Guard by Onset Pipe Products, or approved equal; that are resistant to corrosion by soil and sewage and that will provide a permanent watertight joint. The compression coupling shall meet the physical test and joint-leak requirements specified in ASTM C-594. The bands for attaching pipes shall be stainless steel conforming to ASTM C-594. Each coupling shall bear the manufacturer's name and an indication of its size.

2.05 Sanitary Sewer Valves and Gates

A. Plug Valves (Forcemains Only)

1. All plug valves shall be eccentric plug valves unless otherwise specified.
2. Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the plans. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical joint ends shall be to the AWWA Standard C111-64, grooved ends per AWWA C606-87. Screwed ends shall be to the NPT standard.

3. Valve bodies shall be flushing body type and made of ASTM A126 Class B cast iron. Valves shall be furnished with a 1/8" welded overlay seat of not less than 95% pure nickel. Seat area shall be raised, with raised surface completely covered with weld to insure that the plug face contacts only nickel. Screwed-in seats shall not be acceptable.
4. Plugs shall be made of ductile iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug shall be resilient faced with neoprene or hycar, suitable for use with sewage.
5. Valves shall have replaceable sleeve type bearings and grit seals at the upper and lower journals.
6. Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable and repackable without removing the bonnet or actuator from the valve under pressure. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.
7. Valve pressure ratings shall be 175 psi through 12" and 150 psi for 14" through 72". Each valve shall be given a hydrostatic and seat test with test results being certified when required by the specifications.
8. Buried valves shall be manually operated with 2-inch square operating nuts in vertical position for use in a valve box unless otherwise indicated on the plans. Buried valves shall have extension stems that bring the 2-inch square operating nut to within two (2) feet of finished grade. Each buried valve shall be supplied with a tee wrench that allows the valve to be operated with the tee handle at waist height. All valves 6-inch and larger shall be equipped with gear actuators. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft shall be stainless steel and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque and to provide seat adjustment to compensate for change in pressure differential or flow direction change. All exposed nuts, bolts, washers and appurtenances shall be stainless steel.
9. Valves and gear actuators for buried or submerged service shall have seals for all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs, washers and appurtenances shall be stainless steel.

10. Cylinder actuators shall be equipped with a 2-inch operating nut to allow manual valve operation in case of supply failure.
11. Valves shall provide drip tight shutoff up to the full pressure rating. Valves shall be provided with adjustable limit stops and rotate 90 degrees from fully opened to fully closed.
12. Valves shall have rectangular full port openings for throttling service, and shall open to 100% of the corresponding pipe diameter.
13. All buried service plug valves shall have mechanical joint ends and have all exterior surfaces factory coated and two coats of coal tar epoxy field applied.
14. All valves and actuators shall be as manufactured by DEZURIK (Style PEF), or approved equal.

B. Plug Valves (Submerged Forcemains Only)

1. Submerged plug valves shall comply with Specifications of Chapter 2, Section 2.05, Paragraph A except plug valves shall be suited for submerged service in sewage and shall have a bonnet with stainless steel extension stem, hardware and fasteners. Bonnet shall extend to extent indicated on the plans.

C. Swing Check Valves

1. Check valves shall be ductile iron body and domed access cover per ASTM A536 Grade 65-45-12, and flexible internal disc, rated for 150 psi working pressure. Flanges shall be faced and drilled in accordance with ANSI B16.1, Class 125 Standard. Valve shall be designed, manufactured, tested and certified to AWWA C508.
2. Valve body shall have a full-flow equal to nominal pipe diameter at all points through the valve. The seating surface shall be on a 45-degree angle to minimize disc travel. A threaded port with pipe plug shall be provided on the bottom of the valve to allow for installation of a backflow actuator without special tools or removing the valve from the pipeline.
3. The top access port shall be full size, allowing for removal of the disc without removing the valve from the pipeline. The access cover shall be domed in shape to provide flushing action over the disc for operation in lines containing high solids content.
4. The disc shall be of one-piece construction, precision molded Buna-N, with an integral

o-ring type sealing surface, and contain steel and nylon reinforcement in the hinge. Non-slam closing characteristics shall be provided through a short 35-degree disc stroke and a memory disc return action.

5. A screw-type backflow actuator shall be provided for field installation to allow opening of the valve during no-flow conditions. Buna-N seals shall be used to seal the stainless steel stem in a bronze bushing. The backflow device shall be of the rising stem type to indicate position and furnished with a T-handle for ease of operation.
6. Swing check valves shall be base bid as manufactured by Val-Matic (Swing-Flex Series #500), or approved equal.

D. Sewage Combination Air/Vacuum Release Valves Manholes

1. Sewage Combination Air Valves and Boxes shall be installed at the high points of the force main and at various locations as shown on the Contract Drawings. Sewage Combination Air Valve shall be installed as shown on Standard Detail Drawing in the Appendices.
2. Air valves shall be automatic float operated valves designed to exhaust air during the filling of a piping system and close upon liquid entry. The valve shall open during draining or if a negative pressure occurs. The valve shall also release accumulated air from a piping system while the system is in operation and under pressure.
3. The valve seat shall provide complete shut off to the full valve pressure rating.
4. Valves shall incorporate a full port orifice, a seal plug assembly, and an upper and lower float to provide a rolling resilient seal.
5. The seal shall be a one-piece design and include a large orifice and a small orifice and each shall open or close as needed to allow release or intake of air as the demand on the system regulates.
6. Valve shall be designed to intake or discharge a minimum of 100 SCFM of air with a 3.5-psi differential pressure.
7. Materials: Valve cover, lower float, stem, washer, spring, nuts and bolts: 316 Stainless Steel.
8. Upper float: Foamed polypropylene. O-rings: Buna-N.
9. Seal plug assembly and base and body: 316 Stainless Steel.
10. All Sewage Combination Air Valves on the force main shall be ARI model no. D-025

as manufactured by A.R.I. Flow Control Accessories, Kfar Charuv, Israel, or approved equal.

11. Sizes shall be based on the pipeline diameter as noted herein:

Pipe Diameter	3" – 8"	10" – 16"	18" – 20"	24" – 48"
Air Valve Size	2"	3"	4"	6"

12. The Sewage Combination Air Valve Access Manhole shall be a 4-foot diameter precast manhole per Standard Detail 20 and shall be set on crushed stone. The cover and frame shall be cast iron, with a 24-inch clear opening as indicated for Sanitary Manhole hereinbefore.
13. Contractor to install pipe at sufficient depth to accommodate Valve height so that top of manhole is at existing ground level.
14. A stainless steel pipe nipple (if needed for NPT connection) and isolation ¼ turn full port stainless steel ball valve of diameter equal to the air valve size indicated above shall be furnished and installed between the valve and main connection.

E. Valve Boxes – Buried Valves (Except Sewage Combination Air/Vacuum Release Valves)

1. Valve boxes shall be of 5-1/4 inch standard cast iron, two-piece, screw type valve box with drop cover marked "SEWER". Valve boxes for valves larger than 8 inches shall be three-piece. Valve boxes shall be accurately centered over valve operating nut with centering device, and backfill thoroughly tamped about them. Valve boxes shall not rest on the valves but shall be supported on crushed stone fill. They shall be set vertically and properly cut and/or adjusted so that the tops of boxes will be grade in any paving, walk or road surface, and 2 inches above finish grade in grass plots, fields, woods or other open terrain with positive drainage away from box. Valve box centering device shall be Box-Seat as manufactured by QWP, Box Lok as manufactured by Trumbull, or approved equal. Valve boxes and covers shall be as manufactured by Tyler Corporation, Opelika Foundry, Bingham & Taylor, or approved equal.
2. Contractor shall furnish one (1) 6-foot T-handle operating wrenches for underground valves. Nut operator extensions for all valves buried deeper than 3 feet shall be provided with stem extensions sufficient to raise operator nut to within two (2) feet of finished grade.

3. Valve boxes shall have extension stems, where necessary when operating nut is raised to be within 3 feet of the existing grade.

F. Elastomeric (“Duckbill”) Check Valve (Wetwell Only – Valve Vault Drain Line)

1. Elastomeric “Duckbill” check valves shall be all rubber of the flow-operated type, with slip-on end and stainless steel backup ring connection.
2. The port area shall contour down to a duckbill, allowing passage of flow in one direction while preventing reverse flow. The valve shall be one-piece rubber construction with nylon reinforcement of material suitable for the intended service.
3. When line pressure inside valve exceeds the backpressure outside the valve by a certain amount, the line pressure forces the bills of the valve open, allowing flow to pass. When backpressure exceeds the line pressure by the same amount, the bill of the valve is forced closed. Upon request by the Engineer, flow test data shall be made available for review from an accredited hydraulics laboratory to confirm pressure drop data.
4. The valve shall open on ½” level of flow and shall be able to withstand 10’ of submergence without damage.
5. Elastomeric check valves shall be Series TF-2 as manufactured by the Red Valve Co., Inc.; Cla-Val Series DBO; or equal.

G. Stainless Steel Slide Gate (Wetwell Only)

1. Gates and operators shall be supplied with all the necessary parts and accessories indicated on the Drawings, specified or otherwise required for a complete, properly operating installation, and shall be the latest standard product of a manufacturer regularly engaged in the production of fabricated gates. Except as modified or supplemented herein, all gates and operators shall conform to the applicable requirements of AWWA C561, latest edition.
2. Sluice gates shall be ASTM A240 Type 304L stainless steel, non self-contained of the rising stem configuration, wall thimble mounted. All gate components shall be designed to safely withstand the maximum seating and unseating heads based on the Drawings. Sluice gates shall be substantially watertight under design head conditions. Leakage shall not exceed 0.05 gpm per foot of seating perimeter. Under the unseating head, the leakage for heads of 20 feet or less shall not exceed 0.1 gpm per foot. For unseating heads greater than 20 feet, the allowable leakage shall not exceed the rate per foot of perimeter specified by the following equation:

Maximum allowable leakage: Gallons per minute per foot of perimeter =
 $0.10 + [0.0025 \times (\text{unseating head in feet} - 20)]$

The gate's sealing system shall have been tested through a cycle test in an abrasive environment and should show that the leakage requirements are still obtained after 25,000 cycles with a minimum deterioration. Certification of this testing shall be provided to **Liberty Regional Waste District** upon request.

3. Frames shall be ASTM A-240 Type 304L stainless steel, constructed of structural members or formed plate welded to a rigid one piece frame with mounting flange and rectangular opening as indicated on the Drawings. The guide slot shall be made of UHMWPE (ultra-high molecular weight polyethylene).
4. The slide shall be ASTM A-240 Type 304L stainless steel, constructed of flat plate reinforced with formed plates or structural members to limit its deflection to 1/720 of the gate's span under the design head.
5. Guides shall be made of UHMWPE per ASTM D-4020 and shall be of such length as to retain and support at least two-thirds (2/3) of the vertical height of the slide in the fully open position. Side and top seals shall be made of UHMWPE of the self-adjusting type. A continuous compression cord or J-bulb type of Nitrile ASTM D-2000 or EPDM shall ensure contact between the UHMWPE guide and the gate in all positions. The sealing system shall maintain efficient sealing in any position of the slide and allow the water to flow only in the opened part of the gate. The bottom seal shall be made of resilient neoprene ASTM D-2000, set into the bottom member of the frame and shall form a flush-bottom.
6. The operating stem shall be ASTM A-276 Type 316 stainless steel designed to transmit in compression at least two (2) times the rated output of the operating manual mechanism with a 40 lbs. effort on the crank. The stem shall have a slenderness ratio (L/r) less than 200. The threaded portion of the stem shall have machined cut or rolled threads of the Acme type. For stems in more than one piece and with a diameter of 1¾ inches and larger, the different sections shall be joined together by solid bronze couplings. Stems with a diameter smaller than 1¾ inches shall be pinned to an extension tube. The couplings shall be grooved and keyed and shall be of greater strength than the stem.
7. Stem guides shall be fabricated from ASTM A-240 Type 304L stainless steel. The guide shall be equipped with an UHMWPE bushing. Guides shall be adjustable and spaced in accordance with the manufacturer's recommendation. The L/r ratio shall not be greater than 200. Rising stem gates shall be provided with a clear polycarbonate stem cover. The stem cover shall have a cap and condensation vents and a clear mylar position indicating tape. The tape shall be field applied to the stem cover after the gate

has been installed and positioned.

8. For new and existing concrete structures, sluice gates shall be mounted directly on the concrete vertical surface in front of a flush pipe of size and type as shown on the Drawings. Wall thimbles are not necessary for new concrete structures provided the sluice gate concrete mounting surface is square and plumb within sluice gate manufacturer's minimum tolerances. A permanent EPDM gasket of uniform thickness shall be provided between the sluice gate frame and concrete surface.
9. Fasteners: All anchor bolts for guides and gates and all bolts and studs for connecting gates to adjacent flanges or thimbles shall be Type 304 stainless steel and shall be furnished by the gate manufacturer.
10. Operators:
 - i. Manual operation shall be by crank-operated floorstand of the type specified herein and shown on the Drawings and provided by the gate manufacturer. All bearings and gears shall be totally enclosed in a weather-tight housing. The pinion shaft of crank-operated mechanisms shall be constructed of stainless steel and supported by roller or needle bearings. Each manual operator shall be designed to operate the gate under the maximum specified seating and unseating heads by using a maximum effort of 40 lbs. on the crank, and shall be able to withstand, without damage, an effort of 80 lbs. The crank shall be removable and fitted with a corrosion-resistant rotating handle. The maximum crank radius shall be 15 inches.
 - ii. Floorstand pedestals shall be ASTM A-126 cast iron Class B designed to position the input shaft approximately 36" above the operating floor. An arrow with the word "Open" shall be permanently attached or cast on the floorstand, indicating the direction of rotation to open the gate. Finish painting of cast iron components shall be in accordance with Chapter 5.
11. Stainless steel slide gates shall be Series 20 as manufactured by Rodney Hunt-Fontaine; Model GH-46 as manufactured by Golden Harvest, Inc.; or approved equal.
- 12.

2.06 Grinder Pump Station

A. Manufacturer

1. Grinder pump stations shall be manufactured by Environment One Corporation, Niskayuna, New York. Or approved equal.

B. General Requirements

- A. PUMP: The pump shall be a progressive cavity type capable of delivering 15 GPM against a rated total dynamic head of 0 feet, 11 GPM against a rated total dynamic head of 92 feet, and 7.8 GPM against a rated total dynamic head of 185 feet. The pump must also be capable of operating at negative total dynamic head without overloading the motor. Under no conditions shall in-line piping or valving be allowed to create a false apparent head. The material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance.
- B. GRINDER: The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller (cutter wheel) assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. Attachment by means of pins or keys will not be acceptable. The grinder impeller shall be a one-piece, 4140 cutter wheel of the rotating type with inductively hardened cutter teeth. The cutter teeth shall be inductively hardened to Rockwell 50 – 60c for abrasion resistance. The shredder ring shall be of the stationary type and the material shall be white cast iron. The teeth shall be ground into the material to achieve effective grinding. The shredder ring shall have a staggered tooth pattern with only one edge engaged at a time, maximizing the cutting torque. These materials have been chosen for their capacity to perform in the intended environment as they are materials with wear and corrosive resistant properties.

This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to minimize clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:

1. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.
2. The maximum flow rate through the cutting mechanism must not exceed 4 feet per second. This is a critical design element to minimize jamming and as such must be adhered to.
3. The inlet shroud shall have a diameter of no less than 5 inches. Inlet shrouds that are less than 5 inches in diameter will not be accepted due to their inability to maintain the specified 4 feet per second maximum inlet velocity which by design prevents unnecessary jamming of the cutter mechanism

and minimizes blinding of the pump by large objects that block the inlet shroud.

4. The impeller mechanism must rotate at a nominal speed of no greater than 1800 rpm.

The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of “foreign objects”, such as paper, wood, plastic, glass, wipes, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4” diameter stainless steel discharge piping.

- C. **ELECTRIC MOTOR:** The motor shall be 1 HP, 1725 rpm, 240 volt, 60 hertz, 1 Phase, capacitor start, ball bearing, air-cooled induction type with Class F installation, low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. Non-capacitor start motors, permanent split capacitor motors and oil-filled motors will not be accepted. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories, Inc., for the application. The wet portion of the motor armature must be 300 Series stainless.
- D. **MECHANICAL SEAL:** The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.
- E. **TANK AND INTEGRAL ACCESSWAY:** The tank shall be a wetwell/drywell design made of high density polyethylene, with a melt index of 2.0 grams/10 minutes or lower to assure high environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. Corrugations of the outside wall are to be of a minimum amplitude of 1 1/2” to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be a minimum 0.250-inches thick. All seams created during tank construction are to be thermally welded and factory tested for leak tightness. Tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

The tank shall be furnished with one EPDM grommet fitting to accept a 4.50-inch or 6.625-inch OD DWV or Schedule 40 pipe. The tank capacities are as shown on the contract documents, along with which units require the 6.625-inch opening.

The Drywell accessway shall be an integral extension of the wet well assembly and include a lockable cover assembly mounting and watertight capability. **(For Models DH151, 152 and 275)** The cover shall be compression-molded fiberglass, green in color, with a load rating of 150 lbs. per square foot. Accessway design and construction shall enable field adjustment of station height in increments of 4-inches or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation no field penetrations shall be acceptable.

All discharge piping shall be constructed of 304 Series Stainless Steel and terminate outside the accessway bulkhead with a stainless steel, 1-1/4 inch female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 235 psi WOG; PVC ball valves or brass ball/gate valves will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

The accessway shall include a single NEMA 6P electrical quick disconnect (EQD) for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. The EQD will be supplied with 32-foot, of useable Electrical Supply Cable (ESC) outside the station, to connect to the alarm panel. The ESC shall be installed in the basin by the manufacturer. Field assembly of the ESC into the basin is not acceptable. The EQD shall require no tools for connecting, seal against water be for the electrical connection is made, and include radial seals to assure a watertight seal regardless of tightening torque. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. A junction box shall not be permitted in the accessway due to the large number of potential leaks. The EQD shall be so designed to be conducive to field wiring as required. The accessway shall also include a 2-inch PVC vent to prevent sewage gases from accumulating in the tank.

- F. **CHECK VALVE:** The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping. The check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Moving parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back-pressure. The valve body shall be an injection molded part made of an engineered thermoplastic resin. Ball type check valves are unacceptable due to their limited sealing capacity in slurry applications.

Each grinder pump installation shall also include one separate check valve of the type detailed above for installation in the 1-1/4 inches service lateral between the grinder pump station and the sewer main, preferably next to the curb stop. The separate check valve shall be provided as a separate line item in the bid schedule.

- G. ANTI-SIPHON VALVE: The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the stainless steel discharge piping. Moving parts will be made of 300 series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from an engineered thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices, due to their tendency to clog from the solids in the slurry being pumped. The anti-siphon port diameter shall be no less than 60% of the inside diameter of the pump discharge piping.
- H. CORE UNIT: The Grinder Pump Station shall have cartridge type, easily removable core assembly consisting of pump, motor, grinder, all motor controls, check valve, anti-siphon valve, level control, electric quick disconnect and wiring. The core unit shall be installed by the manufacturer. Field assembly of the pump and controls into the basin is not acceptable. In some cases, stations taller than 96-inches may be shipped on their side without the cores assembled in the basin but this is the only exception. The core unit shall seal to the tank deck with a stainless steel latch assembly. The latch assembly must be actuated utilizing a single quick release mechanism requiring no more than a half turn of a wrench. The watertight integrity of each core unit, shall be established by 100 percent factory test at a minimum of 5 PSIG.
- I. CONTROLS: All necessary controls, including motor and level controls, shall be located in the top housing of the core unit secured by stainless steel fasteners. Locating the motor starting controls in a plastic enclosure is not acceptable.

The wastewater level sensing controls shall be housed in a separate enclosure from motor starting controls. The level sensor housing must be sealed via a radial type seal; solvents or glues are not acceptable. The level sensing control housing must be integrally attached to pump assembly so that it may be removed from the station with the pump and in such a way as to minimize the potential for the accumulation of grease and debris accumulation, etc. The level sensing housing must be a high-impact thermoplastic copolymer over-molded with a thermos-plastic elastomer. The use of PVC for the level sensing housing is not acceptable.

Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The air column shall be integrally molded from a

thermoplastic elastomer suitable for use in wastewater and with excellent impact resistance. The air column shall have only a single connection between the water level being monitored and the pressure switch. Any connections are to be sealed radially with redundant O-rings. The level detection device shall have no moving parts in direct contact with the wastewater and shall be integral to the pump core assembly in a single, readily-exchanged unit. Depressing the push to run button must operate the pump even with the level sensor housing removed from the pump.

All fasteners throughout the assembly shall be 300 Series stainless steel. High-level sensing will be accomplished in the manner detailed above by a separate air column sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and high-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices and their tendency to malfunction because of incorrect wiring, tangling, grease buildup, and mechanical cord fatigue. To assure reliable operation of the pressure switches, each core shall be equipped with a factory installed equalizer diaphragm that compensates for any atmospheric pressure or temperature changes. Tube or piping runs outside of the station tank or into tank-mounted junction boxes providing pressure switch equalization will not be permitted due to their susceptibility to condensation, kinking, pinching, and insect infestation. The grinder pump will be furnished with a 6 conductor 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a **FACTORY INSTALLED** NEMA 6P EQD half attached to it.

- J. **ALARM PANEL:** Each grinder pump station shall include a NEMA 4X, UL listed alarm panel suitable for wall mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic to assure corrosion resistance. The enclosure shall include a hinged, lockable cover, padlock, and secured dead front.

For each core, the panel shall contain one (1) 15 amp, double pole circuit breaker for the core's power circuit and one (1) 15 amp single pole circuit breaker for alarm circuit. The panel shall contain terminal blocks, integral power bus, push to run feature and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.

The Alarm Panel shall include the following features: external audio & visual alarm, push-to-run switch, push-to-silence switch and high level (redundant) pump starting control. The alarm sequence for each grinder pump station is to be as follows:

1. When liquid level in the sewage wet-well rises above the alarm level, visual and audio alarms will be activated. The contacts on the alarm pressure switch will close. The redundant pump starting system will be energized.
2. The audio alarm may be silenced by means of the externally mounted, push-to-silence button.
3. Visual alarm remains illuminated until the sewage level in the wet-well drops below the “off” setting of the alarm pressure switch.

The visual alarm shall be inside a red oblong lens at least 3.75” L x 2.38” W x 1.5” H. The visual alarm shall be mounted on the top of the enclosure in such a manner to maintain NEMA 4X rating. The audio alarm shall be externally mounted on the bottom of the enclosure, capable of 94 dB @ 2 feet. The audio alarm shall be capable of being deactivated by depressing a push-type switch which is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure. For duplex units, in addition to the above, two high level indicator lights shall be mounted behind the access cover.

During a high level alarm condition on a duplex station, the appropriate light will illuminate to indicate which pump core requires servicing. The high level system alarm for duplex grinder pump units shall operate as follows:

The duplex grinder pump units Alarm Panel shall include a 20 amp, 240 VAC generator receptacle with a spring-loaded gasketed cover suitably mounted to provide access for connection of an external generator while maintaining a 4X rating. An automatic transfer switch shall be provided, which automatically switches from AC power to generator power during a power outage. The alarm board power shall be provided through the generator receptacle during a power outage. When AC power is restored, the panel is automatically switched back to the AC power mode.

The entire Alarm Panel as manufactured, shall be listed by Underwriters Laboratories, Inc.

A total of thirty-two (32) feet of six conductor tray cable/supply cable, extending from the pump unit to the Alarm Panel, shall be provided with each grinder pump station unit for installation by the Contractor.

- K. **SERVICEABILITY:** The grinder pump core unit, including level sensor assembly, shall have two lifting hooks complete with nylon lift-out harness connected to its top housing to facilitate easy core removal when necessary. The level sensor assembly must be easily removed from the pump assembly for service or replacement. All mechanical and electrical connections must provide easy disconnect capability for core unit removal and installation. Each EQD half must

include a water-tight cover to protect the internal electrical pins while the EQD is unplugged. A push-to-run feature will be provided for field trouble shooting. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

- L. OSHA CONFINED SPACE: All maintenance tasks for the grinder pump station must be possible without entry into the grinder pump station (as per OSHA 1910.146, permit – required confined spaces). “Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant’s body breaks the plan of an opening into the space.”
- M. SAFETY: The Grinder Pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired Grinder Pump Station shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use. UL listing of components of the station, or third-party testing to UL standard will not be acceptable.

The grinder pump shall meet accepted standards for plumbing equipment for use in or near residence, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the seal of NSF International. Third-party testing to NSF standard will not be acceptable.

C. Grinder Pump Station Connection to the Pressure Service Line

- A. The 1.25 inch female discharge point shall be connected to a 1.25 inch diameter, 12-inch long, Schedule 40 stainless steel male NPT threaded end by plain end HDPE pipe. The stainless steel plain end shall be connected to the 1.25 inch HDPE service line with a Dresser “Universal” Style 90, seal and restraint coupling with stainless steel insert.

D. Check Valves

1. Service line shall have check valve in grinder station and check valve prior to discharge into manhole or other approved discharge location.
2. Discharge into forcemain shall be approved on a case by case basis.

E. Service Line

1. Service line shall be HDPE material and shall meet requirements for Forcemain Materials as listed herein.

3.01 Introduction

The following Chapter addresses the minimum requirements for the installation of sanitary sewers and sewer force mains.

3.02 Wetwell & Meter Vault Piping Installation

A. General

1. Install piping as shown, specified and as recommended by the pipe and fittings manufacturer.
2. If there is a conflict between manufacturer's recommendations and the Contract Documents, request in writing instructions from Engineer before proceeding.
3. Provide pipe manufacturer's installation specialist at Site as specified on this Section.

B. Temporary Blind Flanges, Plugs, Caps and Bulkheads

1. Temporarily plug installed pipe at the end of each day of work or other interruption of pipe installation to prevent entry of animals, liquids, and persons into pipe, and entrance or insertion of deleterious materials into pipe.
2. Install standard plugs in all bells at dead ends, tees, and crosses. Cap all spigot and plain ends.
3. Fully secure and block blind flanges, plugs, caps, and bulkheads installed for testing, designed to withstand specified test pressure.
4. Where plugging is required for phasing of Work or subsequent connection of piping, install watertight, permanent type blind flanges, plugs, caps, or bulkhead acceptable to Engineer.

C. Piping Installation

1. Conform to manufacturer's instructions and requirements of standards and manuals listed in this Section, as applicable:
 - a. Ductile Iron Pipe: ANSI/AWWA C600, AWWA M41.
 - b. Concrete Pipe: AWWA M9.
 - c. Steel Pipe: ASME B31.3, ANSI/AWWA C206, AWWA M11.
 - d. Thermoplastic Pipe: AWWA M23
 - e. Fiberglass Reinforced Plastic Pipe: AWWA M45
 - f. Polyethylene Pipe: AWWA M55
2. Install straight runs true to line and elevation.
3. Install vertical pipe truly plumb in all directions.

4. Install piping parallel or perpendicular to walls of structures. Piping at angles and 45 degree runs across corners of structures will not be accepted unless specifically shown on the Contract Documents or approved by the Engineer.
5. Install small diameter piping generally as shown when specific locations and elevations are not indicated. Locate such piping as required to avoid ducts, equipment, beams, and other obstructions.
6. Install piping to leave all corridors, walkways, work areas, and similar spaces unobstructed. Unless otherwise approved by Engineer provide a minimum headroom clearance under piping and pipe supports of 7.5 feet. Clearances beneath piping shall be measured from the outermost edge of piping, flanges or other type of joint that extends beyond the nominal outside diameter of piping.
7. Protect and keep clean interiors, fittings, and valves of pipe that will convey potable water, chemicals, and other pipe designated by Engineer.
8. Cutting: Cut pipe from measurements verified at Site. Field cut pipe, where required, with a machine specially designed for cutting type of pipe being installed. Make cuts carefully without damage to pipe, coating, or lining, and with a smooth end at right angles to axis of pipe. Cut ends of push-on joint type pipe shall be tapered and sharp edges filed off smooth. Do not flame-cut pipe.
9. Place bell and spigot-type pipe so that bells face the direction of laying, unless otherwise approved by Engineer.
10. Place concrete pipe containing elliptical reinforcement with minor axis of reinforcement in a vertical position.
11. Deflections at joints shall not exceed 75 percent of amount allowed by pipe manufacturer, unless otherwise approved by the Engineer.
12. Additional General Requirements for FRP and Thermoplastic Piping:
 - a. Utilize wide band supports as recommended by pipe manufacturer and approved by Engineer to minimize localized stresses.
 - b. Provide piping passing through walls with a sleeve of wearing material to prevent abrasion damage to piping.

- c. Provide anchored supports at elbows, valves, bends in piping, and at connections to equipment and tanks.
- d. Spacing of supports shall be in accordance with the manufacturer's published recommendations at maximum design operating temperature of pipe.
- e. Provide U-clamps with wide band circumferential contact.
- f. Provide guides on long runs of piping to maintain alignment and reduce chance of elastic failure of pipe. Space guides as recommended by pipe manufacturer.
- g. Provide anchored supports to restrain joints that allow expansion. Minimize use of bellows style joints. Where required and approved by the Engineer provide bellows style joints with low axial force to take up pipe expansion. Flexible connectors may be used to absorb thermal movement when approved in writing by Engineer.
- h. Provide devices that will reduce hydraulic pulsation in piping, together with shut-off and drain valve on all discharge lines of positive displacement pumps to reduce hydraulic hammer, and provide flexible connectors to absorb vibration. Submit details for Engineer to review.

D. Joining Pipe

1. General:
 - a. Make joints in accordance with pipe manufacturer's recommendations and Contract Documents.
 - b. Cut piping accurately and squarely and install without forcing or springing.
 - c. Ream out pipes and tubing to full inside diameter after cutting. Remove all sharp edges on end cuts.
 - d. Remove all cuttings and foreign matter from inside of pipe and tubing before installation. Thoroughly clean all pipe, fittings, valves, specials, and accessories before installing.
2. Ductile Iron Proprietary Joints:
 - a. Pipe that utilizes proprietary joints for restraint specified in Section 40 05 19, Ductile Iron Process Pipe, or other such joints, shall be installed in accordance with manufacturer's instructions.
3. Ductile Iron and Steel Flanged Joints:
 - a. Assemble flanged joints using ring-type gaskets, with thickness as recommended by pipe manufacturer but not less than 1/8-inch thick, for raised-face flanges. Use full-face gaskets for flat-face flanges, unless

otherwise approved by Engineer or recommended by pipe manufacturer. Gaskets shall be suitable for the service intended in accordance with the manufacturer's ratings and instructions. Gaskets shall be properly centered.

- b. Tighten bolts in a sequence that provides equal distribution of bolt loads.
 - c. Length of bolts shall be uniform. Bolts shall not project beyond the nut more than 1/4-inch or fall short of the nut when fully taken up. Machine-cut ends of bolts to be neatly rounded. Do not use washers.
 - d. Prior to assembly of flanged joints, lubricate bolt threads and gasket faces.
 - e. Alternately tighten bolts 180 degrees apart to compress the gasket evenly.
 - f. After assembly, coat all bolts and nuts, except stainless steel bolts and nuts, with same coating specified herein
4. Steel Pipe Threaded Joints:
- a. For threaded joints, use standard, right hand tapered full depth threads on steel piping and apply a manufacturer's recommended joint compound to male threads only, before installation.
 - b. Remove cuttings and foreign matter from inside of pipe.
 - c. Thoroughly clean all pipe, fittings, valves, specials, and accessories before installing.
5. Thermoplastic Pipe Joints:
- a. Solvent Cement Welded Joints:
 - 1) Bevel pipe ends and remove all burrs before making joint. Clean pipe and fittings thoroughly. Do not make solvent cement joints if temperature is below 40 degrees F. Do not make solvent cement welded joints in wet conditions.
 - 2) Use solvent cement supplied or recommended by pipe manufacturer.
 - 3) Apply joint primer and solvent cement and assemble joints in accordance with recommendations and instructions of manufacturer of joint materials and pipe manufacturer.
 - 4) Implement appropriate safety precautions when using joint primers and solvent cements. Allow air to circulate freely through pipelines to allow solvent vapors to escape. Slowly admit fluid when flushing or filling pipelines to prevent compression of gases within pipes.
 - b. Threaded Joints:
 - 1) Cut pipe square and smooth and remove burrs or raised edges with a knife or file.
 - 2) Hold pipe firmly in a pipe vise. Protect pipe at the point of grip by inserting a rubber sheet or other material between pipe and vise.
 - 3) Thread pipe in accordance with pipe manufacturer's recommendations.

Brush threads clean of chips and ribbons.

- 4) After threading pipe, starting with second full thread, and continuing over thread length, wrap 100-percent virgin TFE (Teflon) thread tape in direction of threads. Overlap each wrap by one-half width of tape.
 - 5) After application of the TFE thread tape, screw fitting or coupling onto the pipe end to be joined and tighten by hand. Using a strap wrench only, further tighten connection an additional one to two threads past hand tightness.
- c. Bell and Spigot Joints:
- 1) Bevel pipe ends, remove all burrs, and provide a reference mark at correct distance from pipe end before making joint.
 - 2) Clean spigot end and bell thoroughly before making the joint. Insert O-ring gasket while ensuring that gasket is properly oriented. Lubricate spigot with manufacturer's recommended lubricant. Do not lubricate bell and O-ring. Insert spigot end of pipe carefully into bell until reference mark on spigot is flush with bell.
6. FRP Pipe Joints:
- a. All joints shall meet the laboratory performance requirements of Section 7 of ASTM D4161.
 - b. Flanged Joints:
 - 1) Provide flanged connections to expansion joints, valves, tanks, and other equipment, except where flexible connectors such as bellows type expansion joints or rubber hose are required to prevent transmission of vibration, shock loads, and undue strain to adjoining piping. Flanges shall be hand laid up to PS 15 thickness, except that minimum thickness shall be 3/4-inch.
 - 2) Each flange face shall be machined flat, and a new corrosion barrier applied. Flange face shall be textured for use with full-face gaskets.
 - 3) Flange drilling shall be per ANSI B16.1, 125 pounds. Bolt holes shall be back spot faced for a washer seat.
 - 4) Flange bolts shall be torqued only to manufacturer's recommended values.
 - c. Bell and Spigot Adhesive Bonded Joints:
 - 1) For pipe up to 12-inch diameter, provide a tapered socket and tapered spigot section and an adhesive recommended by pipe manufacturer.

Taper angle shall be seven degrees for pipe 1.5-inch to 6-inch diameter, and eight degrees for pipe 8-inch to 12-inch diameter.

d. Tapered Butt and Strap Joints:

- 1) For pipe 14-inch diameter and larger, provide tapered butt and strap joints with a laminated overlay.

7. Copper Tubing Joints:

a. Soldered Joints:

- 1) Assemble copper tubing with soldered joints. Solder shall be 95-5 tin-antimony solder conforming to ASTM B32.
- 2) Ream or file pipe to remove burrs.
- 3) Clean and polish contact surfaces of joints.
- 4) Apply flux to both male and female ends.
- 5) Insert end of tube into full depth of fitting socket.
- 6) Heat joint evenly.
- 7) Form continuous solder bead around entire circumference of joint starting at the bottom.

b. Threaded Joints:

- 1) When open flames for soldering are impractical, or at unions and connections to equipment and appurtenances, assemble copper tubing with flared ends as permitted by authority having jurisdiction.
- 2) Ends of tubing shall be flared at an angle of 45 degrees with flaring tool recommended by pipe manufacturer. Flaring tool shall have same outside diameter as tube to be flared.
- 3) Tubing to be flared shall be soft temper or annealed prior to flaring.
- 4) Cut end of tube square and ream to remove burrs.
- 5) Resize back to round tube that is out-of-round.
- 6) Clean and polish contact surfaces of joints using an abrasive cloth.
- 7) Place flare nut over end of tube with threads closest to end being flared.
- 8) Insert appropriate length of tube between flaring bar of flaring tool and position yolk with flaring cone over tube end and clamp yoke in place.
- 9) Turn handle of yolk clockwise without over-tightening. Cracked or deformed tubes will be rejected.
- 10) Do not apply jointing compounds to mating surfaces of flare fitting and flared tube end before attaching flare nut to threaded connection.

8. Mechanical Coupling Joints:

- a. Mechanical couplings include: sleeve-type flexible couplings, split flexible couplings, ANSI/AWWA C606 grooved or shouldered end couplings, plasticized PVC couplings, and other mechanical couplings used.
- b. Prior to installing and assembling mechanical couplings, thoroughly clean joint ends with a wire brush to remove foreign matter.
- c. For mechanical couplings that incorporate gaskets, after cleaning apply lubricant to rubber gasket or inside of coupling housing and to joint ends. After lubrication, install gasket around joint end of previously installed piece and mate joint end of subsequent piece to installed piece. Position gasket and place coupling housing around gasket and over grooved or shouldered joint ends. Insert bolts and install nuts tightly by hand. Tighten bolts uniformly to produce an equal pressure on all parts of housing. When housing clamps meet metal to metal, joint is complete and further tightening is not required.
- d. For plasticized PVC couplings, loosen the stainless steel clamping bands and remove the clamps from the coupling. Slide the coupling over the plain ends of the pipes to be joined without using lubricants. Place clamps over each end of coupling at grooved section and tighten with a torque wrench to torque recommended by manufacturer.

E. Installing Valves and Accessories

1. Provide supports for large valves, flow meters, and other heavy items as shown or required to prevent strain on adjoining piping.
2. Position flow measuring devices in pipe lines so that they have the amount of straight upstream and downstream runs recommended by the flow measuring device manufacturer, unless specific location dimensions are shown.
3. Position swing check valves and butterfly valves so that they do not conflict with upstream and downstream elements of the piping system.

F. Unions

1. Install dielectric unions as specified in Section 40 05 06 - Couplings, Adapters, and Specials for Process Piping, where dissimilar metals are connected, except for bronze or brass valves in ferrous piping.
2. Provide a union downstream of each valve with screwed connections.
3. Provide screwed or flanged unions at each piece of equipment, where shown, and where necessary to install or dismantle piping.

G. Transitions from One Type of Pipe to Another

1. Provide all necessary adapters, specials, and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

H. Closures

1. Provide closure pieces, such as blind flanges and caps, shown or required to complete the Work.

3.03 Sanitary Sewer Installation (Gravity and Forcemain)

A. Excavation for Pipeline Trenches

- a. Trenches in which pipes are to be laid shall be excavated in open cut to the depths shown on the drawings and required by field conditions. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ASTM-D-2321 except as modified herein.
- b. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe.
- c. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe. Trenches shall in no case be excavated or permitted to become wider than 2'-0" plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2'-0" at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.
- d. The trench shall be straight and uniform so as to permit laying pipe to lines and grades shown on the drawings. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be

maintained so that it will freely drain and prevent surface water from entering the excavation at all times. Temporary drainage ditches shall be installed as necessary to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.

- e. Minimum cover of 30" shall be provided for all gravity pipelines, except those located in the State Highway Right of Way. Those shall have a minimum cover of 42". Minimum cover for all pressure forcemains shall be 48".

B. Pipe Bedding

- a. All sewer pipe shall be supported on a bed of granular material. In no case shall pipe be supported directly on rock. Bedding shall be provided in earth bottom trenches, as well as rock bottom trenches. Bedding material shall be free from rock, foreign material and, frozen earth. Bedding shall be a minimum of 4" below pipe barrel.
- b. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe and insofar as possible where bell and spigot pipe is involved so that none of the load will be carried on the bells.
- c. Where flexible pipe is used, the granular bedding shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. Granular bedding shall be INDOT No. 8 crushed stone or Class II clean sand.
- d. Where undercutting and granular bedding are involved the undercutting shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated.
- e. In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. Yielding and mucky materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.
- f. Installation shall be in accordance with ASTM D 2321 except as modified

hereinafter.

C. Special Granular Fill

- a. "Special Granular Fill" when directed by the **Liberty Regional Waste District** shall be INDOT No. 57.

D. Laying Pipe

- a. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.
- b. All pipes shall be laid with ends abutting and true to line and grade as shown on the Drawings. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.
- c. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to insure its being clean. Each piece of pipe shall be lowered separately. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.
- d. Pipe shall not be laid on solid rock. A pad of granular material as specified in "Pipe Bedding", shall be used as a pipe bedding. Irregularities in sub-grade in an earth trench shall be corrected by use of granular material.
- e. Unsuitable materials in sub-grades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.
- f. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.
- g. No backfilling (except for securing pipe in place) over pipe will be allowed until **Liberty Regional Waste District** has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

E. Backfilling Pipeline Trenches

1. General
 - a. Backfilling of pipeline trenches shall be accomplished with the requirements set forth in ASTM D 2321, in accordance with the details as shown on the Standard Details, and as described hereinafter.
2. Method “A” – Backfilling in Open Trench
 - a. The lower portion of the trench (Initial Backfill), from the pipe bedding to a point 12" above the top of the pipe, shall be backfilled with INDOT No. 8 crushed stone or Class II Clean Sand per ASTM C12. This material shall be placed in 6" lifts and shall be carefully compacted to avoid displacement of the pipe.
 - b. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.
 - c. The upper portion of the trench (Final Backfill) above the compacted portion shall be backfilled with native excavated Class I, II, III, or IV materials per ASTM C12. Incorporation of rock larger than 3" is prohibited.
 - d. Final grading and seeding or sodding shall be in accordance the specifications herein.
3. Method “B” – Backfilling under Sidewalk & Unpaved Gravel Drives
 - a. The lower portion of the trench (Initial Backfill), from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with INDOT No. 8 crushed stone or Class II Clean Sand per ASTM C12. This material shall be placed in 6" lifts to avoid displacement of the pipe.
 - b. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.
 - c. The middle portion of the trench (Final Backfill), from a point 12" above the top of the pipe to a point 6" below the grade line, shall be backfilled with INDOT B Borrow material free from rock. This material shall be placed and compacted in layers of approximately 6 inches.
 - d. The upper portion of the trench shall be temporarily backfilled and maintained with crushed stone or gravel until such time as the sidewalk is constructed or the driveway surface is restored.
4. Method “C” – Backfilling under Streets, Roads, and Paved Drives

- a. The lower portion of the trench (Initial Backfill), from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with INDOT No. 8 crushed stone or Class II Clean Sand per ASTM C12. This material shall be placed in 6" lifts to avoid displacement of the pipe. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.
- b. The middle portion (Final Backfill) of the trench from the pipe bedding to a point 6" below the bottom of the pavement or concrete sub-slab, shall be backfilled with compacted INDOT B Borrow. This material shall be placed in 6" lifts to avoid displacement of the pipe.
- c. Compaction shall be accomplished by hand tamping or approved mechanical methods.
- d. The upper portion of the trench, from a point 6" below the bottom of the pavement or concrete sub-slab to grade, shall be backfilled with compacted INDOT No. 53 Crushed Stone. At such time that pavement replacement is accomplished, the excess base course shall be removed as required.

5. Trenches

- a. Trenches outside existing sidewalks, driveways, streets, and highways shall be backfilled in accordance with Method "A". Trenches within the limits of sidewalk and unpaved driveways shall be backfilled in accordance with Method "B". Trenches within the paving limits of existing streets, highways, driveways and paved areas shall be backfilled in accordance with Method "C".
- b. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-ways and/or private property all excess earth or other materials resulting from construction.
- c. In the event that pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

F. Installation of Identification Tape (Gravity and Forcemain)

1. Identification tape shall be installed over the centerline of all (open cut) buried pipe in accordance with the manufacturer's installation instructions and as specified herein.

2. Identification tape shall be installed 12 inches (for 3” wide tape) to 20 inches (for 6” wide tape) below final grade over centerline of pipe.

G. Installation of Location/Tracer Wire (Forcemain)

1. For Open Cut Excavation:
 - a. Tracer wire shall be installed over the centerline of all buried pressure pipe in accordance with the manufacturer’s installation instructions and as specified herein.
 - b. Location wire shall be taped to the top center of the buried pipe.
 - c. Location wire for open cut applications shall be provided in sufficient quantity and redundancy (minimum of 1 wire).
 - d. Tracer wire shall be brought up into terminating box for connection to a locating device (at the B.O.P. and E.O.P. of the forcemain). **Contractor shall meet with Liberty Regional Waste District to establish locations of tracer wire terminating boxes before beginning pipe installation.** The wire shall be one continuous piece from end to end.
 - e. For each wire installed, Contractor shall leave 3’ of additional wire measured from the top of the terminating box. Contractor shall strip insulation 1” from ends of each wire installed and coil in top of terminating box.
 - f. Contractor shall test tracer wire using **Liberty Regional Waste District** locating device after installation of pipe to ensure continuity from end to end. If the tracer wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of the wire at his own expense.
 - g. In the event tracer wire cannot be installed as one continuous piece from end to end for Open Cut Excavation, Contractor may be allowed to use tracer wire connectors, subject to **Liberty Regional Waste District** approval. Open cut excavation splice kit shall be “DryConn Direct Bury Lug Aqua Model #90220” as manufactured by King Innovation; as manufactured by 3M; or approved equal.
2. For Horizontal Directional Drilling:
 - a. Tracer wire shall be installed with all horizontal directional drilled pipe in accordance with the manufacturer’s installation instructions and as specified herein.

- b. Location wire shall be looped up into marker posts for connection to a locating device (maximum 250 feet of forcemain between marker posts and each side of creek/stream and railroad crossings). The wire shall be one continuous piece from end to end.
- c. Location wire for horizontal directional drilling applications shall be provided in sufficient quantity and redundancy (minimum of 2 wires). Contractor shall test each tracer wire using **Liberty Regional Waste District** locating device after installation of pipe to ensure continuity from end to end. If the tracer wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of the wire at his own expense.

H. Installation of Utility Marker (Forcemain)

1. Marker shall be installed at a minimum every 500 feet along pipe, each side of creek/stream, each side of railroad crossings, and immediately adjacent to all new sewage air release vaults located within open terrain (outside of pavement limits) as shown on the Drawings, unless otherwise directed by **Liberty Regional Waste District**. Marker locations shall be approved by **Liberty Regional Waste District**.
2. Marker shall be installed in accordance with the manufacturer's recommendations and tools to provide 48 inches exposed length above the finished grade and minimum ground embedment depth of 24 inches.

I. Settlement of Trenches

1. Whenever lines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement that occurs within these rights-of-way within one year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the Contractor at no extra cost to **Liberty Regional Waste District**. Repair of settlement damage shall meet the approval of **Liberty Regional Waste District**, Liberty Regional Waste District Engineering Dept., and/or the State Department of Transportation.

J. Pre-Fabricated Trench Baffles

1. Pre-fabricated trench baffles shall be installed where shown on the Drawings, required by the specifications or as directed by the Engineer. The product shall be installed according to the manufacturer's recommendations, and shall provide a watertight seal around the pipe. Contractor shall insure that the correct line and grade of the pipe is maintained before backfilling around the trench baffle.

K. Concrete Highway, Street, and Drive Replacement

1. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.
2. Concrete Highway, Street, and drive replacement shall be completed according to INDOT Engineering Standards.

L. Portland Cement Concrete Drive Replacement

1. Wherever Portland cement concrete driveways are removed, they shall be reconstructed to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than existed prior to the operation.
2. Concrete Drive replacement shall be completed according to INDOT Engineering Standards.

M. Concrete Curb and Gutter Replacement

1. The Contractor shall remove the curb and gutter when encountered when required for laying the sewer. Only that portion of the curb and gutter needed to lay the sewer line shall be removed.
2. Concrete Curb and Gutter replacement shall be completed according to INDOT Engineering Standards.

N. Mailbox, Culvert, Clothes Line Posts, Fences and other Replacements

1. Existing mail boxes, drainage culverts, clothes line posts, fences and the like shall not be damaged or disturbed unless necessary, in which case, they shall be replaced in as good condition as found as quickly as possible. Existing materials shall be reused in replacing such facilities when materials have not been damaged by the Contractor's operations. Existing facilities damaged by Contractor's operation shall be replaced with new materials of the same type at the Contractor's expense.
2. Replacement of paved drainage ditches within highway right-of-way shall be accomplished in accordance with Department of Transportation specifications.

O. New Sanitary Sewer to Existing Manhole Connection (Gravity Sewer)

1. Core Drill existing structure and connect with flexible, watertight connection. Bench shall be reconstructed per **Liberty Regional Waste District** Standards.
2. At the time the new sewer is placed into permanent service, as designated by **Liberty Regional Waste District**, the Contractor shall remove the old sewer pipe from the manhole, patch and seal the wall with an expansive cement mortar, construct new manhole bench in accordance with the standard details, and remove plug from the new sewer. All temporary pumping, piping, excavation, etc. as required to maintain or divert the sewage flow shall be included by the Contractor.

3.04 Sanitary Sewer Manhole Installation

A. Excavation for Manhole Installation

1. Excavation in which manholes are to be installed shall be excavated in open cut to the depths required on the drawings and by field conditions. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the manhole to be properly bedded.
2. Excavation may be undercut to a depth below the required invert elevation that will permit installing the manhole on a bed of granular material to provide continuous support for the manhole base.
3. Excavations shall be of sufficient dimensions to provide free working space on all sides of the manhole and to permit proper backfilling around the manhole. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the excavation.
4. The excavation shall be straight and uniform so as to permit installation of the manhole to lines and grades shown on the drawings. It shall be kept free of water during the installation of the manhole and until the manhole has been backfilled. Removal of water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.

B. Manhole Bedding

1. All manholes shall be supported on a bed of compacted INDOT No. 53 stone. In no case shall manhole be supported directly on rock. Bedding shall be provided in earth bottom excavations, as well as rock bottom excavations. Bedding shall be a minimum of 6" below manhole base.
2. A minimum 4" layer of Size #2 crushed stone over filter fabric shall be used in wet conditions.
3. Where undercutting and granular bedding is involved it shall be of such depth that the bottom of the manhole will be at least six inches above the bottom of the excavation.
4. In wet, yielding, mucky locations where the manhole is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe and/or manhole might take place during the placing of the backfill, the pipe and/or manhole must be weighted or secured permanently in place by such means as will prove effective. Yielding and mucky materials in sub-grades shall be removed below ordinary excavation depth in order to prepare a proper bed for the manhole. Crushed stone or other such granular material, if necessary, to replace poor sub-grade material classified as "Special Granular Fill".

C. Manhole Lining

1. All manholes with a forcemain discharge connection, and three (3) manholes downstream of such a connection shall receive a protective lining.
2. Protective Lining system shall be Mainstay Composite Liner System by Madewell Products Corporation or **Liberty Regional Waste District** approved equal.
3. The liner system shall be comprised of the following:
 - a. Hydraulic Cement Mortar: Mainstay ML-10
 - b. Restoration Mortar: Mainstay ML-72
 - c. Corrosion Barrier: Mainstay DS-5
 - d. Manhole Frame Seal: Madewell 806 Flexible Epoxy
3. The liner system shall be accompanied by a warranty against failure for a minimum of 10-years and be transferable to **Liberty Regional Waste District**. This warranty shall, at a minimum, cover the following:
 - a. Failure of the liner to protect against the interior deterioration or corrosion of the structure.

- b. Failure to protect the substrate and environment from contamination by effluent.
- c. Failure to prevent groundwater infiltration.

Any such failures shall be repaired and restored at no cost to **Liberty Regional Waste District** within 60 days of notice of failure.

D. Converting Existing Pump Station to Manhole

- 1. Where noted on the Drawings, wet wells shall be converted to manholes as described herein. Structure shall be filled with compacted crushed stone or sand to a level approximately one foot below the invert elevation shown on the Drawings.
- 2. The invert shall be constructed with 3000 psi concrete, approximately one foot thick, with bench and channel(s) formed and finished per **Liberty Regional Waste District** Standards. New outlet pipe openings shall be core drilled in the wall of the structure, and the pipe installed with a PSX Direct Drive Manhole Adapter, or approved equal. Areas around pipe shall be grouted to achieve a smooth surface.

E. Concrete Highway, Street, and Drive Replacement

- 1. Reference Section 3.02 K of this document.

F. Concrete Curb and Gutter Replacement

- 1. Reference Section 3.02 M of this document.

G. Mailbox, Culvert, Clothes Line Posts, Fences and other Replacements

- 1. Reference Section 3.02 N of this document.

H. Manhole Frame Installation

- 1. The manhole frame casting shall be centered over the opening in the cone or grade ring of the manhole, with a bituminous mastic joint sealing compound applied between the concrete and the casting.
- 2. The frame shall be bolted to the cone or grade ring with wedge anchors.

3.05 Grinder Pump Station Installation

A. Installation

1. CONTRACTOR shall install grinder pump units in accordance with the MANUFACTURER'S Drawings, shop drawings and instructions.
 - a. Contractor shall remove all spoil, resulting from the excavation for grinder pump installation, from the site within 14 days after the completed grinder pump installation.
 - b. Contractor shall complete the temporary grading of the grinder pump site within 14 days of the completed installation.
2. The CONTRACTOR shall coordinate the orientation of gravity service stub location with Manufacturer to minimize bends in the gravity service connections. During installation, Contractor shall orient gravity service stubs in the direction that minimizes pipe bends in gravity service.
3. Install HDPE service line per Sanitary Sewer Installation for Forcemains.

4.01 Introduction

The following Chapter describes the minimum requirements and general procedures for the inspection and testing of sanitary and storm sewers to be dedicated to **Liberty Regional Waste District**.

Any section of sewer not passing the tests prescribed herein shall be repaired to the satisfaction and approval of **Liberty Regional Waste District**, retested and re-inspected.

4.02 Testing

A. Gravity Sanitary Sewers

1. Cleanup: Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.
2. Inspect Lines and Laterals: Provide post installation sanitary sewer line jet cleaning and television inspection of the sewer line. All video recordings are to be turned over to **Liberty Regional Waste District** for Engineer review and final approval. Any video deemed incomplete or otherwise deficient shall be re-televised before **Liberty Regional Waste District** acceptance. Televising will be on an acceptable form of digital media, such as CD/DVD or portable external hard drive (flash media).
3. Deflection Test: Deflection tests shall be performed on a flexible pipe. The test shall be conducted after the final backfill has been in place at least 30 days to permit stabilization of the soil-pipe system. No pipe shall exceed a deflection of 5 percent. If deflection exceeds 5 percent, pipe shall be replaced or corrected. The mandrel used for the deflection test shall have a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM Specification, including the appendix, to which the pipe is manufactured. The pipe shall be measured in compliance with ASTM D2122 Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings. The test shall be performed without mechanical pull devices.
4. Replacement of Defective Lines: All lines or sections of lines that are found to be laid improperly with respect to line or grade, that are found to contain broken or leaking sections of pipe, or are obstructed in such a manner that they cannot

be satisfactorily corrected otherwise, shall be removed and replaced at the Contractor's expense.

5. Low Pressure Air Test:

- a. To test for leaks, all completed piping as specified herein after backfilling shall be tested by low-pressure air test, exfiltration, or infiltration test. Should the low pressure air test results be inconclusive, an exfiltration or infiltration test will be required on the low pressure air tested segments. Labor, equipment and supplies required for all tests shall be furnished by the Contractor.
- b. The low pressure air test shall consist of meeting a required holding time during a measured pressure drop. The initial test pressure shall be 4.0 psi, with the allowable pressure loss being 1.0 psi during the calculated holding time. PVC pipe shall be tested in accordance with ASTM F1417. Test time shall be calculated as follows:

$$T = \frac{0.085DK}{Q}$$

Where:

T = shortest time allowed for the air pressure to drop 1.0 psig, s;

K = 0.000419 DL but not less than 1.0;

Q = Leak rate in cubic feet/minute/square feet of internal surface
= 0.0015 cfm/sf;

D = measured average inside diameter of sewer pipe, in.;

L = length of test section, ft.

6. Exfiltration Test: In order to test for infiltration **Liberty Regional Waste District** may also require exfiltration tests on each section of pipe between manholes after it has been laid but prior to back filling of joints. Exfiltration tests shall be conducted by plugging the lower end of the section of sewer to be tested and filling the sewer with water to a point approximately five feet above the invert at the lower end and at least one foot above the pipe at the upper end, observing for leakage at all joints and measuring the amount of leakage for a given interval of time. Exfiltration shall not exceed 110 percent times the infiltration limits set out hereinbefore. All observed leaks shall be corrected even though exfiltration is within the allowable limits.
7. Infiltration Test: To test for infiltration, **Liberty Regional Waste District** may also require that the Contractor plug the open ends of all lines at the manhole so

that measurements may be made at each section of the sewer line. Infiltration tests shall consist of weir measurement to determine quantities of any infiltration. Measurements shall be taken at line locations determined on-site. This infiltration test will not be made until the sewer line is completed, and the Contractor will be required to correct all conditions that are conducive to excessive infiltration and may be required to relay such sections of the line that may not be corrected even though infiltration is within allowable limits.

8. **Smoke Test:** Smoke testing may be used only to locate leaks and in no case shall be considered conclusive. In all cases the smoke test shall be accompanied by an air test, exfiltration test or infiltration test. Smoke testing may only be performed where ground water is low and smoke is blown into a conduit that is properly sealed. All such leaks or breaks discovered by the smoke tests shall be repaired and/or corrected by the Contractor at his own expense. Equipment and supplies required from smoke tests shall be furnished by the Contractor. The Contractor may also be required to smoke test the first section (manhole-to-manhole) of each size of pipe and type of joint on each construction contract prior to backfilling to establish and check laying and jointing procedures. Other supplementary smoke tests prior to backfilling may be performed by the Contractor at his option; however, any such tests shall not supplant the final tests of the completed work.
9. **I & I Limit Test: I & I Limits:** The Contractor shall lay sewer lines, including house connections so that the access of ground water or loss of water from the sewer system or other gravity flow piping which does not normally flow full will be limited to 10 gallons per inch diameter per mile per day. This limitation is inclusive of manholes, sewers, house connections, and appurtenances. This requirement may be applied to a portion of the contract work, such as the sewers in a separate drainage area or to a single section of the line between two manholes.

B. Sanitary Sewer Forcemains

1. Hydrostatic Test (Ductile Iron and PVC)

- a. Hydrostatic leak testing shall be done in accordance with AWWA or ASTM Standards based on force main material, in accordance with ASTM E1003 (latest revision), and as follows:
- b. All pressure piping (lines not laid to grade) shall be given a hydrostatic leak test after final backfill is placed and air and/or vacuum release valves are installed.

- c. Contractor shall furnish a hydrostatic test pump (jockey pump); continuous recording gauge (4" diameter, 0-200 psi range, 1 psi increments); calibrated/graduated chamber for measuring water used during leakage test; recording pressure charts during duration of test; pipe plugs/caps with openings for filling/draining the force main and bleeding air from the line.
- d. The procedures for hydrostatic test are as follows:
 - i. After the force main has been backfilled to final grade, securely plug and/or bulkhead the ends being tested. Thrust blocking restraints may be installed at each bulkhead in accordance with the bulkhead manufacturer's recommendations.
 - ii. All air/vacuum release valves shall be installed and in open in-service position during the test.
 - iii. The force main shall be slowly pressurized with water to 1.5 times the working pressure (including surge pressure), or 150 psi, whichever is greater. Trapped air shall be expelled through high point bleed off valves as the force main is being filled. When the pressure is reached, the test pump shall be shut-off. After the force main is pressurized, measure the pressure drop for two (2) continuous hours.
 - iv. If no (zero) pressure drop occurs within the two (2) hour test time as determined by the Contractor and observed by **Liberty Regional Waste District**, the force main shall have passed the test.
 - v. Allowable leakage shall be per AWWA C600. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

In inch-pound units:

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

Where:

L = allowable leakage, in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during the leakage test, in pounds per square inch (gauge)

- e. All pipe, fittings, valves, and other materials found to be defective under test shall be removed and replaced at no additional expense to **Liberty Regional Waste District**.
- f. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.
- g. **All water for testing shall be metered and cost of water shall be paid for by Contractor.**

2. **Hydrostatic Test (HDPE)**

- a. All new HDPE sanitary sewer forcemain shall be hydrostatic tested to ensure water tightness and integrity in accordance with ASTM F 2164 (latest revision) *“Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure”*.
- b. The Contractor shall furnish a recording gauge and water meter for measuring water used during leakage test and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Engineer at conclusion of test. The pressure recording device (calibrated gage or sensor) shall be suitable for outside service, with a full scale value not to exceed twice the test pressure with scale gradations no greater than two percent (2%) of the full scale value, be accurate to within two percent (2%) of full scale, and approved by the Engineer.
- c. **Liberty Regional Waste District** shall witness all tests. The procedure for testing shall be approved by **Liberty Regional Waste District** and in accordance with the following steps.
 - i. Preparation:
 - 1) Before testing, heat fusion joints shall be completely cooled. Mechanical joints shall be completely assembled. Concrete supports or blocking shall be sufficiently cured to withstand test pressure thrust forces.

- 2) Interior pipe shall be free of dirt or debris.
- 3) Testing may be conducted on the entire system or sections of the system. Test section length shall be determined by the Contractor by the capacity of the filling and pressurizing equipment within the allotted overall time for the test.

ii. Initial Expansion:

- 1) Fill the test section with water and remove all air from the line and service laterals. Allow the test section and test liquid to equalize to a common temperature.
- 2) Pressurize the test section at a steady rate. The test pressure should not exceed 1.5 times the system design pressure where lower pressure-rated components or devices are not present, or have been removed or isolated from the test section. The maximum test pressure is not to exceed the pressure rating of the lowest pressure-rated component in the test section, where lower pressure-rated components or devices cannot be removed or isolated from the test section. Pressure readings shall be measured as close as possible to the lowest point of the line.
- 3) The pipe test section shall be allowed to stand for four (4) hours to allow for expansion of the pipe. Make-up water should be added to the system at hourly intervals to return the test section to the test pressure.
- 4) After equilibrium is established within the pipe test section, begin the final hydrostatic test.

iii. Test Phase:

- 1) At the end of the fourth hour, reduce test pressure by 10 psi and monitor pressure for one (1) hour. Do not increase pressure or add make-up water.
- 2) If there are no visual leaks and pressure during the test phase remains steady (zero tolerance for leaking at 100 psi) for the one (1) hour test period, the test section passes the test.

Allowance for Expansion of HDPE Pipe* (U.S. Gallons/100 Feet of Pipe)

Nominal Pipe Size (inches)	2-Hour Test
0.75	0.055
1	0.060
1 ¼	0.085
1 ½	0.100
2	0.120
3	0.150
4	0.250
6	0.600
8	1.000

iv. Test Duration:

- 1) If the maximum test pressure is between the system design pressure and 1.5 times the system design pressure or at 1.5 times the system design pressure, total testing time including the time required to pressurize, stabilize, hold test pressure, and depressurize shall not exceed eight (8) hours.
- 2) If the maximum test pressure is the system design pressure or less, the total test time including the time required to pressurize, stabilize, hold test pressure, and depressurize shall not exceed 72 hours.

v. Retesting:

- 1) If any defects or leaks are revealed during the test phase resulting in a failed test section, the test section shall be retested. The test section shall be depressurized at a controlled rate and any defects or leaks shall be rectified/corrected at the Contractor's expense. The pipeline shall be re-tested after a minimum 8-hour recuperation period. No pipeline shall be placed into service or accepted by the Engineer until it has passed the testing requirement.

vi. **All water for testing shall be metered and cost of water shall be paid for by Contractor.**

C. Sanitary Sewer Manholes

1. Testing Prior to Backfilling

- a. This specification shall govern the vacuum testing of sanitary sewer manholes and structures and shall be used as a method of determining acceptability by **Liberty Regional Waste District**, in accepting maintenance of a sanitary sewer manhole or structure on behalf of the public. This test shall be performed in accordance with ASTM C 1244 prior to backfilling. Other forms of testing of some manholes may be required, as deemed necessary by **Liberty Regional Waste District**.
- b. Manholes shall be tested after installation with all connections in place.
- c. Lift holes, if any, shall be plugged with an approved, non-shrinkable grout prior to testing.
- d. Drop connections shall be installed prior to testing.
- e. The vacuum test shall include testing of the seal between the cast iron frame and the concrete cone, slab or grade rings.
- f. Test Procedure
 - (1) Temporarily plug, with the plugs being braced to prevent the plugs or pipes from being drawn into the manhole, all pipes entering the manhole at least eight inches into the sewer pipe(s). The plug must be inflated at a location past the manhole/pipe gasket.
 - (2) The test head shall be placed inside the frame at the top of the manhole and inflated, in accordance with the manufacturer's recommendations.
 - (3) A vacuum of 10" of mercury shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and disconnect the vacuum line.
 - (4) The pressure gauge shall be liquid filled, having a 3.5-inch diameter face with a reading from zero to thirty inches of mercury.

- (5) The manhole shall be considered to pass the vacuum test if it holds at least 9 inches of mercury for the following time durations:

Time (Seconds)

Manhole Depth	4' Diameter	5' Diameter	6' Diameter
20 Feet or Less	50	65	81
20.1 to 30 Feet	74	98	121

- (6) If a manhole fails the vacuum test, the manhole shall be repaired with a non-shrinkable grout or other suitable material based on the material of which the manhole is constructed and retested, as stated above.
- (7) All temporary plugs and braces shall be removed after each test. Manholes will be accepted as having passed the vacuum test requirements if they meet the criteria stated above.

5.01 Introduction

This Chapter pertains to the requirements for the design and construction of submersible type lift stations, which are the primary type typically constructed as part of private development. Dry well stations are not acceptable.

Lift stations meeting or exceeding the requirements set herein will be approved. Any proposed alteration of the pump station dimensions, equipment, controls, etc. from the standards set forth herein will be approved only upon the submittal of plans and specifications of the proposed changes to **Liberty Regional Waste District**, and upon the **Liberty Regional Waste District** written approval. **Liberty Regional Waste District** reserves the right to alter any standard set forth hereinafter.

This Chapter is divided into two sections designated by a Type I Lift Station and a Type II Lift Station. Lift Stations, in general, shall be submersible type including a minimum of two (2) pumps and motors, wetwell basin, separate valve pit, valves, piping hatches, guide rails, pump removal components, control center, level control switches, remote monitor package, interconnecting electrical wiring, incoming power and radio supply, and all other features regularly and normally required as a part of a complete and functional facility. All work shall be in accordance with site requirements, details in the Plans, these Standards and the manufacturer’s recommendations.

5.02 Lift Station Site Requirements

A. Security Fencing

1. A security fence shall be installed at all lift station sites. The type of fencing to be used shall be determined by **Liberty Regional Waste District** and shall consist of the following:
 - a. Chain Link Fencing:
 - i. Fencing shall be a minimum of 6-feet tall, commercial grade, black PVC coated steel chain link fencing. Fencing shall also include 3-strand barbed wire (for Industrial Sites) and black privacy slats.
 - ii. Access gate shall consists of a double swing type gate with black PVC coated chain link fabric and black privacy slats. Access gate shall also have 3-strand barbed wire. Each gate shall have a black PVC coated industrial strong arm latch and “hold back” to prevent the gate from inadvertently closing. An additional 4-foot wide access gate may also be installed

adjacent to the double swing gate if required by **Liberty Regional Waste District**. This gate shall be constructed of black PVC coated chain link fabric, black privacy slats and 3-strand barbed wire (for Industrial Sites).

- iii. Minimum gate post diameter shall be 6-⁵/₈" with black powder coated finish.

B. General Site

1. Areas inside of the security fencing and not paved shall be covered with landscaping geotextile fabric and 6-inches of INDOT No. 8 Stone.

5.03 Type I Pump Station

A. Scope of Work

1. Quality Assurance:

- a. All similar components shall be manufactured and furnished by one manufacturer unless specifically approved by **Liberty Regional Waste District** in writing.
- b. Equipment shall be in accordance with the following standards, as applicable and as indicated in each equipment specification:
 - i. American Society for Testing and Materials (ASTM).
 - ii. American National Standards Institute (ANSI).
 - iii. American Society of Mechanical Engineers (ASME).
 - iv. American Water Works Association (AWWA).
 - v. American Welding Society (AWS).
 - vi. National Fire Protection Association (NFPA).
 - vii. National Electrical Manufacturers Association (NEMA).
 - viii. Manufacturer's published recommendations and specifications.

2. Submittals

a. Shop Drawings:

Shop Drawings for the lift station and associated equipment shall be submitted. Submittals shall include, but not be limited to, the following documentation:

- i. Descriptive literature including materials of construction, equipment weight, motor data, pressure ratings, certification of all applicable ASTM standards;
- ii. Predicted performance curves developed for the specific application.

Performance curves shall plot speed, capacity, head, horsepower, efficiency, and NPSH requirements over the manufacturer's recommended range of operation;

- iii. Dimensional factory drawings including cross sectional views of pumps and all equipment showing details of construction;
- iv. Written report on the factory test results;
- v. Manufacturer's installation instructions.
- vi. Control panel schematics and wiring diagrams.

b. Operation and Maintenance Manuals:

Contractor shall submit one (1) hard copy and one (1) USB flash memory stick copy of the Operation and Maintenance Manuals to **Liberty Regional Waste District**. Manuals shall include, at a minimum, the following:

- i. Warranty Statement
- ii. Pump down test procedures and results from the start-up tests;
- iii. Operation Instructions;
- iv. Maintenance Instructions;
- v. Recommended spare parts list;
- vi. Lubrication schedules;
- vii. Structural diagrams;
- viii. As-built wiring diagrams;
- ix. Piping and Instrumentation Drawings (P&ID); and
- x. Bill of materials

3. Experience Qualifications:

The equipment to be furnished hereunder shall be made by a manufacturer regularly engaged in such work, and who has furnished similar installations and had them in successful and continuous operation for a period of 10 years.

2. Factory Testing:

Each pump to be delivered under this Section shall be tested for performance at the pump manufacturer's factory to determine head versus capacity, efficiencies, and kilowatt draw required for the operating points that are specified. All tests shall be run in accordance with the latest edition of the American Hydraulic Institute Standards and Submersible Wastewater Pump Association and at the appropriate voltage and frequency. Testing shall also include, but not be limited to, the following:

- a. Head vs. flow with five (5) equally spaced points including shutoff and maximum flow shall be certified.
- b. The input KW, speed, power factor, no load current, and torque characteristics shall be certified.
- c. Impeller, motor rating, and electrical connections shall first be checked for compliance to the specifications.
- d. Insulation Test: A motor and cable insulation test for moisture content or insulation defects shall be made.
- e. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
- f. Operational Test: The pump shall be run for 30 minutes submerged, under a minimum of six feet of water.
- g. After the operational test (described in line F) has been conducted, the insulation test (described in line D above) shall be performed again.
- h. After testing, the pump shall be inspected to insure that the pump maintains full watertight integrity.
- i. A written report stating the tests have successfully been completed and providing the results of the test shall be provided for each pump. The pump manufacturer shall also certify that similar tests have been conducted on pumps of a similar size for a period of not less than five (5) years.

B. Products

1. Manufacturers:

- a. Flygt
- b. Alternates and substitutions to be approved by **Liberty Regional Waste District**

2. Schedule:

a. Include the following example schedule in the construction drawings:

Parameter	Pump Schedule
Manufacturer	XXXX
Pump Model	XXXXXXXXXXXXXXXX
Quantity	Two (2)
Impeller Size	XX.XXX inch
Motor HP	XX
RPM	X,XXX
Electric Service	460 volt / 60 Hz / 3 phase
Operating Point (1 pump)	X,XXX gpm @ XXX' TDH
Operating Point (2 Pumps)**	X,XXX gpm @ XXX' TDH
Minimum Pump Efficiency	XX%
Maximum NPSH Required	XX ft.
NEC Classification	Above min. pump submergence level = Class 1, Div 2, Groups C & D
Cooling Jacket Equipped	
Minimum Water Level	
Discharge Connection	X inch
Shut-Off Head	XXX ft.

(**) Basis of Design at full speed

3. Wetwell & Valves Vault:

a. Wetwell Design

- i. Submit wetwell sizing calculations to determine required internal diameter, or approved alternative from **Liberty Regional Waste District** in writing.
- ii. All hardware shall be stainless steel.

- iii. All piping connections inside the wetwell shall be bolted flange connections. Mechanical joint connections shall not be permitted.
- iv. Provide a stainless steel cable hanger assembly, mounted to the pump station lid, opposite the pump discharge piping. The assembly shall provide one double hook for each power cable(s) and level control cable(s). The hanging of multiple cables on one hook will not be permitted.
- v. All control and pump cables/cords shall have a stainless steel double hook style with stainless steel Hubbel Kellem Heavy Duty Single Eye strain relief.
- vi. The wetwell vent shall be per Standard Details.
- vii. Aluminum access hatch shall be cast into top lid. Access hatch shall be sized by pump manufacturer to allow removal of pumps without entering wetwell.
- viii. At the discretion of **Liberty Regional Waste District**, the interior of the wetwell may be required to have an epoxy liner system applied.
- ix. Piping shall be coated with a protective coating as follows, or as approved in writing by **Liberty Regional Waste District** :

1) Piping and fittings in wetwell shall have the following coatings:

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils
Surface Prep	Factory Primed Surface Shall be Clean / Dry		Factory Primed Surface Shall be Clean / Dry	
1st Coat	Tnemec Perma-Shield Series 435-5020	30-40	SW Dura-Plate 6000	30-40

2) Piping, fittings, valves in valve vault shall have the following coatings:

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils
Surface Prep	Factory Primed Surface Shall be Clean / Dry		Factory Primed Surface Shall be Clean / Dry	
1st Coat	N69 Hi-Build Epoxoline II	4.0 – 6.0	Macropoxy 646 FC	4.0 – 6.0

2nd Coat	N69 Hi-Build Epoxoline II	2.0 – 3.0	Macropoxy 646 FC	2.0 – 3.0
----------	---------------------------	-----------	------------------	-----------

3) Piping and fittings above wetwell and valve vault shall have the following coatings:

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils
Surface Prep	Factory Primed Surface Shall be Clean / Dry		Factory Primed Surface Shall be Clean / Dry	
1st Coat	N69 Epoxoline II	4.0 – 6.0	Macropoxy 646 FC	4.0 – 6.0
2nd Coat	1074 Endura -Shield	2.0 – 3.0	HiSolids Polyurethane or Acrolon 218 HS	2.0 – 3.0

b. Valve vault Design:

- i. All piping connections inside the valve vault shall be bolted flange connections. Mechanical joint connections are not permitted.
- ii. All hardware shall be stainless steel.
- iii. Refer to Sewage Valve Section for valve manufacturers
- iv. Minimum valve vault dimensions shall be per Standard Details, or approved alternative from **Liberty Regional Waste District** in writing.
- v. All forcemain piping shall have a minimum of 60-inches depth of cover.
- vi. Valve vault shall have aluminum access hatch cast into top lid, located over valves.
- vii. Piping shall be coated with a protective coating as outlined for the wetwell above, or as approved in writing by **Liberty Regional Waste District**.
- viii. Flow Meter: A flow meter shall be required at the discretion of **Liberty Regional Waste District**. Flow meter shall be Endress + Hauser W400 Promag electromagnetic flow meter shall be installed in a meter vault at the lift station.

4. Submersible Pumps and Appurtenances

c. a. Pump Design:

- i. The pump shall be capable of handling at least 3” diameter solids and raw

water or unscreened sewage. The discharge connection elbow shall be permanently installed in the wetwell along with the discharge piping. The pump shall be automatically and firmly connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter the wetwell. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump.

ii. Stainless steel upper and intermediate guide bar brackets shall be an integral part of each pump unit. The entire weight of the pump unit shall be guided by no less than two (2) stainless steel guide bars, size as recommended by the pump manufacturer, extending from the top of the station to the discharge connection and pressed tightly against the discharge connection elbow with a machined metal-to-metal watertight contact. No portion of the pump shall bear directly on the floor of the sump.

iii. Pump Construction:

- 1) Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be of stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.
- 2) Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
- 3) Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used

iv. Cable Entry Seal:

- 1) The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommet(s), flanked by washers, all having a close tolerance fit against the cable outside

diameter and the entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

v. Motor:

- 1) The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.
- 2) The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.
- 3) For motors greater than 5 hp, Motors shall be 230/460V, 60 Hz, 3 phase. For motors 5 hp or less, Motors shall be 120/240 V, 60 Hz, 1 Phase. The motor service factor (combined effect of voltage,

frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C ambient and shall have a NEMA Class B maximum operating temperature rise of 80° C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

- 4) The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length of reach the junction box without the need of any splices. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.
- 5) The motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire pump performance curve, from shut-off through run-out. **The pump/motor/cable assembly shall be suitable for use in NEC Class I, Division 1, Groups C and D hazardous locations.**

vi. Bearings:

- 1) The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a two row angular contact ball bearing. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L₁₀ bearing life shall be 50,000 hours at any usable portion of the pump curve.

vii. Mechanical Seals:

- 1) Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals

without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

- 2) Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.
- 3) The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.
- 4) A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

viii. Pump Shaft:

- 1) The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. Shaft sleeves will not be acceptable.

ix. Impeller:

- 1) Impeller shall be ductile iron ASTM A-536 of a non-clog design capable of handling minimum three (3) inch sphere solids, fibrous material, heavy sludge and other matter found in normal sewage applications. Impeller shall be of the two-vane, enclosed non-clogging design and have pump-out vanes on the front and backside

of the impeller to prevent grit and other materials from collecting in the seal area.

- 2) Impellers shall be dynamically balanced. The tolerance values shall be listed below according to the International Standard Organization grade 6.3 for rotors in rigid frames. The tolerance is to be split equally between the two balance planes that are the two impeller shrouds.

RPM	Tolerance
1750	.02 in. – oz./lb. of impeller weight

- 3) Impeller shall be either slip fit or taper fit with key to securely lock the impeller to the driving shaft. A 300 series stainless steel washer and impeller bolt shall be used to secure the impeller to the shaft for both threaded and tapered shafts. Straight end shafts for attachment of the impeller shall not be acceptable.

x. Volute/Suction Cover:

- 1) The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s) that is cast into the suction cover. The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of ASTM A-48 Class 35B gray iron and provide effective sealing between the multi-vane semi-open impeller and the volute.

xi. Protection:

- 1) Each pump motor stator shall incorporate three (3) thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection. When activated, the float switch will stop the motor and send an alarm both local and/or remote.
- 2) The thermal switches and float switch contacts shall be connected to a Flygt “Mini CAS” control (or approved equivalent) and status monitoring unit mounted in the pump control panel.

xii. Control Panel:

- 1) All of the automatic control equipment is to be supplied by one manufacturer. It shall be factory assembled, wired, tested and covered by complete electrical drawings and instructions.
- 2) Control panel shall be built to meet the requirements provided by NFPA 70 (National Electric Code) and Underwriters Laboratories (UL Listed) or built within a UL listed panel shop. Wiring interfacing between the wet well (classified space) and the control panel shall include an intrinsically safe barrier per Article 504 of the NEC to limit the voltage entering the classified space.
- 3) Control panel shall be NEMA 4X 316 Stainless Steel, pad-lockable, and sized appropriately for the installation.
- 4) Control Panel shall include inner swingout door to protect maintenance staff from hazardous electricity. All switches, lights, breakers, overload resets, etc operated through the door shall have permanently mounted tags indicating what the device controls/operates. The door shall have the following mounted through for access:
 - a. Main, motor, and accessory circuit breakers
 - b. Lights, buttons, switches
 - c. Motor overload resets
 - d. Elapsed Time Meters
 - e. Pump Station Controller Display
 - f. Pump Station Level Display
 - g. Leak detection/ Hi Temp overload controller
 - h. Convenience Receptacle
- 5) The control panel shall be powered by one (1) single source of power 460VAC, 3 phase, 100A minimum, and shall include a main circuit breaker that will remove power from the entire panel in the event of overcurrent. 230VAC, 3phase may also be used, but 460VAC is preferred. Should 3 phase not be available contact the electric utility company for additional requirements.
 - a. Note: For stations that do not have 3 phase power available, single phase may be used for powering the control panel. Variable frequency drives shall be used to convert single phase power to 3 phase for the 3 phase pumps. VFD sizing shall be coordinated with the VFD manufacturer for oversizing requirements for use of the VFD with single phase service.

- 6) Accessory Circuit Breakers shall be provided for the following:
 - a. 15A: Site Lighting
 - b. 10 A: Flow metering (if applicable)
 - c. 10 A :Remote Monitoring unit (Omnisite)
 - d. 10A: Panel Heater
 - e. 15A: Convenience Receptacle
 - f. 1 spare 10A breaker.
- 7) Provide a 200W, 115VAC, heater with integral thermostat and fan.
- 8) Provide a convenience receptacle rated for 15A, 125VAC, in a handy box
- 9) Control Power Transformer shall be provided to provide 120VAC control and accessory power to the station. Size the transformer to be loaded 75% capacity to provide spare accessory power for the future. Control power transformer shall be 2 kVA minimum.
- 10) Across the line motor starters shall be provided and shall be NEMA rated. Starters shall be equipped with motor adjustable overloads for pump protection. The overload trips shall be capable of being reset through the inner door and shall not require access to the starters themselves. Sizing of the starters shall meet the following:
 - a. 460VAC, 3 phase
 - i. NEMA size 1, 0 – 10HP
 - ii. NEMA size 2, Greater than 10 HP but less than 25HP
 - b. 230VAC, 3 phase
 - i. NEMA size 1, 0 – 5HP
 - ii. NEMA size 2, Greater than 5 HP but less than 15HP
- 11) Pump Current Sensing Transducer
 - a. Provide a pump current sensor probe to monitor the current to the pump. The output of the transducer shall be a 4-20mA signal to be monitored by the remote monitoring system (Omnisite). Transducer shall be a Magnelab MCT-0024-250 or equal.
- 12) Pump Sequence Controller
 - a. Provide a pump sequencing controller that will provide automatic operation of the pumps using level based control. The controller shall be a readily available controller from a manufacturer in the wastewater industry with at least 10 years' experience. The controller shall operate utilizing continuous level and float backup. The controller shall also have the ability to alternate the pumps between operations.

The pump controller shall provide power to the radar level transmitter as a +/24V, 4-20mA loop.

- b. Continuous Radar Level Detector and loop powered display:
 - i. Radar Transmitter - Endress and Hauser, model FMR 20 order code: FMR20-CBPBNVCEXR02+R3R8
 - ii. Display: Endress and Hauser RIA15, order code: RIA15-AAC3
- c. Float Backup – Primex KwikSwitch Float Connection System rated for Class 1, Div 1 operation. Provide accessory mounting brackets from the manufacturer to meet the application needs. Float backup shall operate upon failure of the continuous level device and shall be operator selectable for continuous level or float operation.
 - i. Hi Level Alarm
 - ii. Pump ON
 - iii. Pumps OFF
 - iv. Low Level Alarm and suction cutoff
- d. Depending on the size and location of the system, floats may be acceptable on a case-by-case basis as primary level control as approved by **Liberty Regional Waste District**.
- e. The controller shall allow for adjustable level set points that can be easily configured by operations staff in the field.
- f. Pump Selector Switches shall be provided to put the pumps in HAND-OFF-AUTO

13) Pump Selector Switches shall be provided to put the pumps in HAND-OFF-AUTO

- a. Hand – Pump turns on and runs until switch is moved
- b. OFF – Pumps are off
- c. Auto – Pump Sequence Controller controls operation, but low suction cutoff float will still inhibit the pump from running at low level.

14) Panel LED 22MM Pilot Lights shall be provided for the following:

- a. Green – Running per pump
- b. Amber – Fail per pump
- c. White – Control power on
- d. Red – Hi Level

15) The station shall include an audible and visual alarm beacon with local silence push button. The visual alarm shall be a weather sealed red alarm strobe wired to trigger upon hi level in the wet well. The audible alarm shall have a push to test feature.

16) Pump Elapsed Time Meters shall be provided to keep track of hours down 9999.99 digits.

17) Auxiliary Contacts shall be provided for the following:

- a. Pump Fail via starter overload (each pump)
- b. Pump Running (each pump)
- c. Pump "In Auto" (each pump)
- d. Control Power ON
- e. Low Suction Cutoff
- f. Hi Water Alarm

18) Remote monitoring system shall be provided to monitor the station over the cellular network. Prior to installation at the site the remote monitoring system supplier shall survey the site to provide the best fit cellular carrier for coverage. The system shall be setup and coordinated with the manufacturer's authorized service provider. The manufacturer's service provider shall provide any updates to the remote monitoring SCADA site to bring online the new station.

- a. OmniSite Crystal Ball Cellular Dialer
- b. GuardDog Web Browsing software
- c. Power: 120 VAC
- d. Enclosure: NEMA 4X, 316 stainless steel.
- e. Communications: Cellular GSM 850/900/1800/1900 MHZ
- f. Access Key: Smart security key to identify personnel on site
- g. Terminal Blocks: Removable style accepts #14-18 AWG solid or stranded wire.
- h. Operating Temperature -20/150 Deg. F
- i. Operating Humidity: 0-90% RH Non-condensing
- j. Certifications: UL Pending
- k. Dimensions: 8.9"H x 9.4"W x 3.8"D
- l. Memory Stick: Shall have one (1) gigabyte storage space
- m. LCD Display: 4x20 rugged operation
- n. Keypad: Eight (8) universal navigation buttons
- o. Analog Inputs: Four (4) 4-20mA, isolated, 10 bit resolution
 - i. Pump No. 1 Amperage from transducer
 - ii. Pump No. 2 Amperage from transducer
 - iii. Station Continuous Level (feet)
 - iv. Spare
- p. Relay Outputs: Four (4) 20A @ 120 VAC resistive.
- q. Digital Inputs: 14 Universal inputs accept 12 VAC/VDC – 120 VAC/VDC
 - i. High Level Alarm dedicated float wired directly to OmniSite
 - ii. Pump No. 1 Run (Normally Open Contact)
 - iii. Pump No. 2 Run (Normally Open Contact)

- iv. Pump No. 1 Over Temperature/Load Combined (Normally Closed Contact)
- v. Pump No. 2 Over Temperature/Load Combined (Normally Closed Contact)
- vi. Pump No. 1 Seal Fail (Normally Open Contact)
- vii. Pump No. 2 Seal Fail (Normally Open Contact)
- viii. Phase Failure Alarm (Each Phase)
- ix. Station Power Loss
- x. Station General Alarm Tied to:
 - 1. Low Suction cutoff float
 - 2. Future alarm device

19) Mounting Structures for control panels shall be aluminum or stainless steel. No wood mounting is allowed.

xiii. Lifting System:

- 1) Each submersible pump shall be provided with and set-up for a Flygt “Grip-Eye” lifting system. Each pump shall then be fitted with a stainless steel lifting chain extending from the top of the station to the stainless steel “Grip-Eye” safety hook attached to the pump unit. The working load of the lifting system shall be 50% greater than the pump unit weight.

xiv. Electrical Equipment

- 1) Service Entrance Rated Manual Transfer Switch
 - a. Enclosure: NEMA 4X Stainless Steel
 - b. Rating: 230/460, 3phase, 4w, 200A or 100A (depending upon station size), Service Entrance Rated
 - c. Phase rotation monitor
 - d. E1016 Series Male Camlok Panel mounts with flip covers for temporary generator connection.
 - e. Removable access panel
 - f. Conduit entry area
 - g. By Trystar LLC, 480/277V version - Part #: TMTS-025W-LLM-IR

xv. Variable Frequency Drive (VFD)

- 1) Depending on lift station size and available power, VFDs may be required. This will be reviewed on a case-by-case basis by **Liberty Regional Waste District**.

C. Execution

1. Preparation

- a. Coordinate with other trades, equipment and systems to the fullest extent possible.
- d. Take all necessary measurements in the field to determine the exact dimensions for all work and the required sizes of all equipment under this contract. All pertinent data and dimensions shall be verified by the Contractor.

2. Installation

- a. Installation shall be in strict accordance with the manufacturer's instructions and recommendations in the locations shown on the Contract Drawings. Anchor bolts shall be set in accordance with the manufacturer's recommendations and setting plans.
- b. The Contractor shall also provide from the submersible pump supplier the service of a qualified start-up engineer (factory representative) who has had prior on-site start-up experience to assist in performing start-up, check-out and initial operation services of the pumping units. The start-up engineer shall also instruct **Liberty Regional Waste District** personnel on the operation and maintenance procedures for the station. Qualified supervisory services, including manufacturers' engineering representatives, shall be provided for a minimum of two (2) full working days to ensure that the work is done in a manner fully approved by the respective equipment manufacturer. The pump manufacturer's representatives shall specifically supervise the installation of the pump and the alignment of the connection piping. If there are difficulties in the start-up or operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to **Liberty Regional Waste District**.
- e. A certificate from the pump manufacturer shall be submitted stating that the installation of his/her equipment is satisfactory, that the equipment is ready for operation and that the operating personnel have been suitably instructed in the operation, lubrication and care of each unit.

3. Field Tests:

- (1) Plug all inlet lines before starting presoak period.
- (2) Presoak period shall be at least 4.0 hours.
- (3) Following the presoak period, fill the structure to a depth of 6-inches below the top structure joint.

(4) The test period shall be a minimum of 2.0 hours. Any detectable leakage shall be cause for rejection and the leakage shall be corrected prior to retesting.

c. After installation of the pumping equipment, and after inspection, operation, testing, and adjustment have been completed by the qualified start-up engineer, each pump shall be given a running test in the presence of **Liberty Regional Waste District**. Testing shall be conducted to indicate that the pumps, motors, and drives generally conform to the efficiencies and operating conditions specified and its ability to operate without vibration, overheating, or over-loading. The pumps and motors shall operate at the specified capacities in the range of heads and capacity specified without undue noise or vibration. Any undue noise or vibration in the pumps or motors, which is objectionable, will be sufficient cause for rejection of the units.

3. Pump Warranty

a. After successful completion of tests and trials under operating conditions on all equipment, the Contractor shall guarantee all equipment, materials and workmanship from undue wear and tear, from mechanical and electrical defects, and from any failure whatever except those resulting from proven carelessness or deliberate actions of the **Liberty Regional Waste District**, for a minimum of one (1) year from date of substantial completion. This one (1) year minimum shall not replace a standard manufacturer's guarantee. This one (1) year minimum shall cover all parts and labor.

b. The pump manufacturer shall warrant for minimum of five (5) years after the date of **Liberty Regional Waste District** Acceptance, that the pumps will be free from defects in material and workmanship.

c. In the event a component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace, at his discretion such defective part. The manufacturer shall further provide, without cost, such labor as may be required to replace, repair or modify major components such as the pumps, motors, etc.

5. Spare Parts: Contractor is required to supply the following spare parts:

- Two (2) Impellers
- Two (2) Seal Kits
- One (1) Mechanical Ball Float (Compatible with Primex KwikSwitch)
- One (1) Transducer

- One (1) Control Panel Relay of each type
- Three (3) Control Panel Fuses of each type

Appendices

Standard Liberty Regional Waste District Documents

MAINTENANCE BOND

WE _____

as Developer, and _____

as Surety are held and firmly bound unto Liberty Regional Waste District as Obligee in the penal sum of _____ Dollars (\$ _____), for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

WHEREAS, the Specifications pertaining to said work require that the same shall be free from all defects caused by inferior materials or the result of poor workmanship for the period of three (3) year from the date of acceptance of the whole work of this system. The bond shall be for 25% of the total system installation cost.

NOW, THEREFORE, if the Principal shall in all things observe the guarantee described in the foregoing paragraph, and shall protect and indemnify said Obligee from and against any and all loss, costs, attorney's fees and expense of whatsoever kind and character which said Obligee shall sustain by reason for the failure of said Principal to faithfully observe the guarantee hereinbefore described that this obligation shall be void: otherwise the same shall be and remain in full force and effect.

Signed, Sealed and Dated this _____ day of _____,
20____.

(Name of Developer)

(Name of Surety)

(Address)

(Address)

By: _____
(Officer of Developer)

(Officer of Surety)

Printed Name and Title:

Printed Name and Title:

ATTEST

(Developer)

(Surety)

Printed Name and Title:

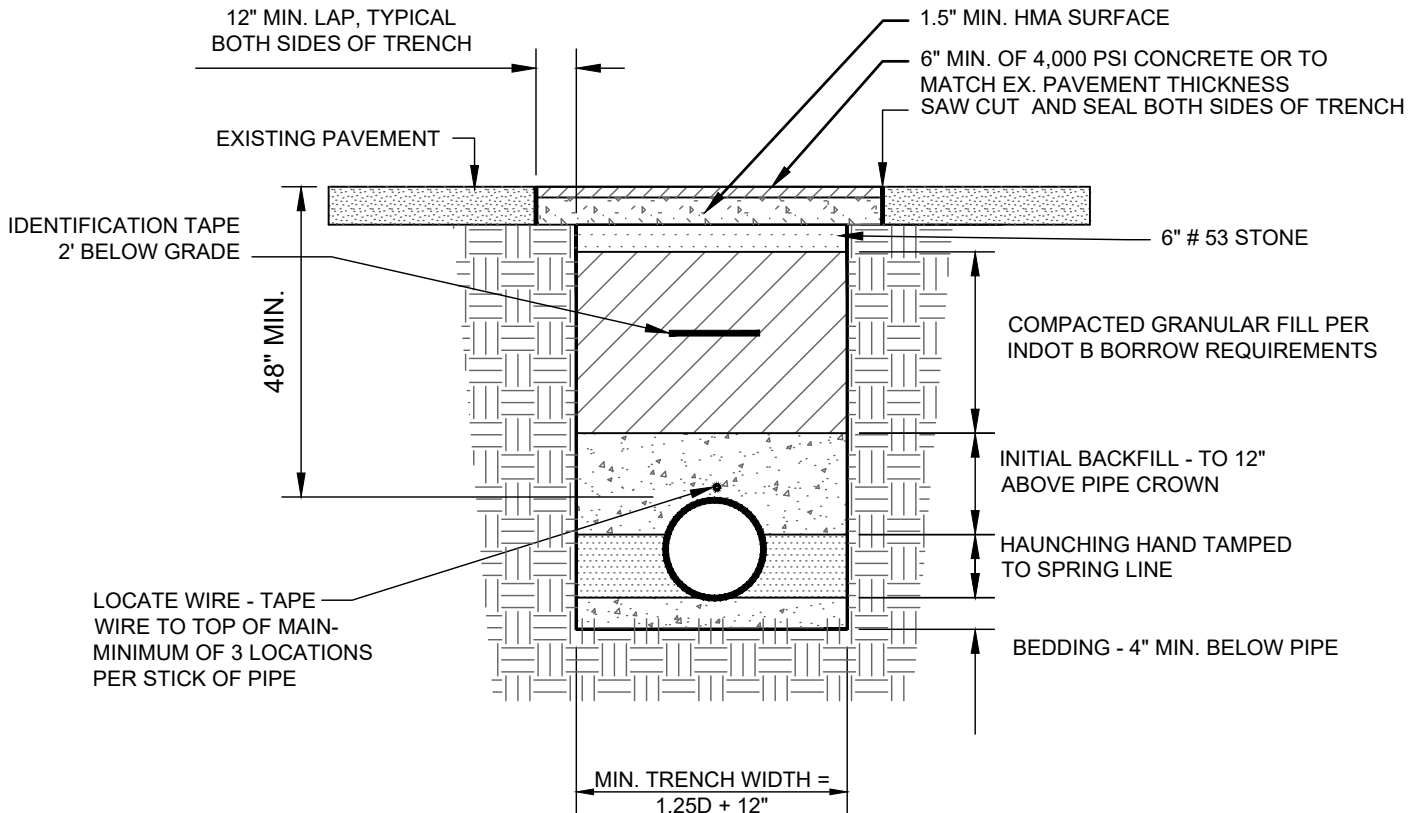
Printed Name and Title:

APPROVED AS TO FORM

BY _____

Standard Liberty Regional Waste District Details

Detail No.	Description
1	FORCEMAIN TYPICAL TRENCH FOR D.I. OR PVC C900 IN PAVED AREAS
2	FORCEMAIN TYPICAL TRENCH FOR D.I. OR PVC C900 IN UNPAVED AREAS
3	GRAVITY SANITARY SEWER TYPICAL TRENCH IN PAVED AREAS
4	GRAVITY SANITARY SEWER TYPICAL TRENCH IN UNPAVED AREAS
5	DUCTILE IRON PIPE RESTRAINED JOINT TABLES
6	PVC PIPE RESTRAINED JOINT TABLES
7	RESTRAINT OF BENDS
8	UTILITY CROSSING SUPPORT DETAIL
9	GRAVITY SANITARY SEWER TYPICAL STREAM CROSSING
10	STEEL CASING
11	TYPE "A" STANDARD PRECAST MANHOLE
12	TYPE "B" OUTSIDE DROP MANHOLE CONNECTION
13	TYPE "B" INSIDE DROP MANHOLE CONNECTION
14	TYPE "C" SHALLOW MANHOLE – 5' OR LESS
15	TYPE "D" STANDARD PRECAST DOGHOUSE MANHOLE
16	EXISTING MANHOLE CONNECTION
17	SAMPLE STATION DOGHOUSE MANHOLE
18	STANDARD MANHOLE BENCH WALL
19	STANDARD MANHOLE BENCHES
20	SANITARY FORCEMAIN AIR RELEASE VALVE STRUCTURE
21	PRECAST ADJUSTING RING
22	TYPE "1" CLEANOUT
23	TYPE "2" CLEANOUT
24	SANITARY SEWER SERVICE CONNECTIONS
25	GREASE TRAP
26	SANITARY FORCEMAIN MAG METER VAULT
27	PUMP/FLOAT CABLE WET WELL JUNCTION BOX
28	ELECTRICAL DIAGRAM
29	TYPE "I" GRINDER PUMP – 70 GAL
30	TYPE "II" GRINDER PUMP – 150 GAL
31	TYPE "III" GRINDER PUMP – 150 GAL
32	TYPE "IV" GRINDER PUMP – 275 GAL
33	TYPICAL GRINDER PUMP CURB STOP ASSEMBLY
34	TYPICAL GRINDER CONNECTION
35	TYPICAL CONTROL PANEL LOCATION
36	TYPE "I" LIFT STATION GENERAL CONFIGURATION – UPPER PLAN
37	TYPE "I" LIFT STATION GENERAL CONFIGURATION – LOWER PLAN
38	TYPE "I" LIFT STATION GENERAL CONFIGURATION – SECTION
39	LIFT STATION SITE LAYOUT I
40	LIFT STATION SITE LAYOUT II
41	LIF STATION DESIGN DATA



BEDDING, HAUNCHING AND INITIAL BACKFILL SHALL BE (INDOT #8 STONE OR CLASS II CLEAN SAND PER ASTM C12)

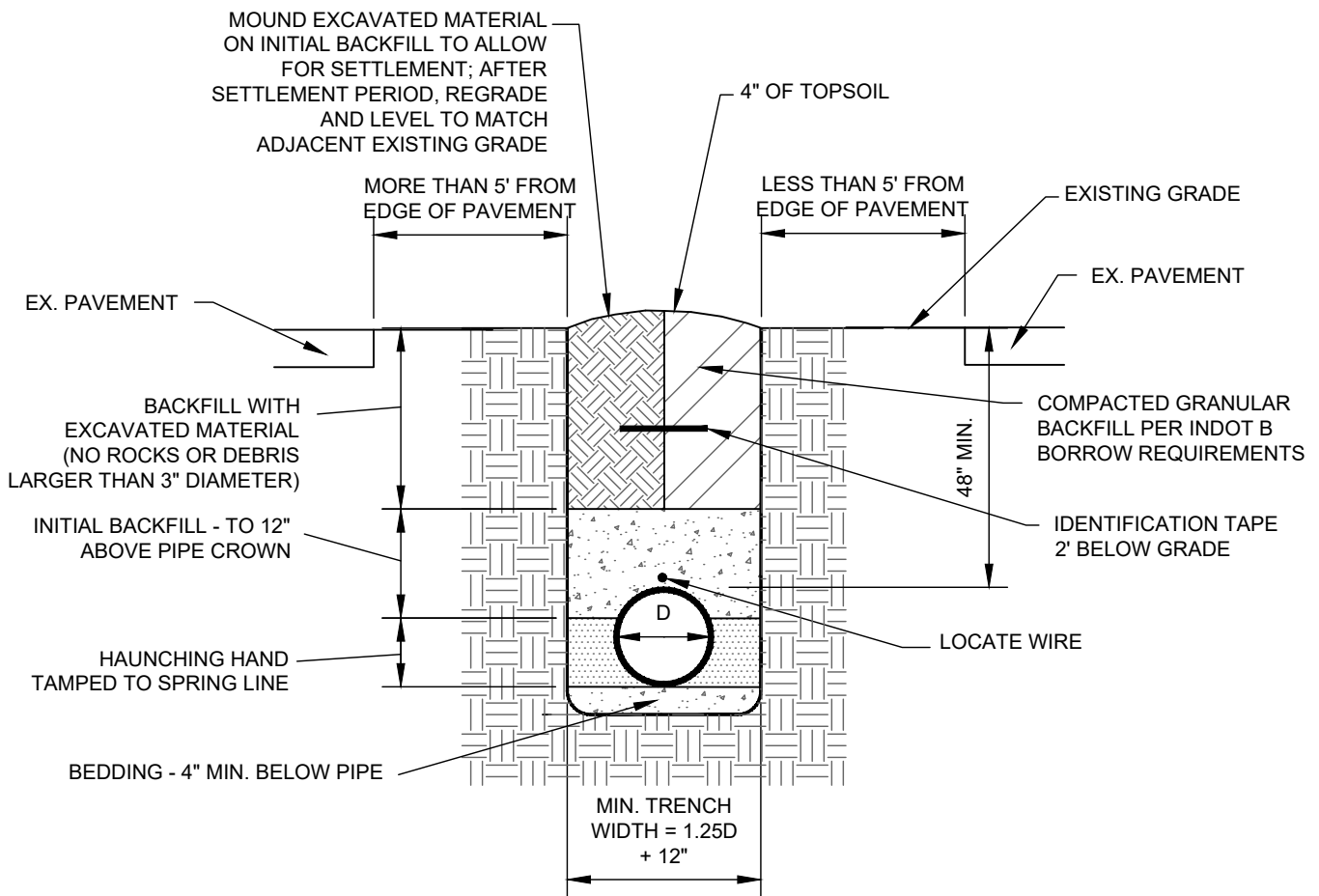
NOTES:

1. EXISTING PAVEMENT IS TO BE SAW CUT FOR A CLEAN BREAK.
2. TRENCH SPOIL IS TO BE REMOVED FROM THE WORK SITE.
3. NEW SURFACE TO BE SLOPED AT SAME RATE AS THE EXISTING SURFACE.
4. GRANULAR FILL SHALL BE PROVIDED WITHIN 5' OF PAVED SURFACE.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

**FORCEMAIN TYPICAL TRENCH FOR D.I. OR PVC
 C900 PIPE IN PAVED AREAS
 STANDARD DETAILS
 LIBERTY REGIONAL WASTE DISTRICT**

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	1

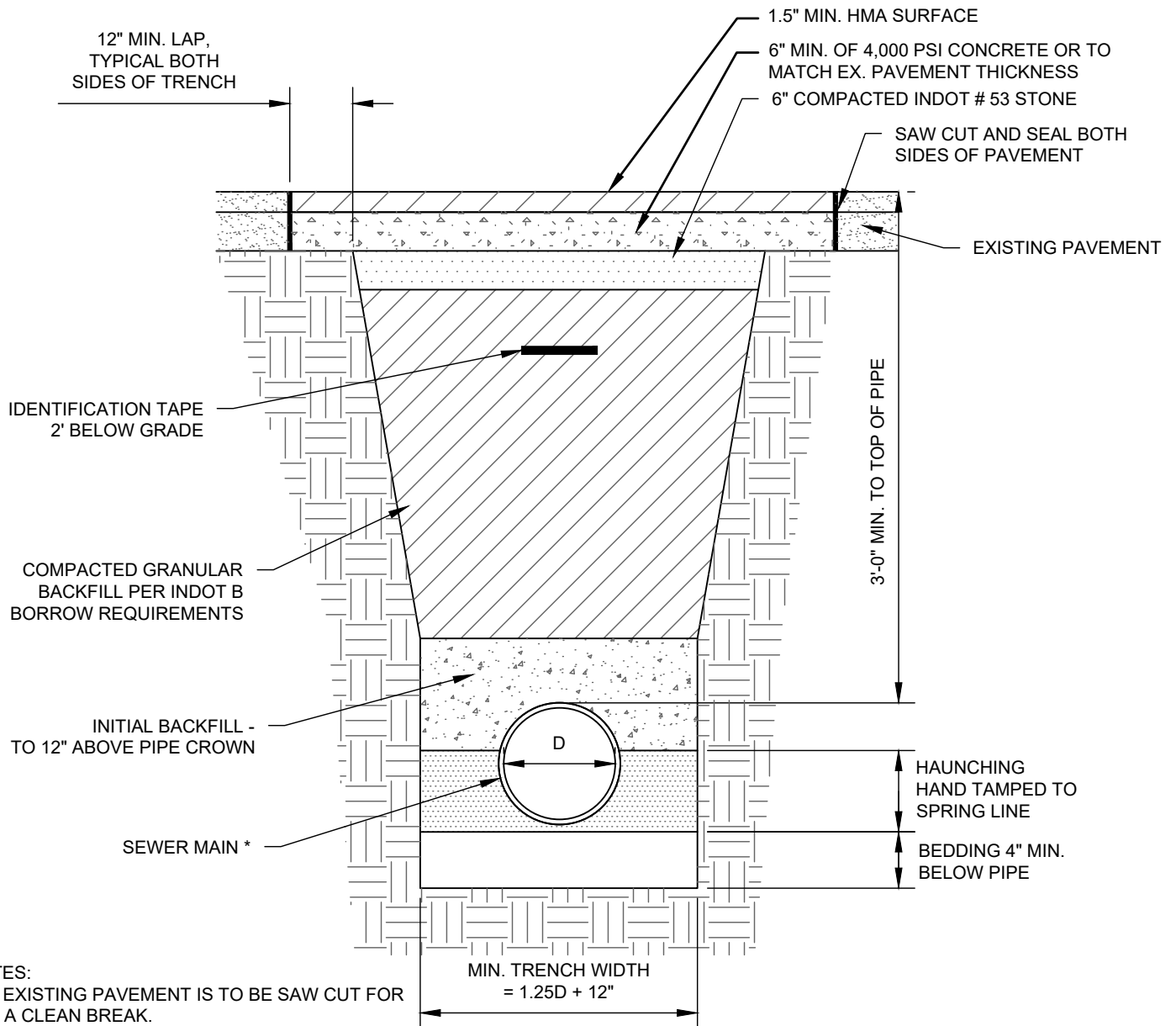


BEDDING, HAUNCHING AND INITIAL BACKFILL SHALL BE (INDOT #8 STONE OR CLASS II CLEAN SAND PER ASTM C12)

REVISIONS			
NO.	DESCRIPTION	DATE	BY

**FORCEMAIN TYPICAL TRENCH FOR D.I. OR PVC C900
 PIPE IN UNPAVED AREAS**
 STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	2



NOTES:

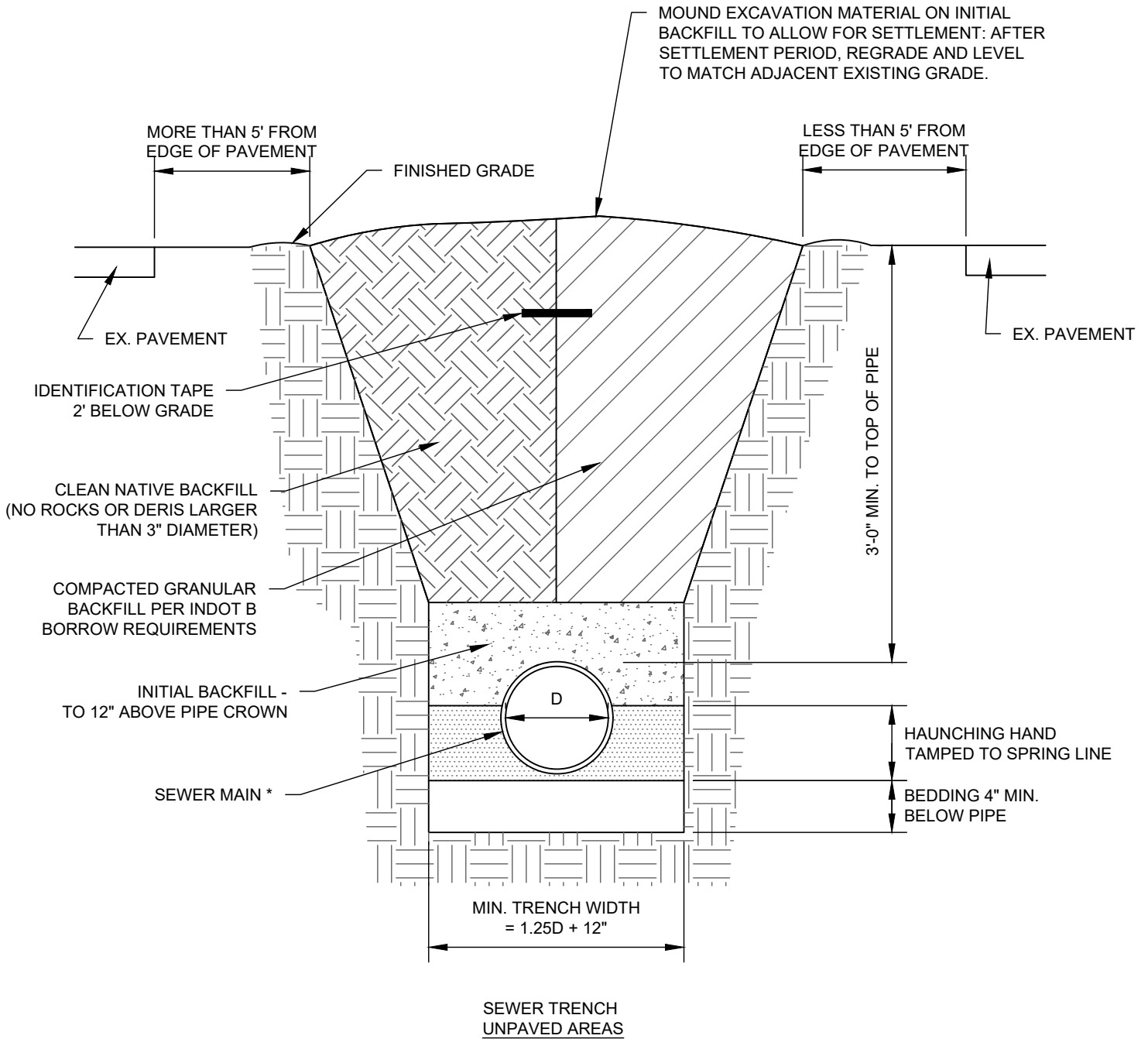
1. EXISTING PAVEMENT IS TO BE SAW CUT FOR A CLEAN BREAK.
2. TRENCH SPOIL IS TO BE REMOVED FROM THE WORK SITE
3. NEW SURFACE TO BE SLOPED AT SAME RATE AS THE EXISTING SURFACE.
4. GRANULAR FILL TO BE USED WITHIN 5' OF ALL PAVED AREAS.
5. EXISTING PAVEMENT SHALL BE BACKFILLED WITH FLOWABLE FILL.
6. OVER EXCAVATE FOR PIPE BELL.
7. FORCEMAIN TO BE INSTALLED PER THE TYPICAL TRENCH DETAILS FOR WATERMAINS

BEDDING, HAUNCHING AND INITIAL BACKFILL SHALL BE (INDOT #8 STONE OR CLASS II CLEAN SAND PER ASTM C12)

REVISIONS			
NO.	DESCRIPTION	DATE	BY

GRAVITY SANITARY SEWER TYPICAL TRENCH IN PAVED AREAS
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	3



NOTE:

1. FORCEMAINS ARE TO BE INSTALLED PER THE TYPICAL TRENCH DETAILS FOR WATER MAINS
2. OVER EXCAVATE FOR PIPE BELL

BEDDING, HAUNCHING AND INITIAL BACKFILL SHALL BE (INDOT #8 STONE OR CLASS II CLEAN SAND PER ASTM C12)

REVISIONS			
NO.	DESCRIPTION	DATE	BY

GRAVITY SANITARY TYPICAL SEWER TRENCH IN UNPAVED AREAS
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	4

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 4" DI PIPE W/ POLY WRAP							
TYPE OF BEND	4" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS	
HORIZ. BEND	53	18	8	4	2	53	
VERT. BEND				22 UPPER	11 UPPER		6 UPPER
				8 LOWER	4 LOWER		2 LOWER

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 12" DI PIPE W/ POLY WRAP										
TYPE OF BEND	4" TEE	6" TEE	8" TEE	10" TEE	12" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	53	74	97	117	139	46	19	10	5	139
VERT. BEND							58 UPPER	28 UPPER	14 UPPER	
							19 LOWER	10 LOWER	5 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 6" DI PIPE W/ POLY WRAP							
TYPE OF BEND	4" TEE	6" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	53	74	25	11	5	3	74
VERT. BEND				31 UPPER	15 UPPER	8 UPPER	
				11 LOWER	5 LOWER	3 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 16" DI PIPE W/ POLY WRAP											
TYPE OF BEND	4" TEE	6" TEE	8" TEE	10" TEE	12" TEE	16" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	53	74	97	117	139	179	59	25	12	6	179
VERT. BEND								75 UPPER	36 UPPER	18 UPPER	
								25 LOWER	12 LOWER	6 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 8" DI PIPE W/ POLY WRAP								
TYPE OF BEND	4" TEE	6" TEE	8" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	53	74	97	32	14	7	4	97
VERT. BEND					41 UPPER	20 UPPER	10 UPPER	
					14 LOWER	7 LOWER	4 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 20" DI PIPE W/ POLY WRAP											
TYPE OF BEND	6" TEE	8" TEE	10" TEE	12" TEE	16" TEE	20" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	74	97	117	139	179	218	72	30	15	8	218
VERT. BEND								91 UPPER	44 UPPER	22 UPPER	
								30 LOWER	15 LOWER	8 LOWER	

1. CONTRACTOR SHALL INSTALL RJDI FITTINGS FOR ALL VERTICAL AND HORIZONTAL BENDS.
2. RESTRAINED LENGTHS WERE CALCULATED USING EBAA IRON'S RESTRAINT LENGTH CALCULATOR (V7.1.3), ASSUMING 60" DEPTH OF BURY, A 2.0 FACTOR OF SAFETY, TYPE 3 TRENCH CONDITIONS, "CL" SOIL CLASSIFICATION, POLYWRAPPED, AND 150 PSI HYDROSTATIC TEST PRESSURES. DESIGNER AND CONTRACTOR SHALL VERIFY INSTALLATION CONDITIONS AND MODIFY RESTRAINT LENGTHS AS REQUIRED TO MEET ACTUAL CONDITIONS SUBJECT TO REVIEW BY LIBERTY REGIONAL WASTE DISTRICT.
3. ALL WATER MAIN APPURTENANCES AND JOINTS WITHIN RJDI LIMITS MUST BE RESTRAINED AT EACH JOINT.
4. AT A MINIMUM, THE NEXT JOINT EITHER WAY FROM A FITTING SHALL BE RESTRAINED.
5. ALL VALVES SHALL BE CONSIDERED DEAD-ENDS

REVISIONS			
NO.	DESCRIPTION	DATE	BY

DUCTILE IRON PIPE RESTRAINED JOINT TABLES
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	5

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 4" PVC						
TYPE OF BEND	4" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	33	17	7	4	2	33
VERT. BEND			19 UPPER	10 UPPER	5 UPPER	
			7 LOWER	4 LOWER	2 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 12" PVC										
TYPE OF BEND	4" TEE	6" TEE	8" TEE	10" TEE	12" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	33	47	62	75	89	44	19	9	5	89
VERT. BEND							51 UPPER	25 UPPER	13 UPPER	
							19 LOWER	9 LOWER	5 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 6" PVC							
TYPE OF BEND	4" TEE	6" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	33	47	24	10	5	3	47
VERT. BEND				27 UPPER	13 UPPER	7 UPPER	
				10 LOWER	5 LOWER	3 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 16" PVC											
TYPE OF BEND	4" TEE	6" TEE	8" TEE	10" TEE	12" TEE	16" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	33	47	62	75	89	116	57	24	12	6	116
VERT. BEND								67 UPPER	32 UPPER	16 UPPER	
								24 LOWER	12 LOWER	6 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 8" PVC								
TYPE OF BEND	4" TEE	6" TEE	8" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	33	47	62	31	13	7	4	62
VERT. BEND					36 UPPER	18 UPPER	9 UPPER	
					13 LOWER	7 LOWER	4 LOWER	

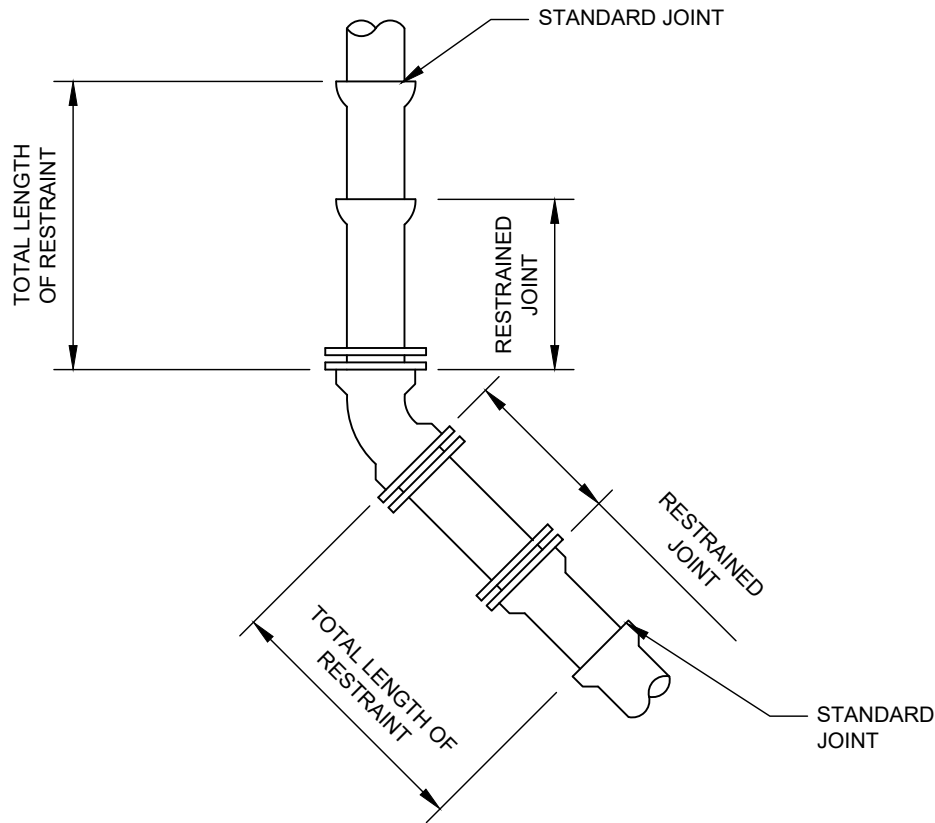
LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 20" PVC											
TYPE OF BEND	6" TEE	8" TEE	10" TEE	12" TEE	16" TEE	20" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	47	62	75	89	116	143	69	29	14	7	143
VERT. BEND								82 UPPER	40 UPPER	20 UPPER	
								29 LOWER	14 LOWER	7 LOWER	

1. CONTRACTOR SHALL INSTALL RJDI FITTINGS FOR ALL VERTICAL AND HORIZONTAL BENDS.
2. RESTRAINED LENGTHS WERE CALCULATED USING EBAA IRON'S RESTRAINT LENGTH CALCULATOR (V7.1.3), ASSUMING 60" DEPTH OF BURY, A 2.0 FACTOR OF SAFETY, TYPE 3 TRENCH CONDITIONS, "CL" SOIL CLASSIFICATION, AND 150 PSI HYDROSTATIC TEST PRESSURES. DESIGNER AND CONTRACTOR SHALL VERIFY INSTALLATION CONDITIONS AND MODIFY RESTRAINT LENGTHS AS REQUIRED TO MEET ACTUAL CONDITIONS SUBJECT TO REVIEW BY LIBERTY REGIONAL WASTE DISTRICT.
3. ALL WATER MAIN APPURTENANCES AND JOINTS WITHIN RJDI LIMITS MUST BE RESTRAINED AT EACH JOINT.
4. AT A MINIMUM, THE NEXT JOINT EITHER WAY FROM A FITTING SHALL BE RESTRAINED.
5. ALL VALVES SHALL BE CONSIDERED AS DEAD-ENDS

REVISIONS			
NO.	DESCRIPTION	DATE	BY

PVC PIPE RESTRAINED JOINT TABLES
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	6

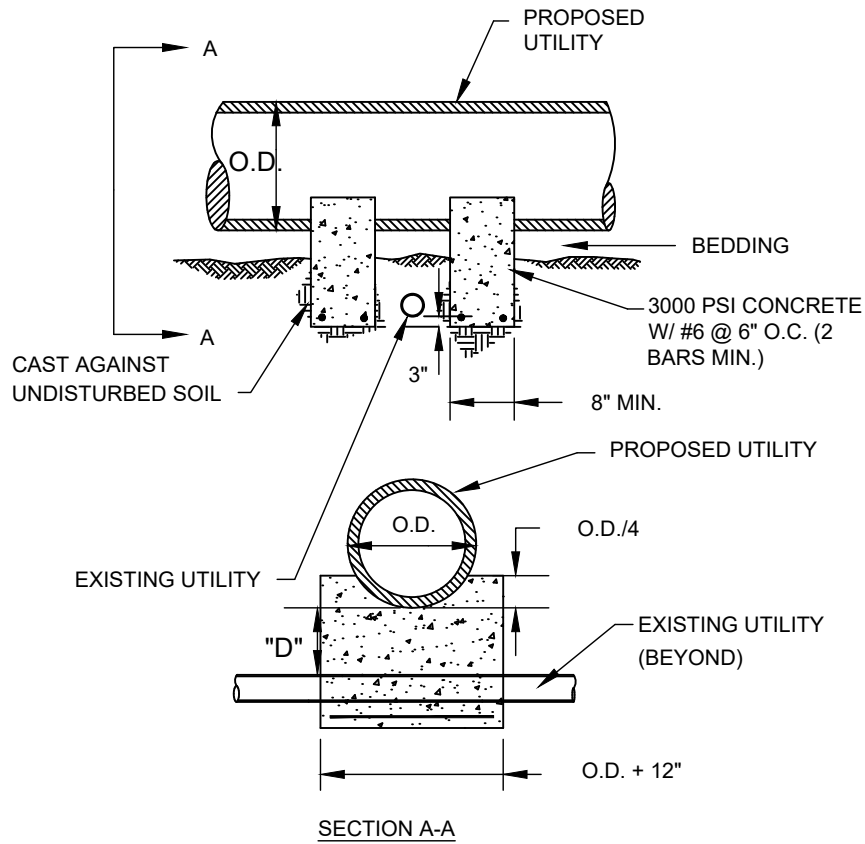


NOTE:
SEE CONSTRUCTION STD. FOR "LENGTH AND METHOD OF RESTRAINT"

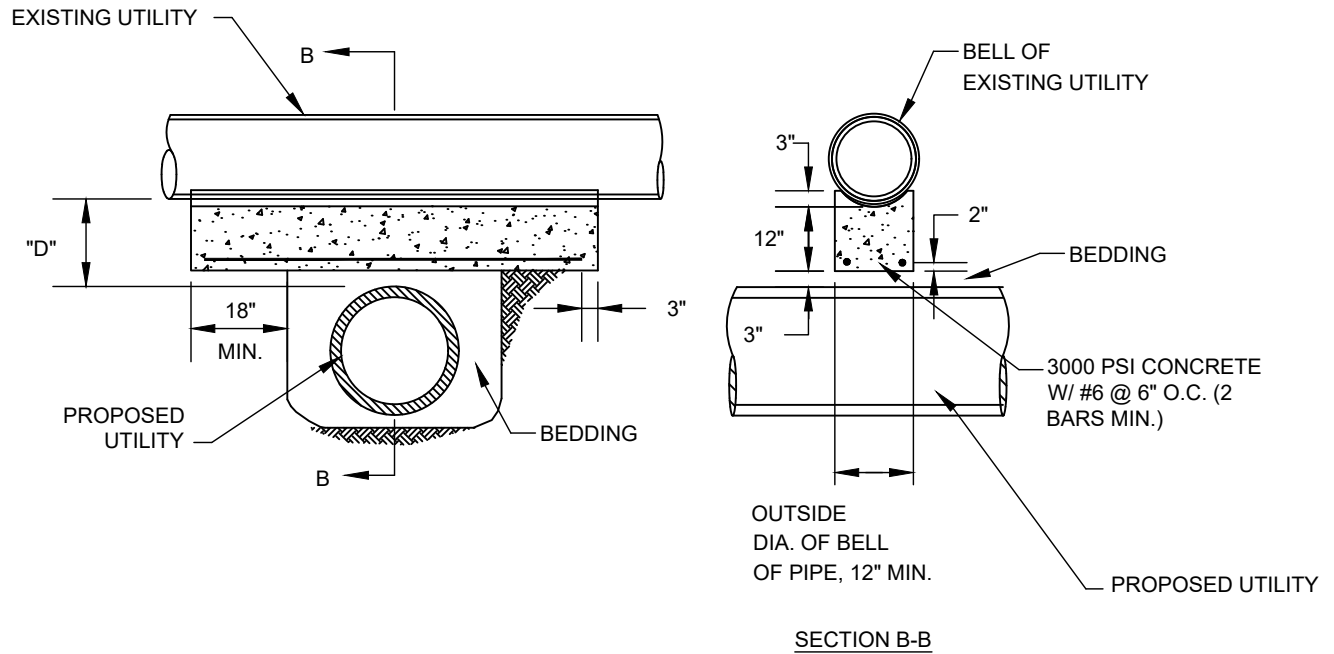
REVISIONS			
NO.	DESCRIPTION	DATE	BY

RESTRAINT OF BENDS
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	7



PROPOSED UTILITY CROSSING ABOVE EXISTING UTILITY



PROPOSED UTILITY CROSSING BELOW EXISTING UTILITY

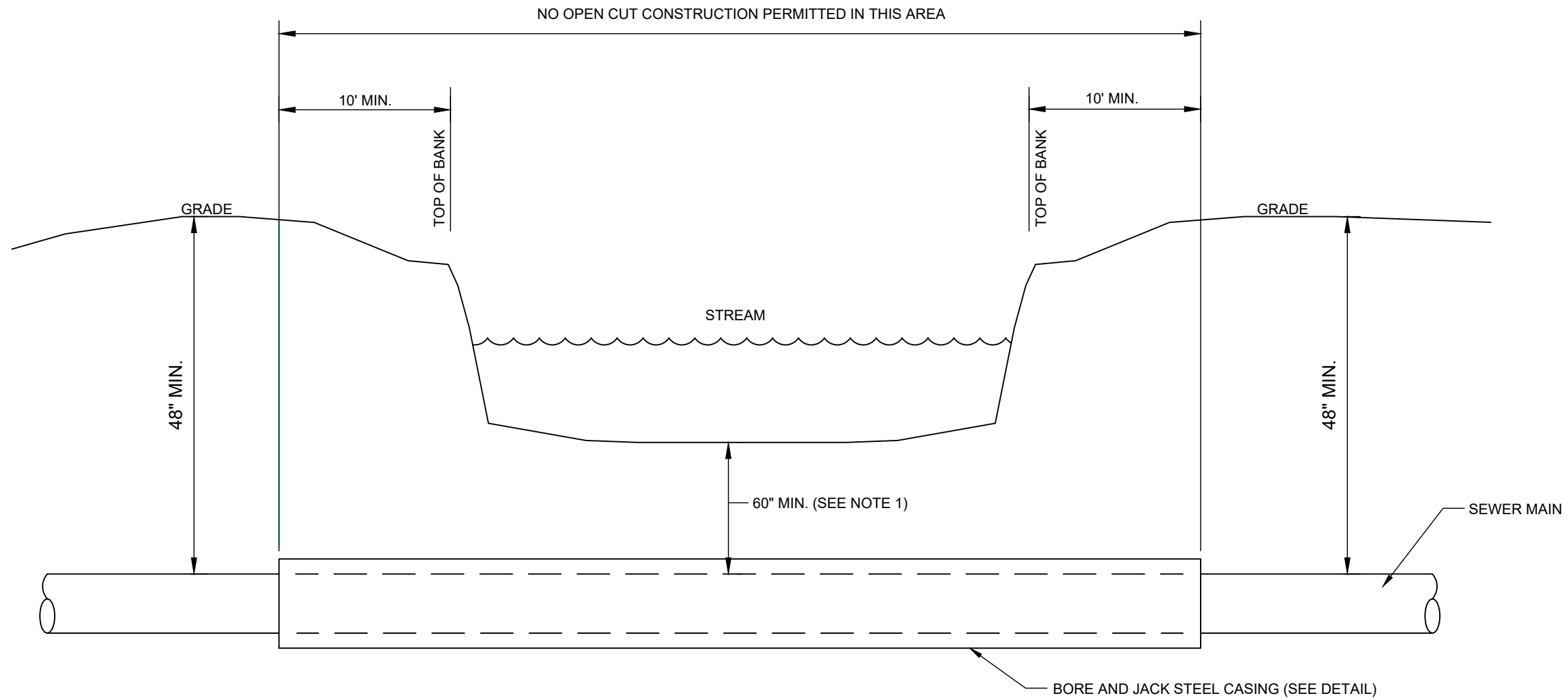
NOTES:

1. PROVIDE UTILITY SUPPORT WHEN "D" IS LESS THAN 18 INCHES.
2. EXISTING UTILITIES SHALL MEAN: STEEL GAS MAINS, ELECTRIC/TELEPHONE CONDUITS, FIBER OPTIC BANKS, SANITARY SEWER PIPING, STORM SEWER PIPING, WATER MAIN PIPING, ETC.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

UTILITY CROSSING SUPPORT DETAIL
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	8



NOTE:
 1: DEPTH MAY EXCEED 60"; COORDINATE W/ LRWD.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

GRAVITY SEWER TYPICAL STREAM CROSSING
 STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

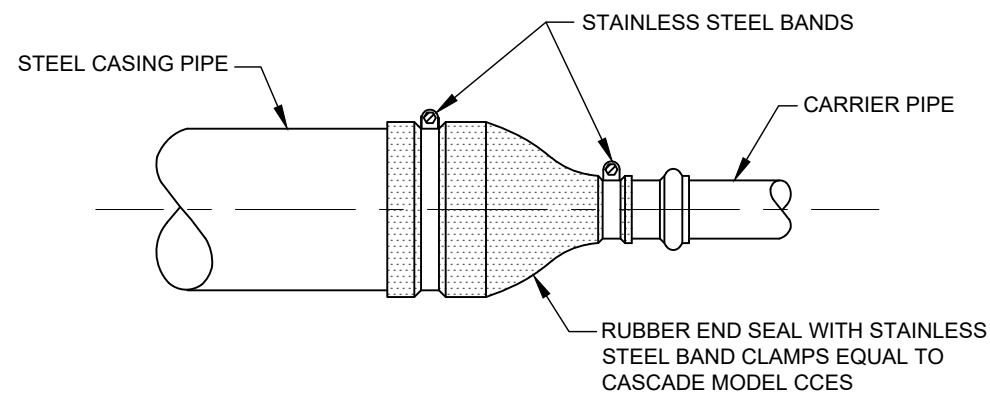
DATE: 03/12/24
 SCALE: NTS
 SHEET NO. **9**

NOTES

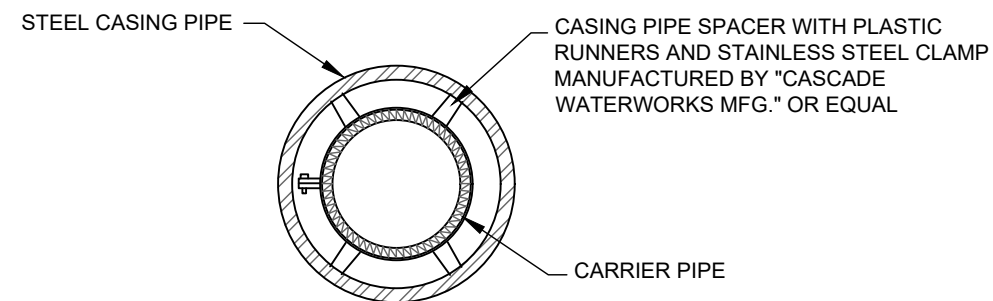
1. CASING SHALL BE WELDED STEEL PIPE; MATERIAL IN ACCORDANCE WITH ASTM A-139; MINIMUM YIELD STRENGTH = 35,000 PSI.
2. CASING SPACERS REQUIRED. MAXIMUM 10'-0" SPACING FOR DUCTILE IRON CARRIER PIPES. MAXIMUM SPACING FOR PVC CARRIES PIPES SHALL BE 6'-0". FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR PLACEMENT AND SPACING.
3. THE INSIDE DIAMETER OF THE CASING SHALL BE A MINIMUM OF SIX (6) INCHES LARGER THAN THE LARGEST DIAMETER OF THE CARRIER PIPE JOINT.

TABLE OF STEEL CASING SIZES

CASING DIAMETER IN INCHES	WALL THICKNESS (WITH PROTECTIVE COATING) IN INCHES - ROADWAYS	WALL THICKNESS (WITHOUT PROTECTIVE COATING) IN INCHES - ROADWAYS	WALL THICKNESS (WITH PROTECTIVE COATING) IN INCHES - RAILWAYS	WALL THICKNESS (WITHOUT PROTECTIVE COATING) IN INCHES - RAILWAYS
12"	0.188"	0.250"	0.188"	0.250"
16"	0.219"	0.281"	0.219"	0.281"
18"	0.250"	0.312"	0.250"	0.312"
20"	0.281"	0.344"	0.281"	0.344"
24"	0.312"	0.375"	0.312"	0.375"
30"	0.406"	0.469"	0.406"	0.469"
36"	0.469"	0.532"	0.469"	0.532"



CASING END SEAL DETAIL



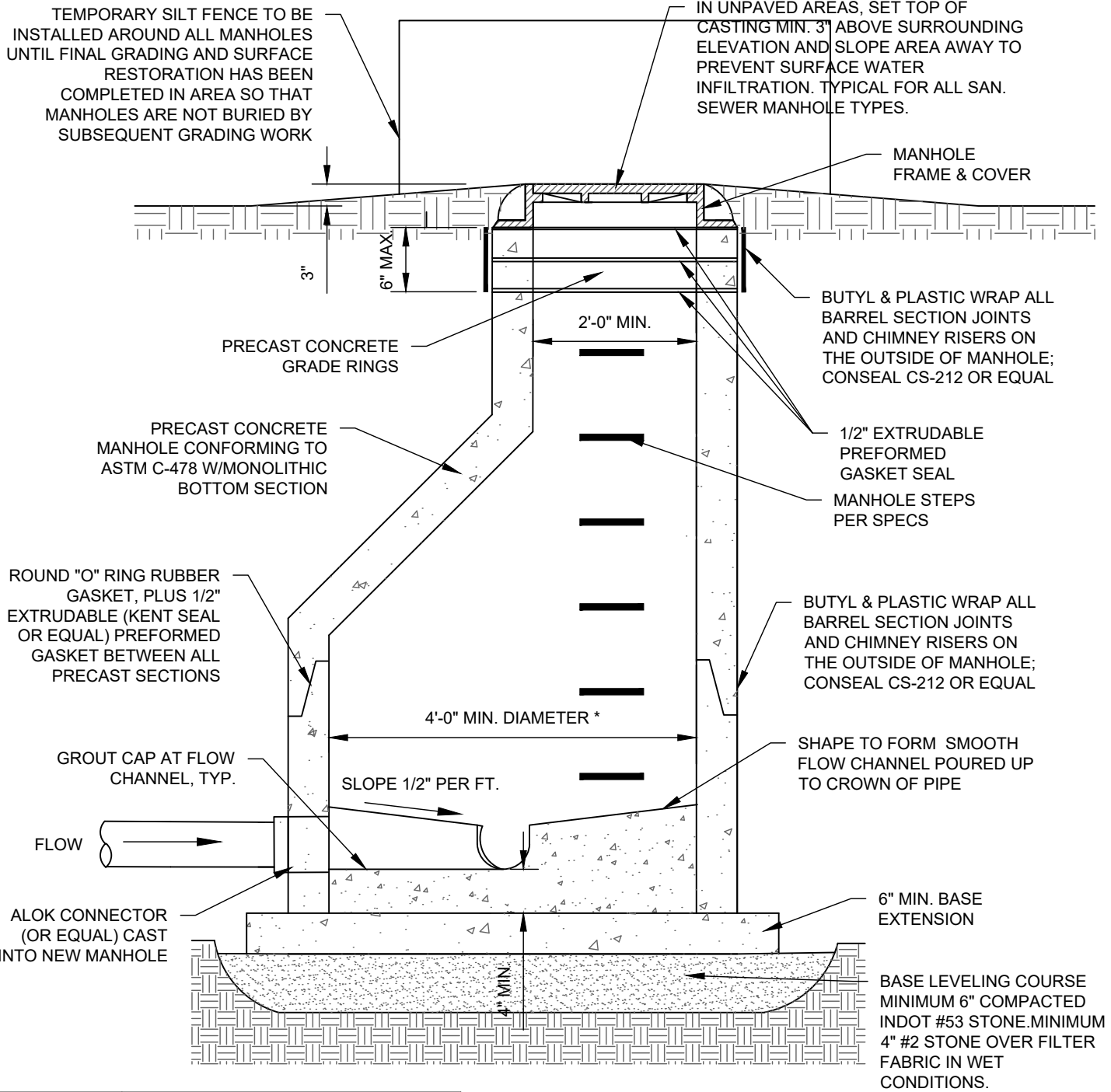
NOTE: CONFIGURE CASING SPACERS PER MFGR. RECOMMENDATIONS FOR GRAVITY CARRIER PIPES TO CORRECT FOR GRADE.

CENTERING CARRIER PIPE WITH CASING SPACER (PRESSURE PIPES)

REVISIONS			
NO.	DESCRIPTION	DATE	BY

STEEL CASING
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	10



PIPE SIZE (INCHES)	MINIMUM MANHOLE DIAMETER (INCHES)	
	PIPES ENTERING OR LEAVING AT UP TO 45° ANGLE	PIPES ENTERING OR LEAVING AT 46°-90° ANGLE
18 OR LESS	48	48
LARGER THAN 18"	TO BE REVIEWED BY LRWD	TO BE REVIEWED BY LRWD

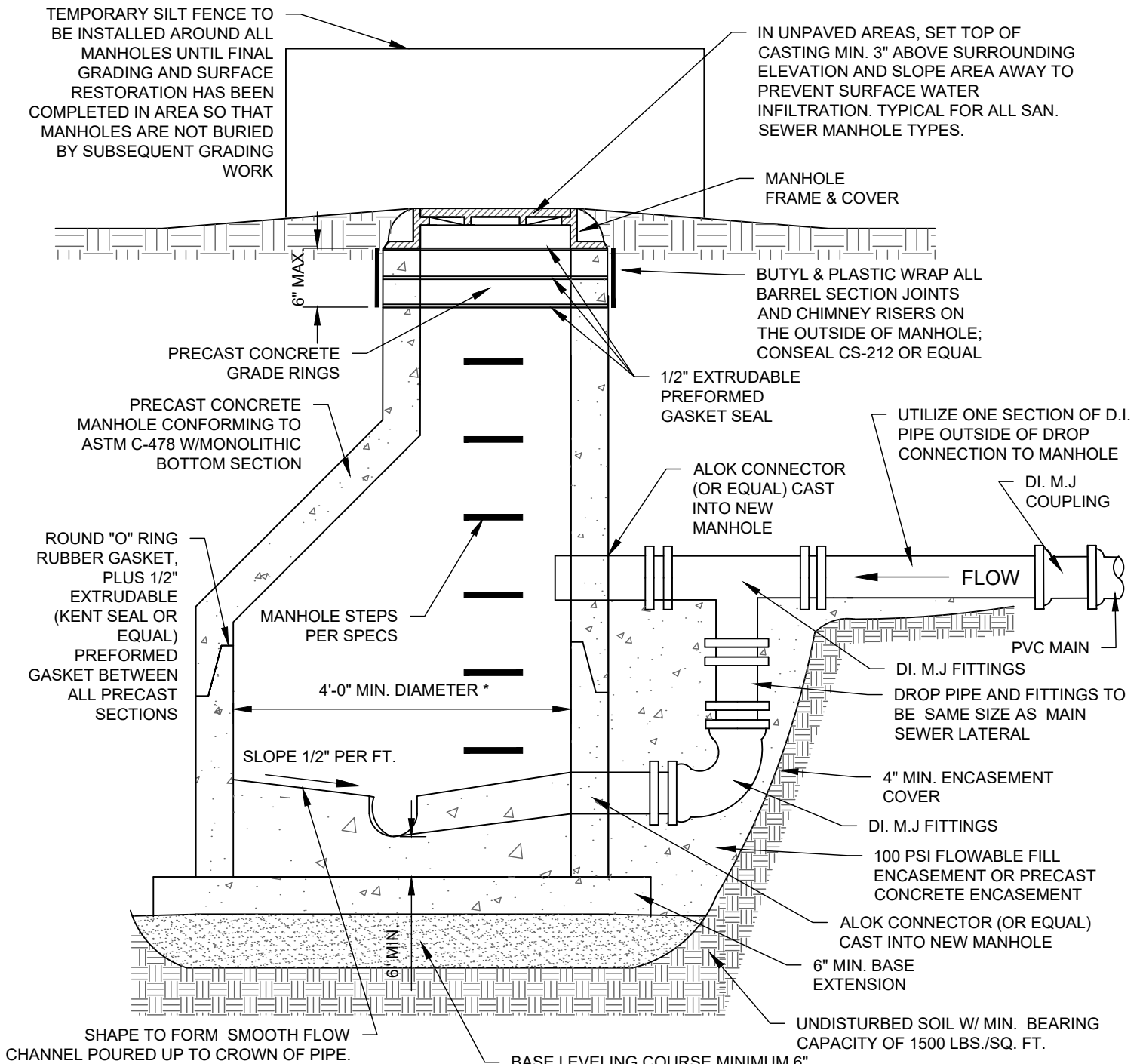
- NOTES:
- LIFT HOLES SHALL BE PLUGGED AFTER SETTING MANHOLE.
 - THE INSIDE WALL DISTANCE BETWEEN OPENINGS SHALL BE A MIN. OF 6".
 - MANHOLES SHALL BE VACUUM TESTED IN ACCORDANCE WITH ASTM C1244.

MIN. PIPE INVERT DROP THROUGH MANHOLE	
THROUGH DEFLECTION	MIN. DROP (FT.)
0-45	0.10
45-90	0.20

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "A" STANDARD PRECAST MANHOLE
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	11



SHAPE TO FORM SMOOTH FLOW CHANNEL Poured up to crown of pipe.

BASE LEVELING COURSE MINIMUM 6" COMPACTED INDOT #53 STONE. MINIMUM 4" #2 STONE OVER FILTER FABRIC IN WET CONDITIONS.

PIPE SIZE (INCHES)	MINIMUM MANHOLE DIAMETER (INCHES)	
	PIPES ENTERING OR LEAVING AT UP TO 45° ANGLE	PIPES ENTERING OR LEAVING AT 46°-90° ANGLE
18 OR LESS	48	48
LARGER THAN 18"	TO BE REVIEWED BY LRWD	TO BE REVIEWED BY LRWD

NOTES:

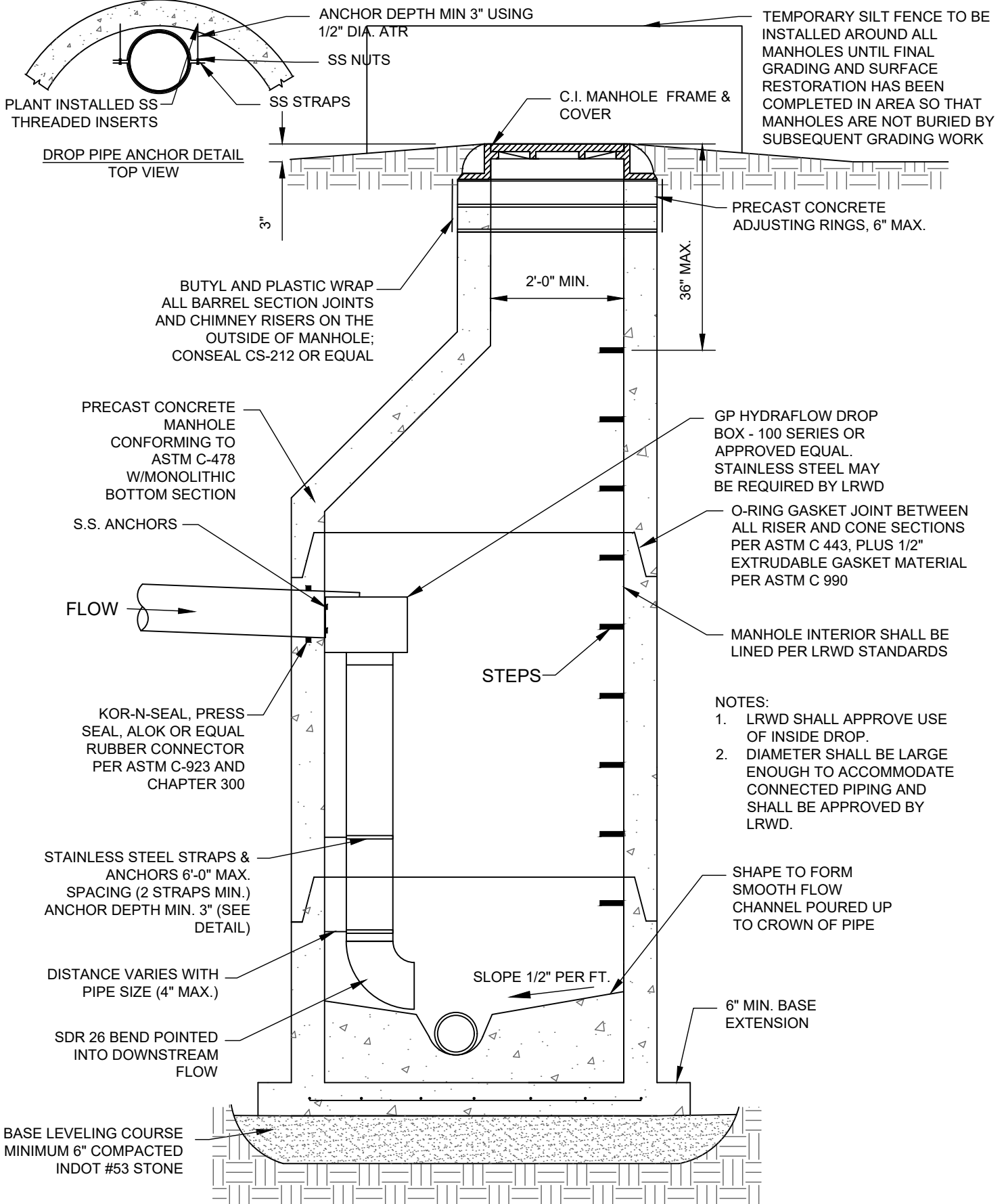
1. LIFT HOLES SHALL BE PLUGGED AFTER SETTING MANHOLE.
2. THE INSIDE WALL DISTANCE BETWEEN OPENINGS SHALL BE A MIN. OF 6".
3. MANHOLES SHALL BE VACUUM TESTED IN ACCORDANCE WITH ASTM C1244.

MIN. PIPE INVERT DROP THROUGH MANHOLE	
THROUGH DEFLECTION	MIN. DROP (FT.)
0-45	0.10
45-90	0.20

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "B" OUTSIDE DROP MANHOLE CONNECTION
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24
SCALE: NTS
SHEET NO.



REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "B" INSIDE DROP MANHOLE CONNECTION

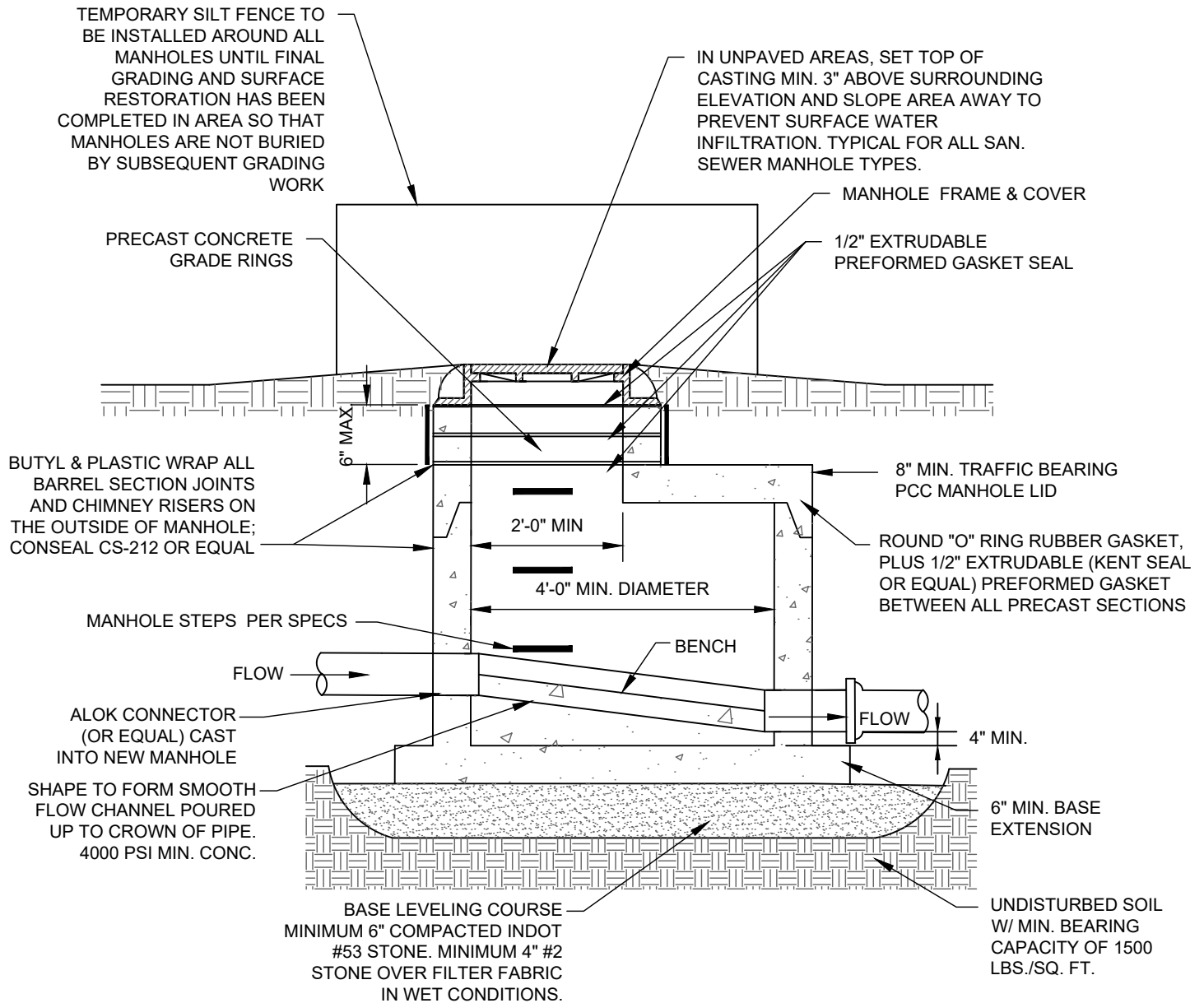
STANDARD DETAILS

LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24

SCALE: NTS

SHEET NO.



PIPE SIZE (INCHES)	MINIMUM MANHOLE DIAMETER (INCHES)	
	PIPES ENTERING OR LEAVING AT UP TO 45° ANGLE	PIPES ENTERING OR LEAVING AT 46°-90° ANGLE
18 OR LESS	48	48
LARGER THAN 18"	TO BE REVIEWED BY LRWD	TO BE REVIEWED BY LRWD

NOTES:

- LIFT HOLES SHALL BE PLUGGED AFTER SETTING MANHOLE.
- THE INSIDE WALL DISTANCE BETWEEN OPENINGS SHALL BE A MIN. OF 6".
- MANHOLES SHALL BE VACUUM TESTED IN ACCORDANCE WITH ASTM C1244.

MIN. PIPE INVERT DROP THROUGH MANHOLE	
THROUGH DEFLECTION	MIN. DROP (FT.)
0-45	0.10
45-90	0.20

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "C" SHALLOW MANHOLE - 5' OR LESS

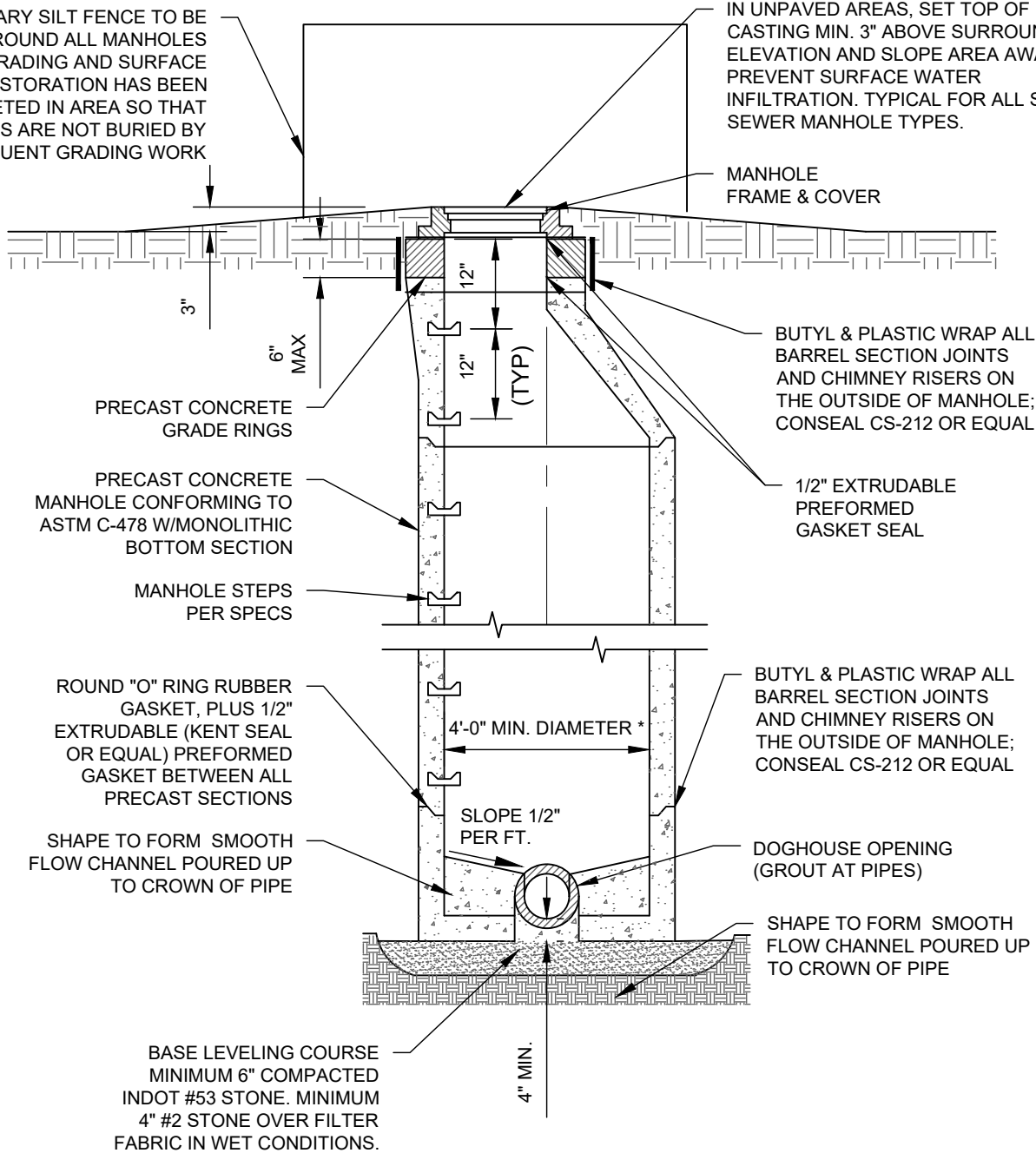
STANDARD DETAILS

LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	14

TEMPORARY SILT FENCE TO BE INSTALLED AROUND ALL MANHOLES UNTIL FINAL GRADING AND SURFACE RESTORATION HAS BEEN COMPLETED IN AREA SO THAT MANHOLES ARE NOT BURIED BY SUBSEQUENT GRADING WORK

IN UNPAVED AREAS, SET TOP OF CASTING MIN. 3" ABOVE SURROUNDING ELEVATION AND SLOPE AREA AWAY TO PREVENT SURFACE WATER INFILTRATION. TYPICAL FOR ALL SAN. SEWER MANHOLE TYPES.



BASE LEVELING COURSE MINIMUM 6" COMPACTED INDOT #53 STONE. MINIMUM 4" #2 STONE OVER FILTER FABRIC IN WET CONDITIONS.

PIPE SIZE (INCHES)	MINIMUM MANHOLE DIAMETER (INCHES)	
	PIPES ENTERING OR LEAVING AT UP TO 45° ANGLE	PIPES ENTERING OR LEAVING AT 46°-90° ANGLE
18 OR LESS	48	48
LARGER THAN 18"	TO BE REVIEWED BY LRWD	TO BE REVIEWED BY LRWD

NOTES:

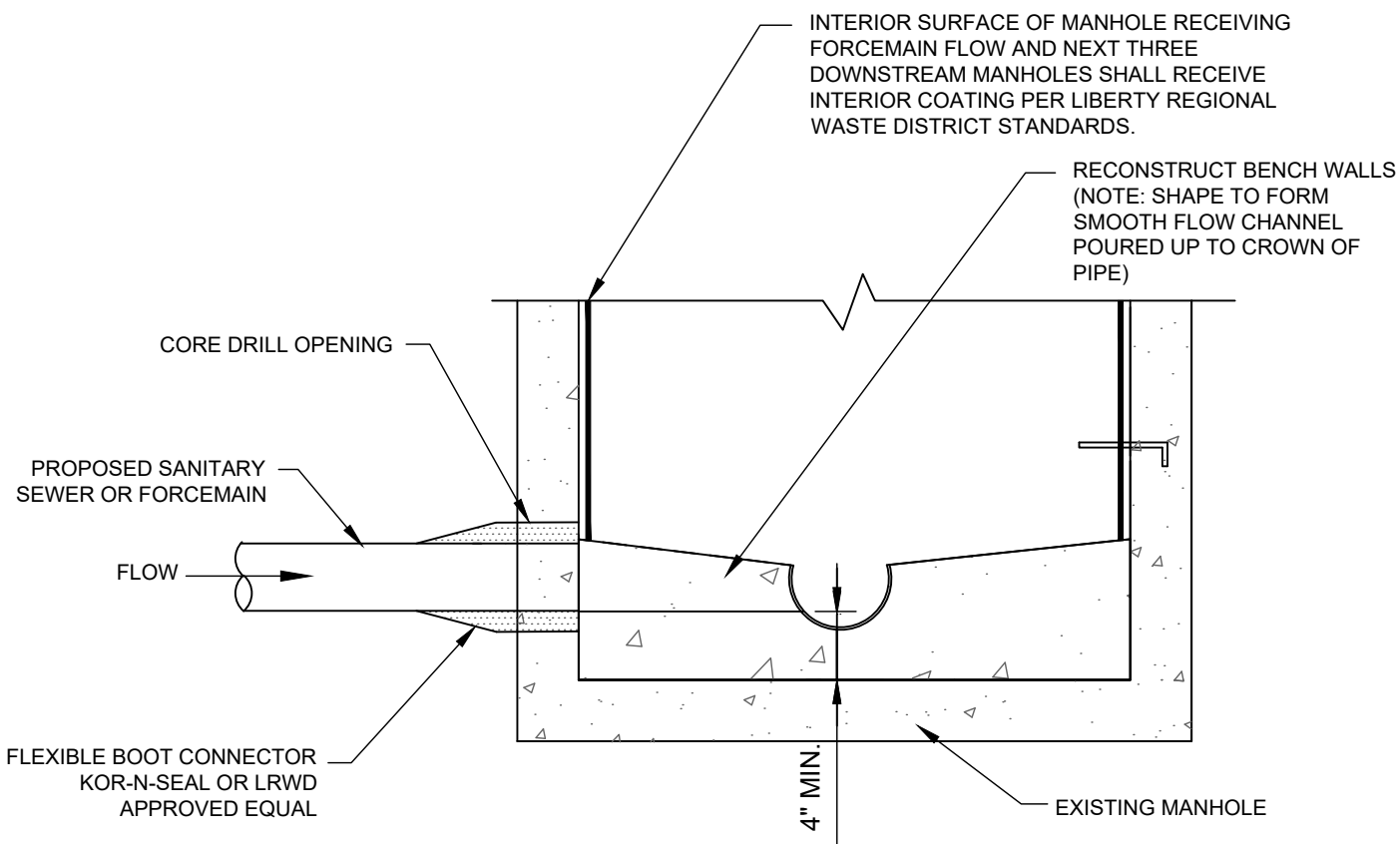
- LIFT HOLES SHALL BE PLUGGED AFTER SETTING MANHOLE.
- THE INSIDE WALL DISTANCE BETWEEN OPENINGS SHALL BE A MIN. OF 6".
- MANHOLES SHALL BE VACUUM TESTED IN ACCORDANCE WITH ASTM C1244.

MIN. PIPE INVERT DROP THROUGH MANHOLE	
THROUGH DEFLECTION	MIN. DROP (FT.)
0-45	0.10
45-90	0.20

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "D" STANDARD PRECAST DOGHOUSE MANHOLE
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	15

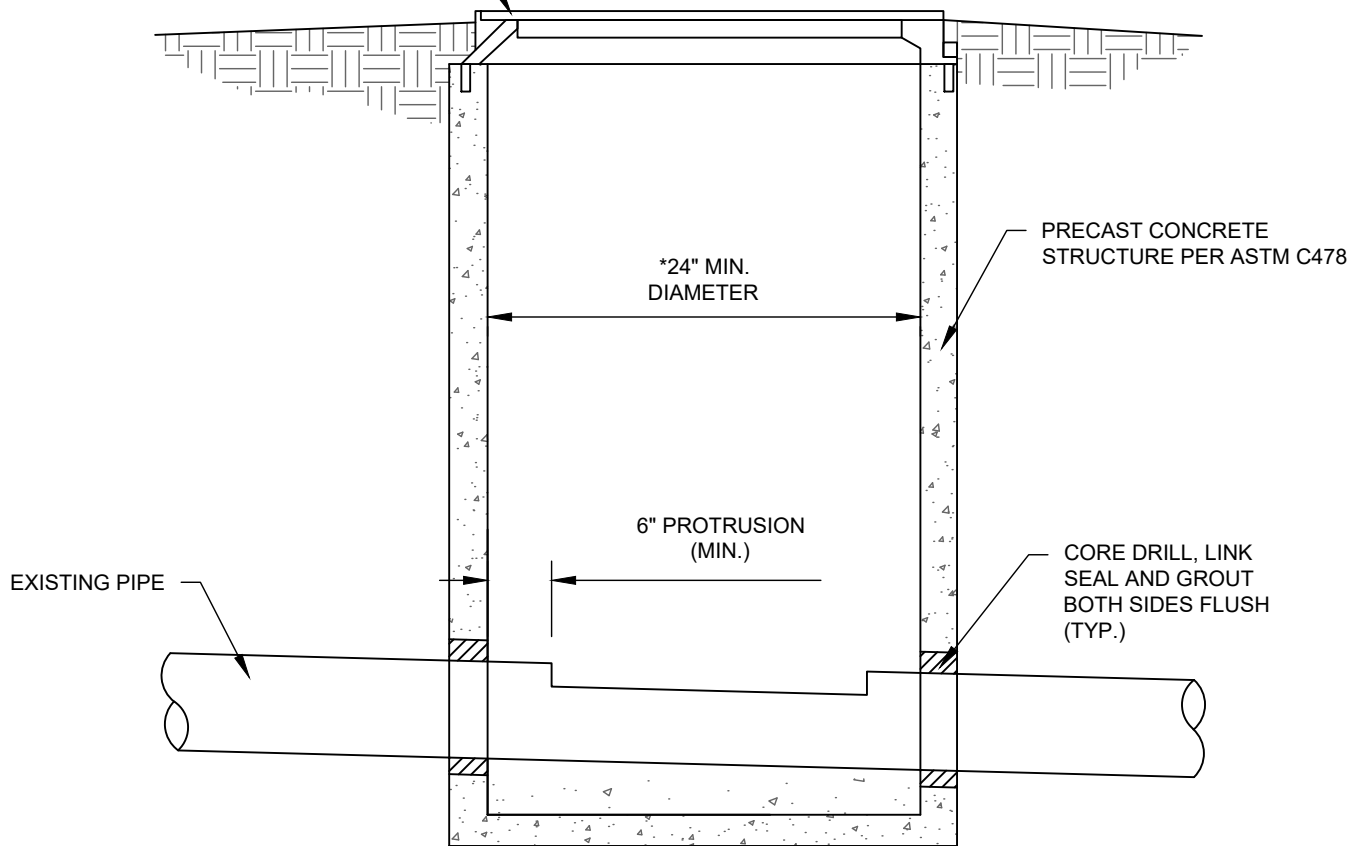


REVISIONS			
NO.	DESCRIPTION	DATE	BY

EXISTING MANHOLE CONNECTION
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

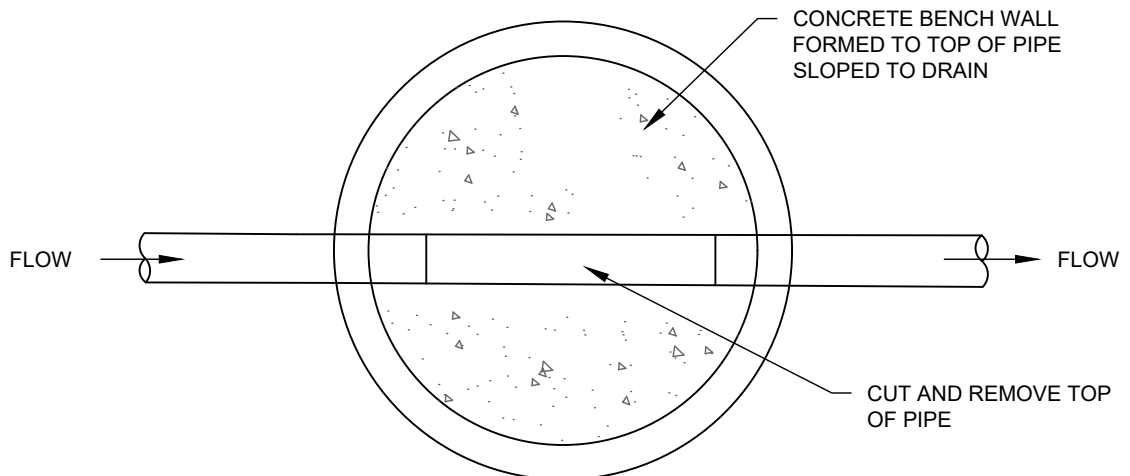
DATE:	03/12/24
SCALE:	NTS
SHEET NO.	16

STANDARD MANHOLE CASTING
 SET RIM 3" ABOVE GRADE AND
 SLOPE SURROUNDING AREA
 TO DRAIN AWAY FROM CASTING
 IN UNPAVED AREAS. SET FLUSH TO
 PAVEMENT IN PAVED AREAS.



***NOTES:**

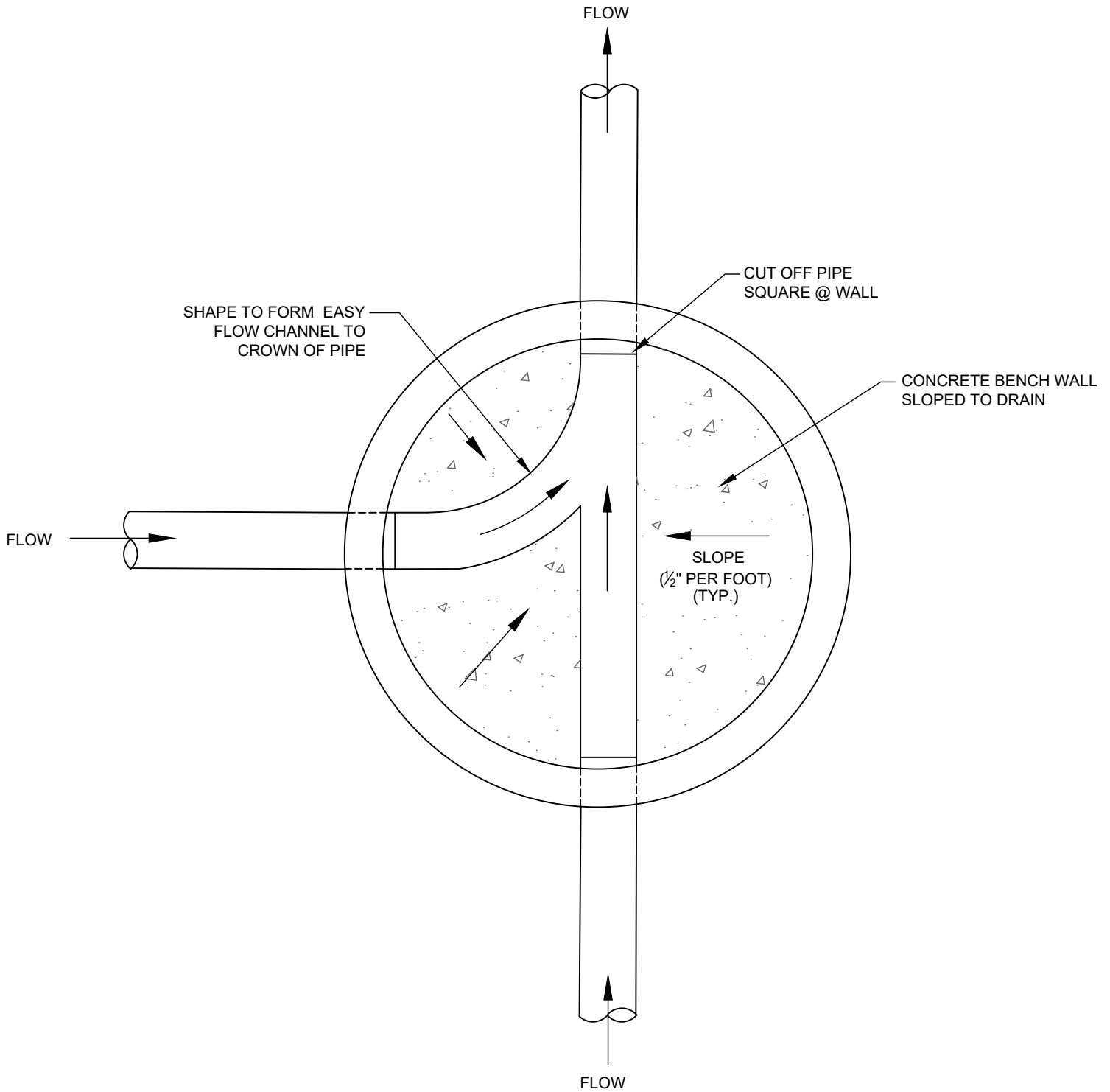
1. WHERE DEPTH OF STRUCTURES EXCEEDS 4'-0", A 4FT. DIAMETER MANHOLE SHALL BE PROVIDED, THE PIPING CONFIGURATION SHALL BE THE SAME. MANHOLE STEPS SHALL BE INCLUDED.
2. SAMPLE MANHOLE STRUCTURES ARE PROPERTY OF THE OWNER AND WILL NOT BE MAINTAINED BY LRWD.
3. SAMPLE MANHOLE SHALL BE VAC TESTED PER LRWD STANDARDS.



REVISIONS			
NO.	DESCRIPTION	DATE	BY

SAMPLE STATION DOGHOUSE MANHOLE
 STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	17

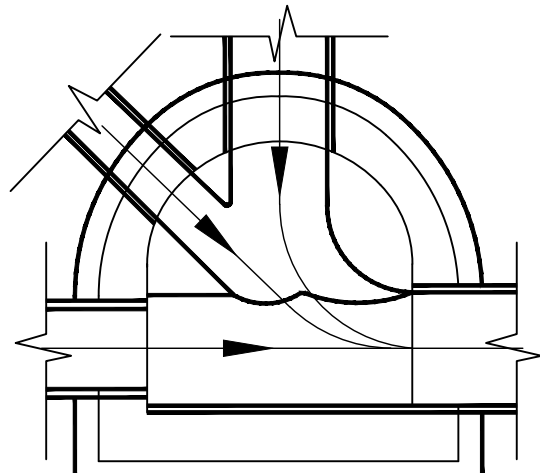
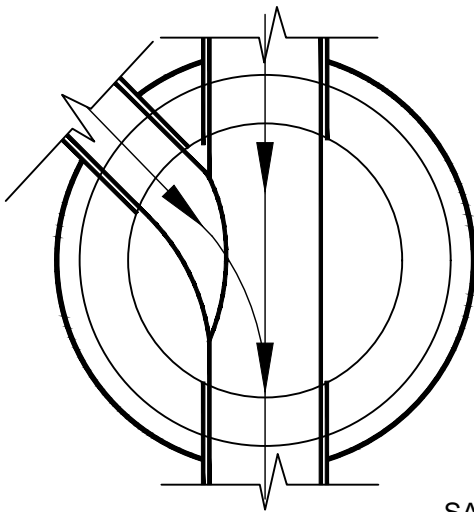
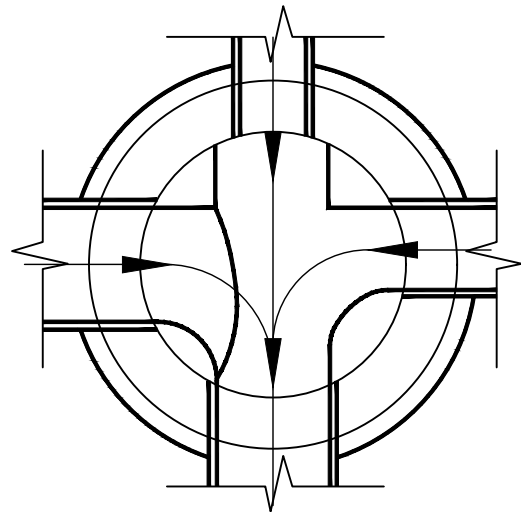
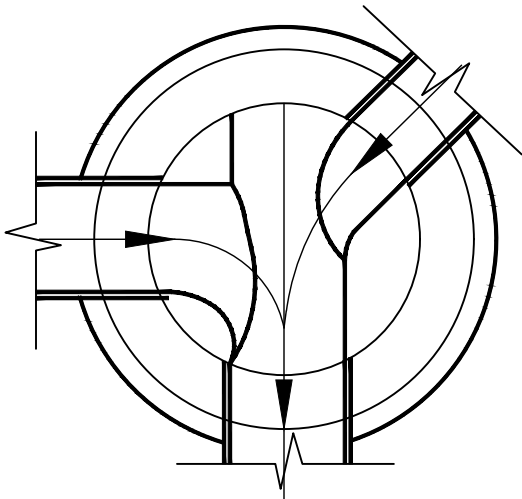
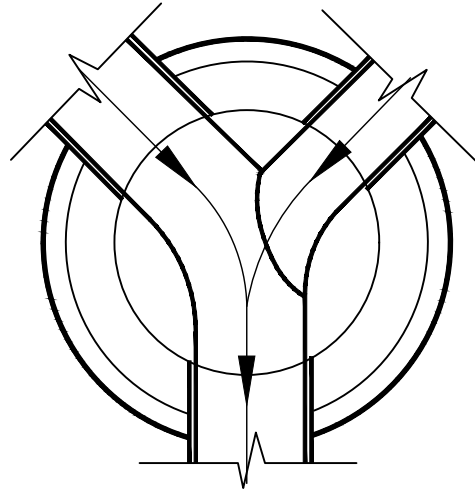
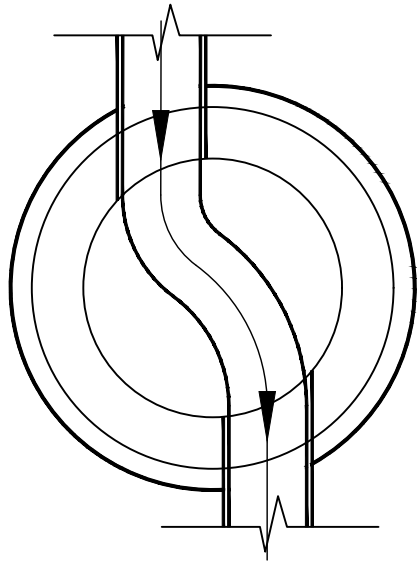


NOTE:
 INSIDE OF ALL SAN. MANHOLE TYPES SHALL BE FREE OF EXCESS MORTAR, MASTIC
 AND OTHER LIKE MATERIAL

REVISIONS			
NO.	DESCRIPTION	DATE	BY

STANDARD MANHOLE BENCH WALL
 STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	18

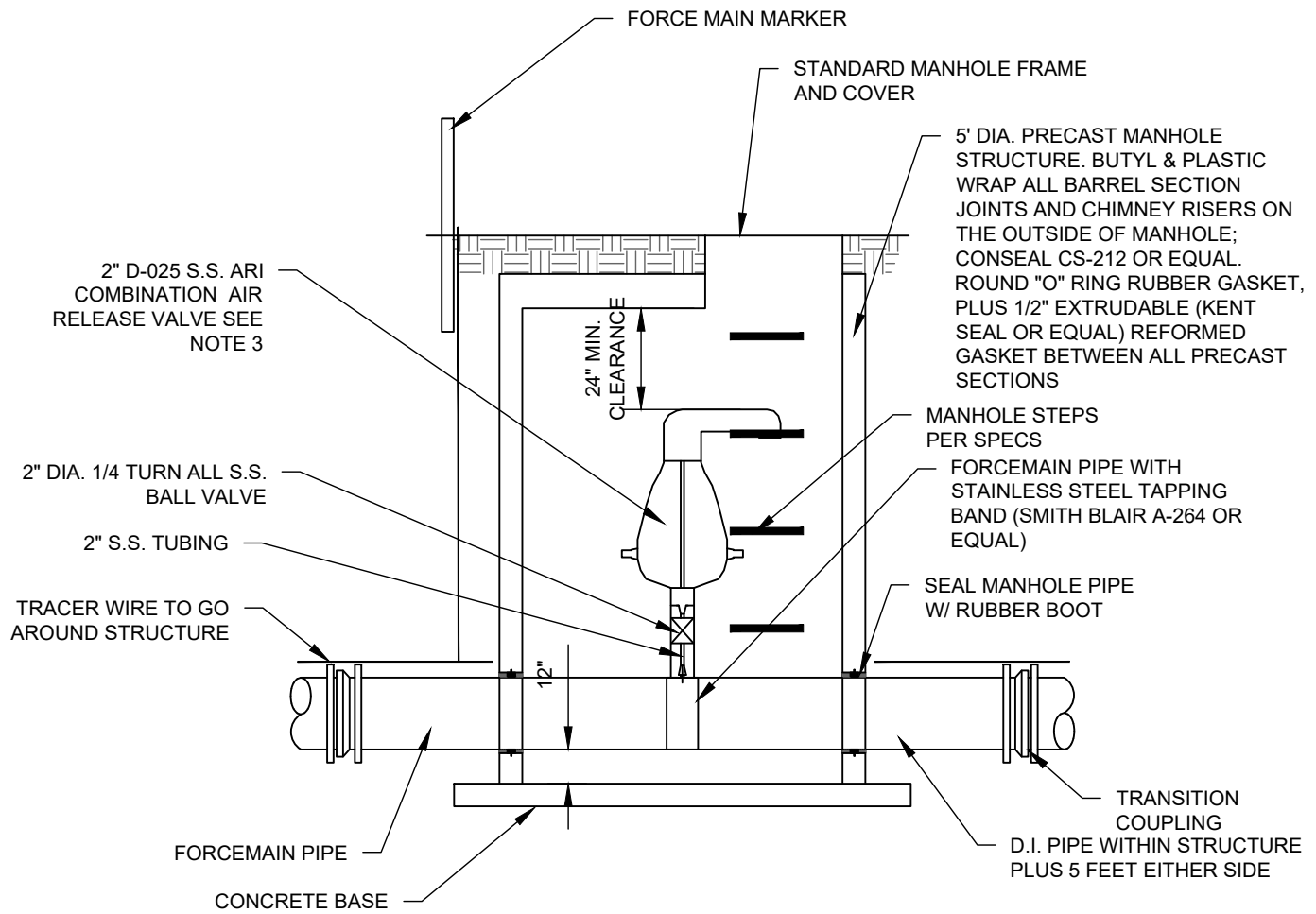


SANITARY SEWER
BENCH SLOPE: 1/2" PER FOOT

REVISIONS			
NO.	DESCRIPTION	DATE	BY

STANDARD MANHOLE BENCHES
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24
SCALE: NTS
SHEET NO.



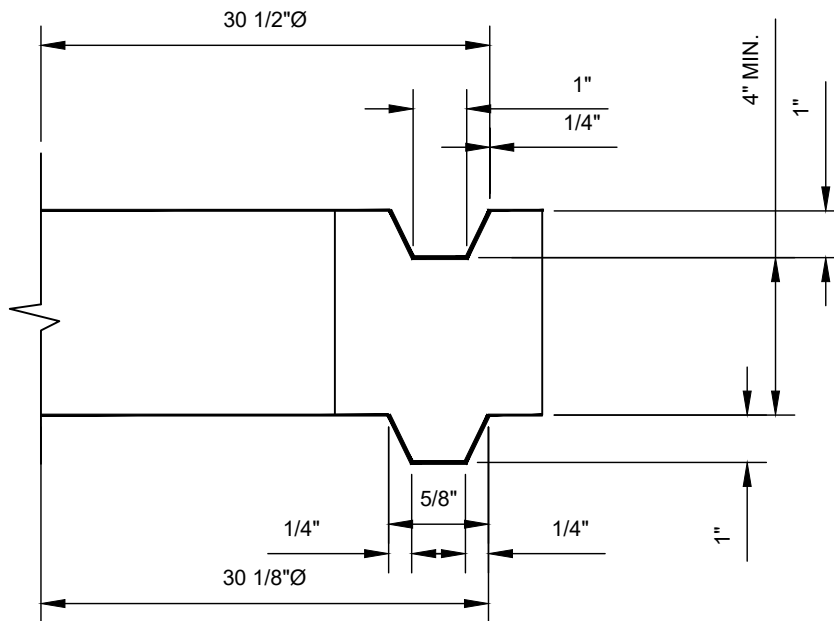
NOTES:

1. IF MORE THAN ONE AIR RELEASE VALVE IS INSTALLED WITH A FORCEMAIN, THE DEVELOPER SHALL PROVIDE ONE SPARE AIR RELEASE VALVE TO LRWD.
2. AIR RELEASE VALVES MUST BE INSTALLED AT ALL HIGH SPOTS IN PRESSURE PIPE.
3. THE DESIGN ENGINEER SHALL VERIFY ARV SIZING REQUIRED FOR THE FORCE MAIN SYSTEM BEING PLANNED.
4. ARV TRACER WIRE TO BE TERMINATED AT MARKER POST AND WIRE RAN AROUND ARV PIT.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

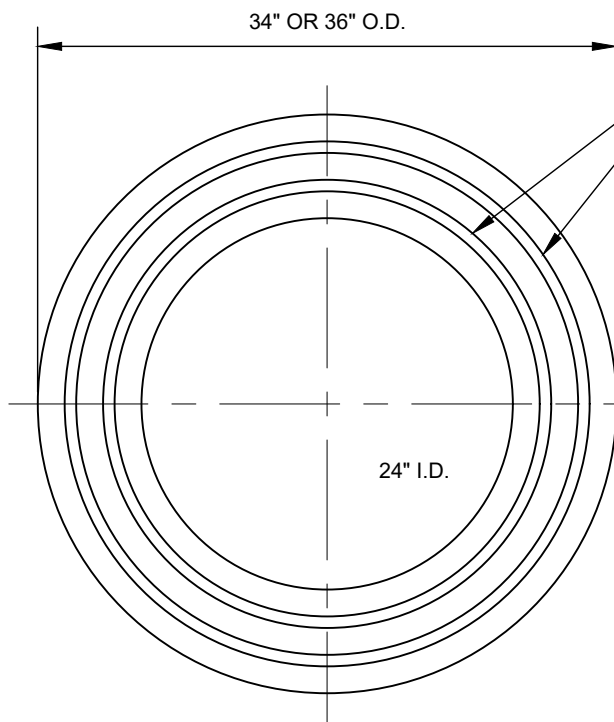
**SANITARY FORCEMAIN AIR RELEASE VALVE
 STRUCTURE**
 STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	20



RISER RING THICKNESS 4" - 12"
 OUTSIDE DIA. 34" OR 36"

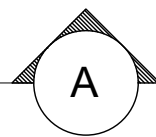
SECTION A-A



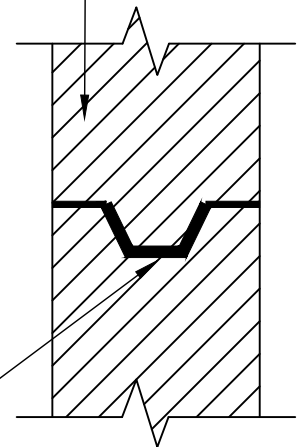
PLAN VIEW

INSTALL 1/2"Ø EXTRUDABLE
 PREFORMED GASKET MATERIAL
 IN EACH KEYWAY (SEE DETAIL)

PRECAST CONCRETE
 ADJUSTING RING OR
 FLANGE OF CASTING



NOMINAL 1/2" BUTYL
 RUBBER BASE EXTRUDABLE
 PREFORMED GASKET
 MATERIAL (TYP.)



GASKET DETAIL

REVISIONS			
NO.	DESCRIPTION	DATE	BY

PRECAST ADJUSTING RING

STANDARD DETAILS

LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24

SCALE: NTS

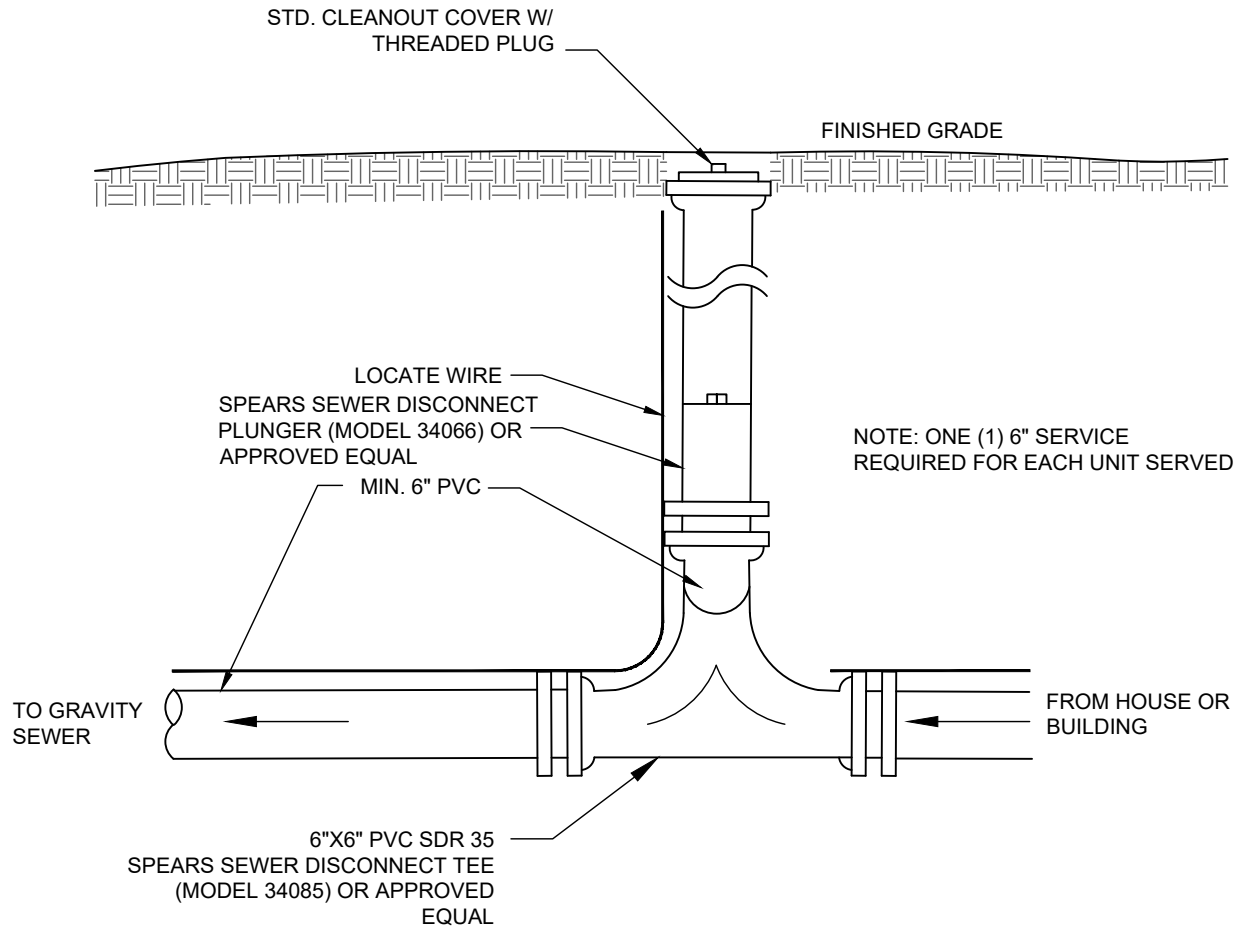
SHEET NO.

21

NOTES

1. CLEANOUTS SHALL BE INSTALLED NO MORE THAN A MAX. 5'-0" FROM OUTSIDE FACE OF BUILDING FOUNDATION WALL AND EVERY 100'-0" MAX. THEREAFTER OR WHERE SERVICE LATERAL CHANGES DIRECTION BEFORE REACHING MAIN SANITARY SEWER LINE.

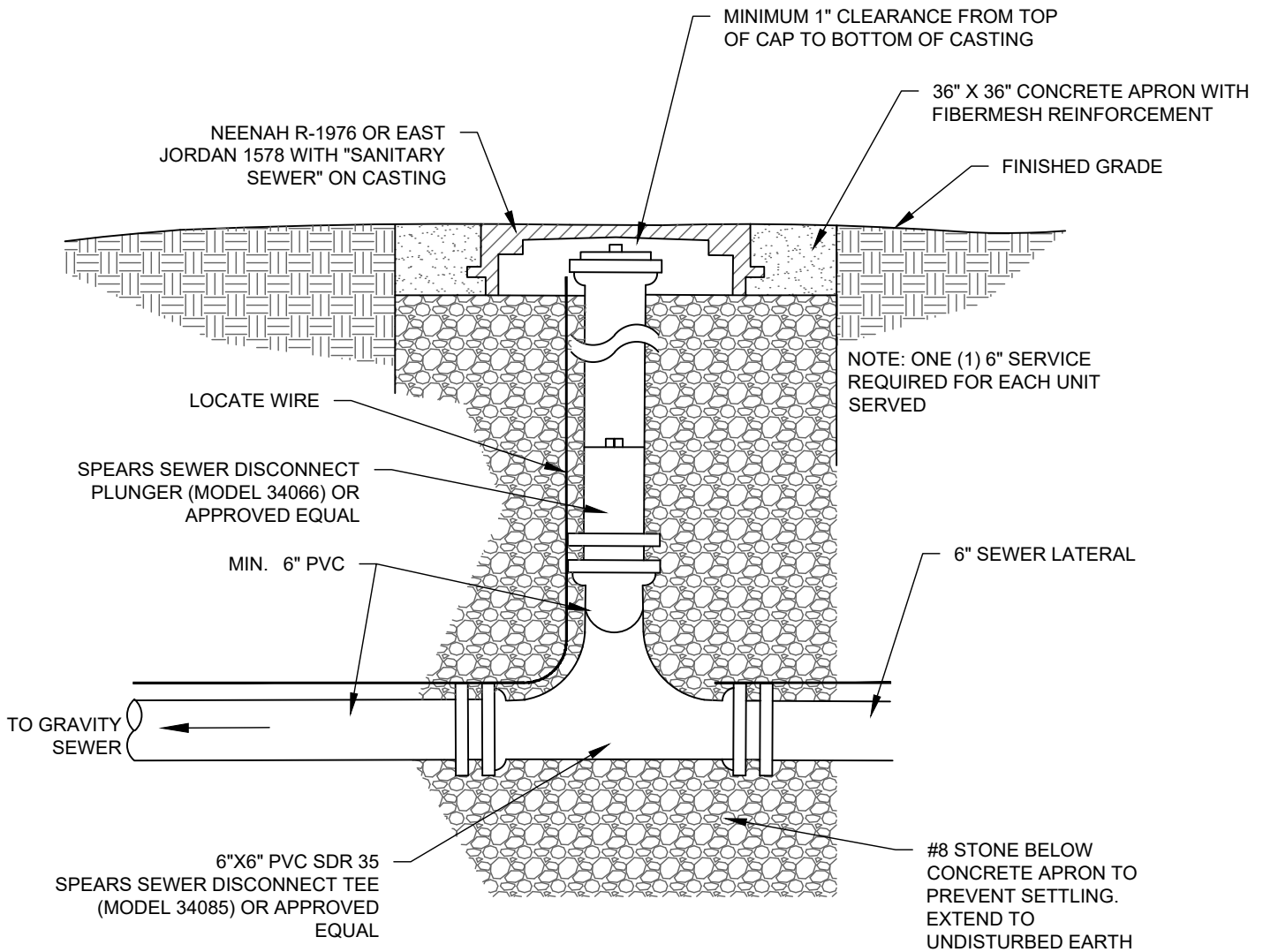
2. CLEANOUT PLUGS SHALL NOT BE COVERED WITH CEMENT PLASTER, OR ANY OTHER PERMANENT FINISHING MATERIAL, WHERE IT IS NECESSARY TO CONCEAL A CLEAN OUT PLUG, A COVERING PLATE OR ACCESS DOOR SHALL BE PROVIDED WHICH WILL PERMIT READY ACCESS TO THE PLUG.



REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "1" CLEANOUT
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	22



NOTE:

1. CONCRETE APRON AND CASTING SHALL BE INSTALLED SO THAT THEY DO NOT CONTACT THE LATERAL OR LATERAL CAP
2. CLEANOUTS SHALL BE INSTALLED NO MORE THAN A MAX. 5'-0" FROM OUTSIDE FACE OF BUILDING FOUNDATION WALL AND EVERY 100'-0" MAX. THEREAFTER OR WHERE SERVICE LATERAL CHANGES DIRECTION BEFORE REACHING MAIN SANITARY SEWER LINE.
3. TO BE USED IN PAVED AREAS OR SIDEWALKS

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "2" CLEANOUT
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	23

SANITARY SEWER TESTING:

1. ALL GRAVITY SANITARY SEWERS SHALL BE TESTED AS FOLLOWS (SEE SPECIFICATIONS):
 - 1.1. ALL MAINS SHALL BE TESTED FOR DEFLECTION WITH A GO-NO-GO MANDREL TEST CONDUCTED 30 DAYS AFTER BACKFILL.
 - 1.2. ALL MAINS SHALL BE TESTED FOR LEAKAGE WITH A LOW-PRESSURE AIR TEST.
 - 1.3. TELEVISION INSPECTION - SEWER SHALL BE FLOODED PRIOR TO INSPECTION.
2. ALL FORCEMAIN SHALL BE SUBJECT TO HYDROSTATIC TEST PRIOR TO BEING PLACED INTO OPERATION (SEE SPECIFICATIONS FOR REQUIREMENTS)

FORCE MAIN LOCATION WIRE AND MARKERS:

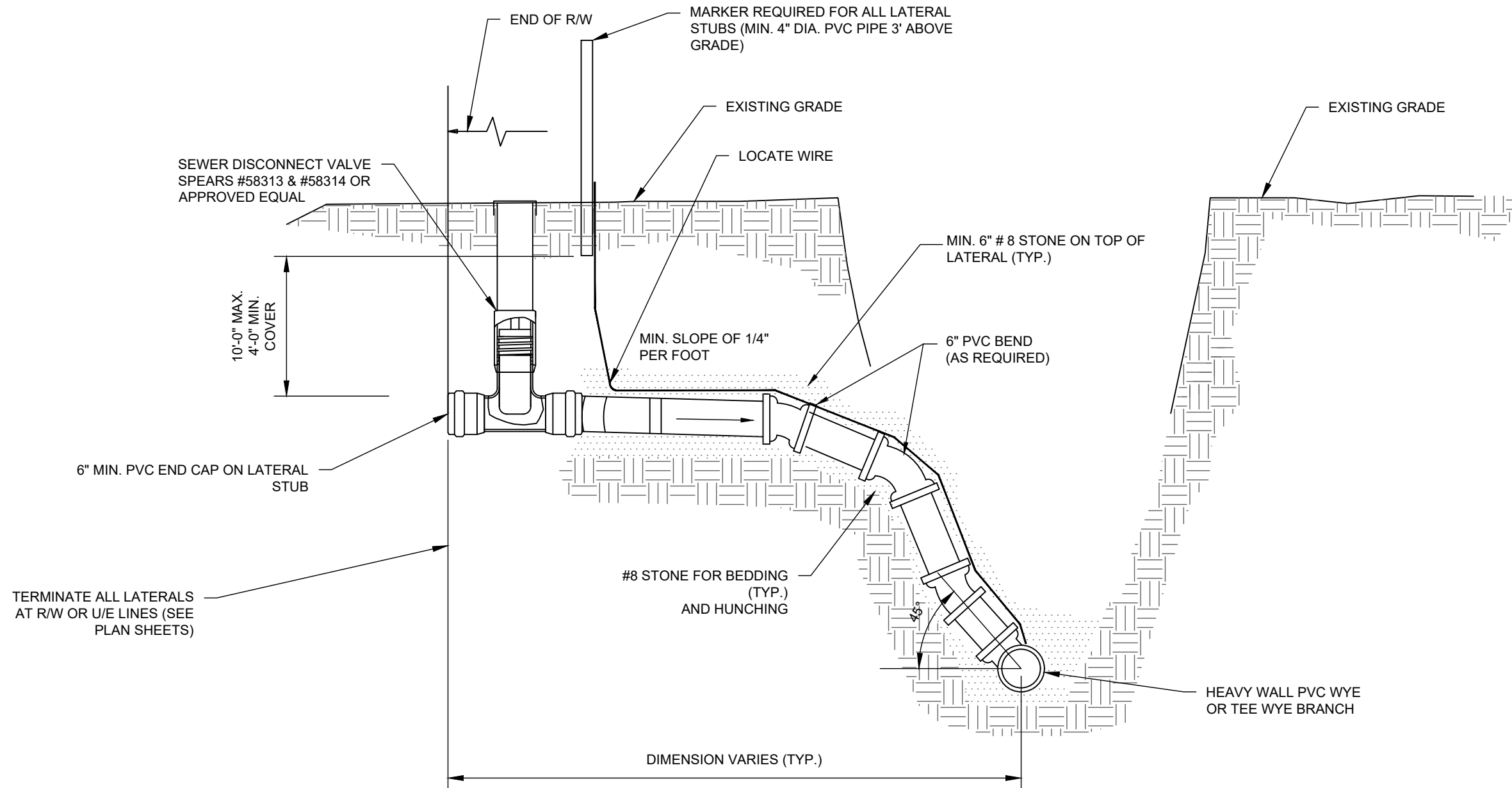
LOCATION WIRE TO BE INSTALLED ON ALL UNDERGROUND PIPE; COLORED GREEN FOR SANITARY SEWER. INSTALL FORCE MAIN POST MARKER WITH TERMINAL CONNECTION EVERY 400'. FORCE MAIN MARKER SHALL BE EQUIVALENT TO HANDLEY INDUSTRIES MODEL PMP 7CE WITH LID C2. WIRE MUST BE CONTINUOUS BETWEEN MARKERS. ALL JOINTS SHALL BE OVERHAND KNOTTED AND SOLDERED THEN COVERED WITH A WATER PROOF SEAL.

OPEN CUT PIPE INSTALLATION REQUIRES ONE #12 AWG HIGH-STRENGTH COPPER CLAD, STEEL CONDUCTOR LOCATE WIRE.

DIRECT DRILL / BORE PIPE INSTALLATION REQUIRES TWO #12 AWG EXTRA HIGH-STRENGTH COPPER CLAD, STEEL CONDUCTOR LOCATE WIRES (SEE LRWD SPECIFICATIONS).

NOTES:

1. ROAD CURB TO BE STAMPED WITH AN "S" TO INDICATE SANITARY SEWER LOCATION.
2. FINISHED FLOOR ELEVATION OF ADJACENT BUILDINGS SHALL BE SET A MINIMUM OF 12" HIGHER THAN THE RIM ELEVATION OF THE UPSTREAM MANHOLE OF THE CONNECTED SEWER MAIN TO PREVENT SANITARY BACKUPS. OTHERWISE, BACKFLOW PREVENTION MUST BE PROVIDED ON THE SERVICE CONNECTIONS.
3. SAMPLE STATION MANHOLES AND GREASE TRAPS SHALL BE INCLUDED ON ALL COMMERCIAL AND INDUSTRIAL SERVICE CONNECTIONS.
4. CONTRACTOR SHALL NOT BACKFILL SERVICE CONNECTION UNTIL LRWD HAS INSPECTED AND TAKEN MEASUREMENTS AND OTHER INFORMATION REQUIRED FOR RECORDS.



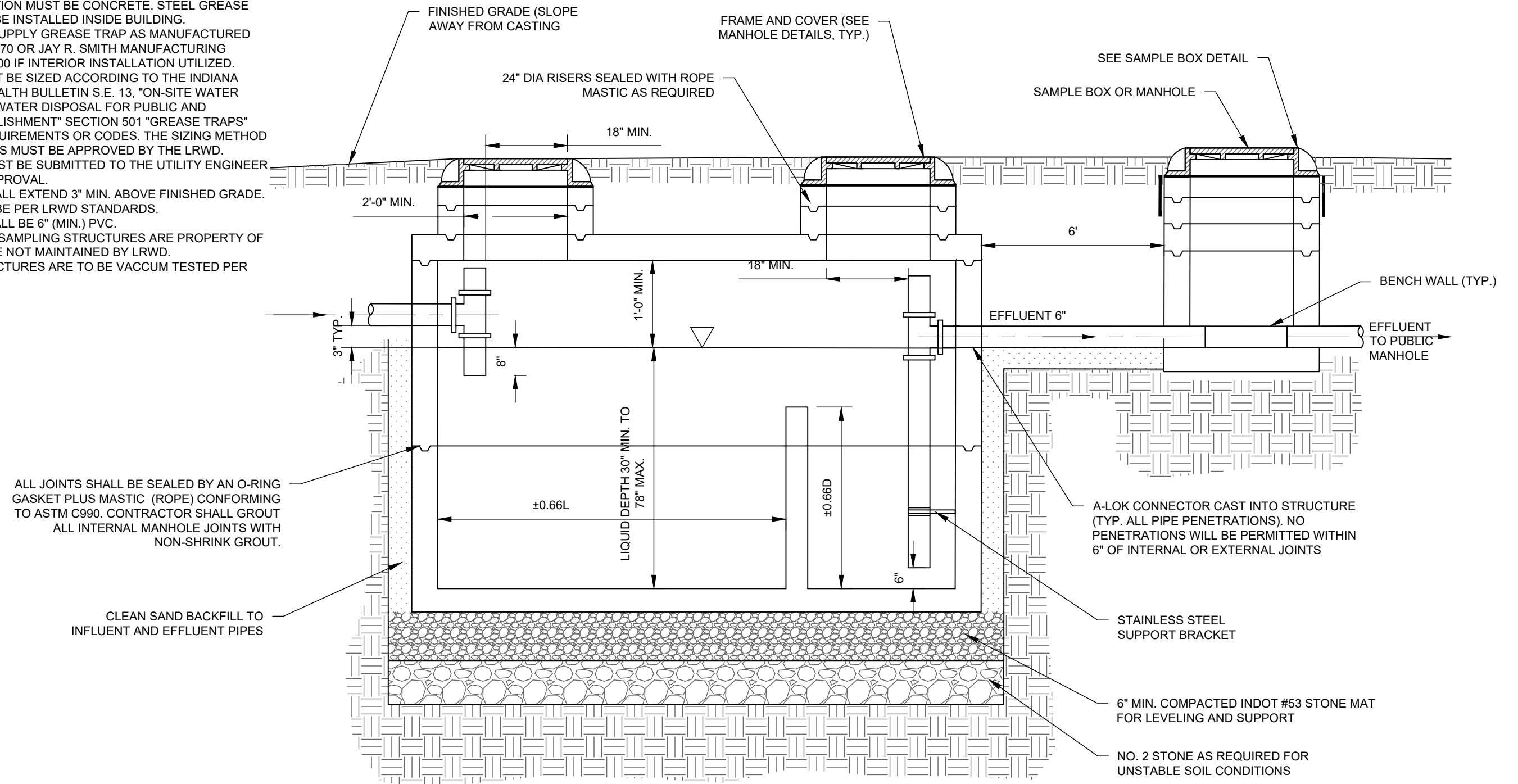
REVISIONS			
NO.	DESCRIPTION	DATE	BY

SANITARY SEWER SERVICE CONNECTIONS
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	24

NOTES:

1. GREASE TRAP SHALL CONFORM TO ASTM C858/C913. UTILIZING 4000 PSI CONCRETE. STRUCTURE SHALL BE DESIGNED TO SUPPORT LOADING IN PLANNED LOCATION.
2. EXTERIOR INSTALLATION MUST BE CONCRETE. STEEL GREASE TRAPS SHALL ONLY BE INSTALLED INSIDE BUILDING.
3. CONTRACTOR MAY SUPPLY GREASE TRAP AS MANUFACTURED BY ZURN SERIES Z-1170 OR JAY R. SMITH MANUFACTURING COMPANY SERIES 8000 IF INTERIOR INSTALLATION UTILIZED.
4. GREASE TRAPS MUST BE SIZED ACCORDING TO THE INDIANA STATE BOARD OF HEALTH BULLETIN S.E. 13, "ON-SITE WATER SUPPLY AND WASTEWATER DISPOSAL FOR PUBLIC AND COMMERCIAL ESTABLISHMENT" SECTION 501 "GREASE TRAPS" AND PER LOCAL REQUIREMENTS OR CODES. THE SIZING METHOD FOR ALL STRUCTURES MUST BE APPROVED BY THE LRWD.
5. SHOP DRAWINGS MUST BE SUBMITTED TO THE UTILITY ENGINEER FOR REVIEW AND APPROVAL.
6. TOP OF CASTING SHALL EXTEND 3" MIN. ABOVE FINISHED GRADE.
7. SAMPLE BOX SHALL BE PER LRWD STANDARDS.
8. INTERIOR PIPING SHALL BE 6" (MIN.) PVC.
9. GREASE TRAPS AND SAMPLING STRUCTURES ARE PROPERTY OF THE OWNER AND ARE NOT MAINTAINED BY LRWD.
10. ALL SAMPLING STRUCTURES ARE TO BE VACCUM TESTED PER LRWD STANDARDS



ALL JOINTS SHALL BE SEALED BY AN O-RING GASKET PLUS MASTIC (ROPE) CONFORMING TO ASTM C990. CONTRACTOR SHALL GROUT ALL INTERNAL MANHOLE JOINTS WITH NON-SHRINK GROUT.

CLEAN SAND BACKFILL TO INFLUENT AND EFFLUENT PIPES

A-LOK CONNECTOR CAST INTO STRUCTURE (TYP. ALL PIPE PENETRATIONS). NO PENETRATIONS WILL BE PERMITTED WITHIN 6" OF INTERNAL OR EXTERNAL JOINTS

STAINLESS STEEL SUPPORT BRACKET

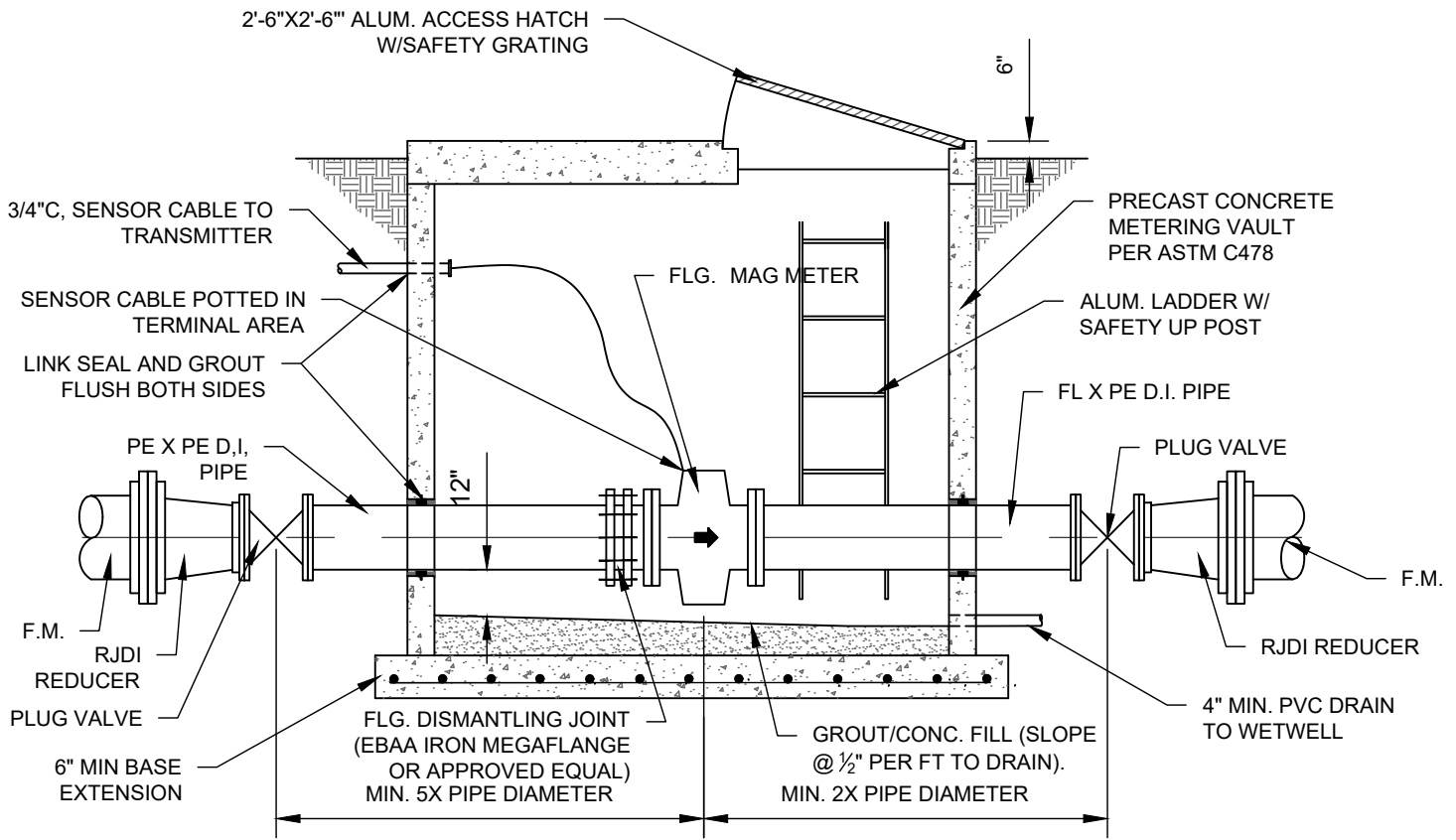
6" MIN. COMPACTED INDOT #53 STONE MAT FOR LEVELING AND SUPPORT

NO. 2 STONE AS REQUIRED FOR UNSTABLE SOIL CONDITIONS

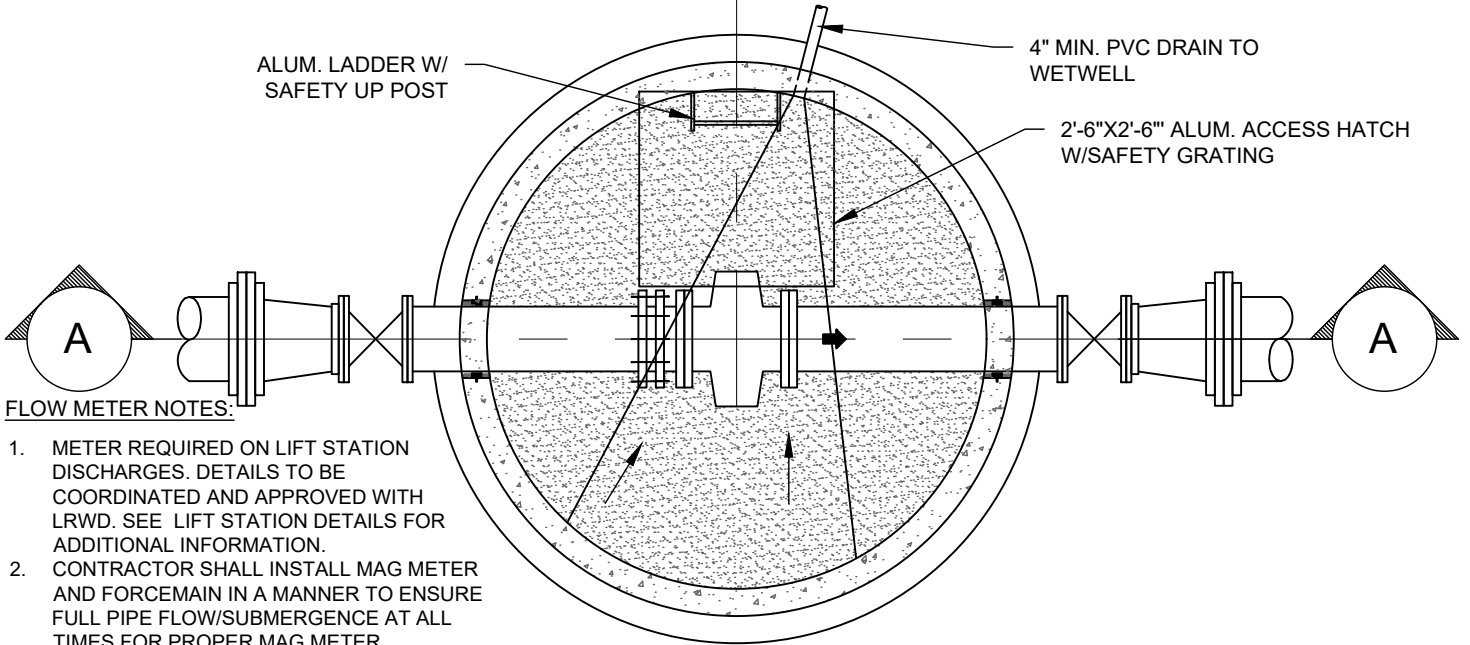
REVISIONS			
NO.	DESCRIPTION	DATE	BY

GREASE TRAP
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24
SCALE: NTS
SHEET NO. **25**



SECTION A-A



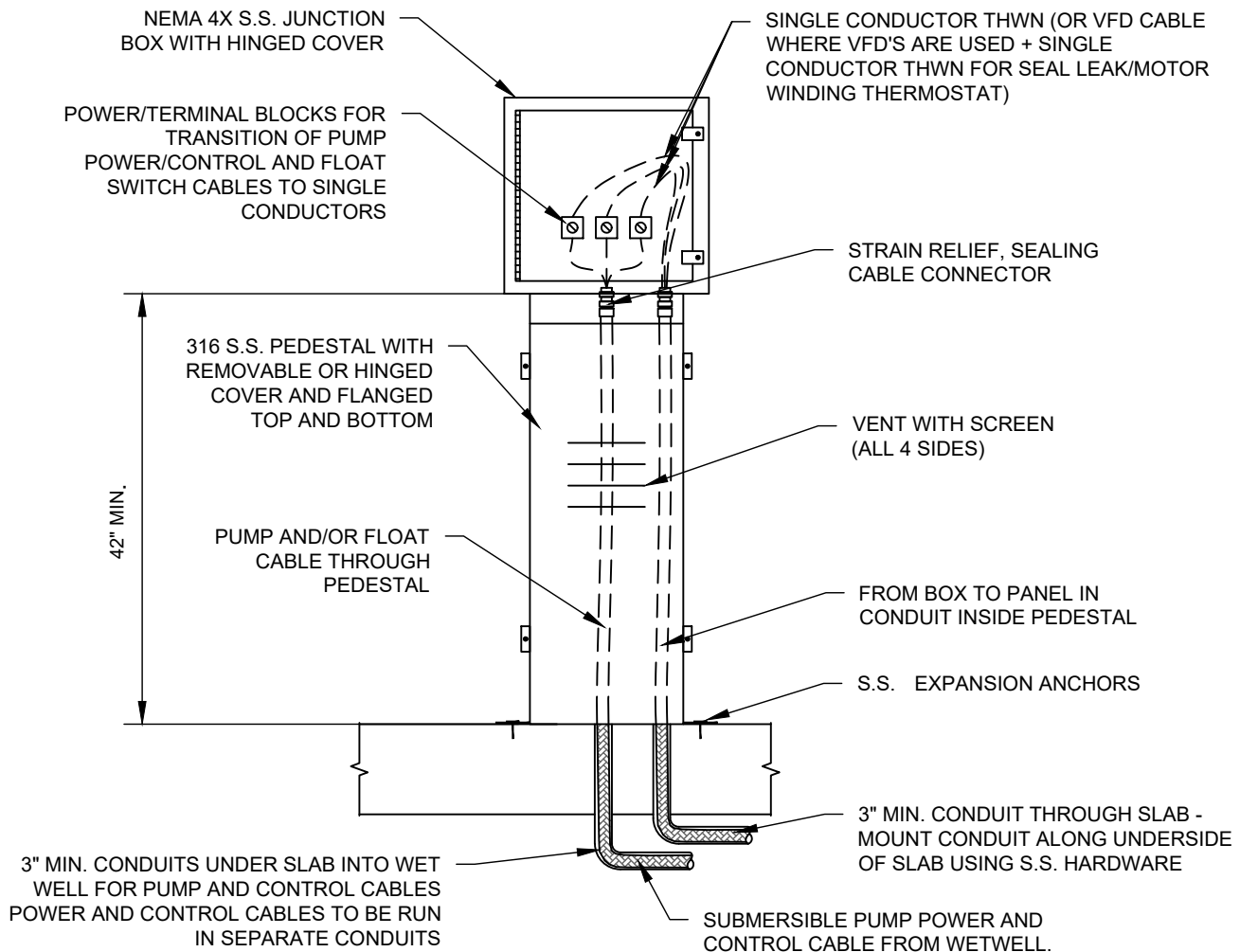
FLOW METER NOTES:

1. METER REQUIRED ON LIFT STATION DISCHARGES. DETAILS TO BE COORDINATED AND APPROVED WITH LRWD. SEE LIFT STATION DETAILS FOR ADDITIONAL INFORMATION.
2. CONTRACTOR SHALL INSTALL MAG METER AND FORCEMAIN IN A MANNER TO ENSURE FULL PIPE FLOW/SUBMERGENCE AT ALL TIMES FOR PROPER MAG METER OPERATION.
3. PROVIDE A SPOOL PIECE TO REPLACE MAGMETER BODY IF REMOVAL IS REQUIRED FOR REPAIR/REPLACEMENT.
4. CONTRACTOR SHALL INSTALL MAG METER VAULT IN A MANNER TO ENSURE THAT A MINIMUM DISTANCE OF 5 PIPE DIAMETERS UPSTREAM AND 2 PIPE DIAMETERS DOWN STREAM OF THE MAG METER IS FREE FROM BENDS OR OTHER APPURTANCES.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

SANITARY FORCEMAIN MAG METER VAULT
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	26



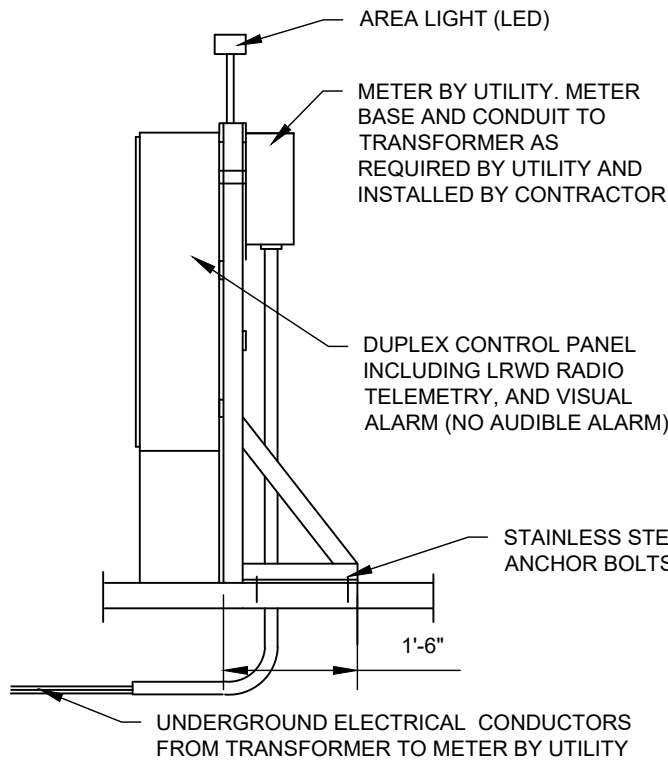
NOTES:

1. JUNCTION BOX SHALL BE SIZED AS REQUIRED TO ACCOMMODATE POWER/TERMINAL BLOCKS AND NUMBER OF CABLES.
2. PROVIDE ADEQUATE POWER AND TERMINAL BLOCKS FOR TRANSITION OF PUMP POWER/CONTROL OR FLOAT CABLES TO SINGLE CONDUCTORS.
3. CONVERT MULTITRODE FACTORY CABLE TO 24 STRAND/12 CONDUCTOR CABLE (GARLAND PART NO. TEM134802008) AT JUNCTION BOX AND EXTEND 12 CONDUCTOR CABLE IN 1" C TO PUMP CONTROL PANEL.
4. PROVIDE STRAIN RELIEF CABLE GRIP AND SEALING CABLE CONNECTORS FOR ALL CABLES ENTERING WETWELL.
5. SEALING CONNECTORS SHALL BE RATED FOR CLASS I, DIVISION 2, GROUP D HAZARDOUS LOCATIONS AND SHALL BE HAWKE 710, OR EQUAL.
6. GROUND LUG IS NOT SHOWN, BUT IS REQUIRED.
7. CONTRACTOR SHALL PROVIDE CONDUIT UNDER SLAB TO ALLOW ROUTING OF PUMP POWER/CONTROL CABLES, TRANSDUCER CABLE AND CAPACITANCE PROBE FROM WETWELL TO JUNCTION BOX. SEPARATE CONDUIT FOR EACH PUMP POWER CORD. ONE CONDUIT FOR PUMP CONTROL CORDS, ONE FOR LEVEL CONTROL.
8. CONTRACTOR SHALL FURNISH AND INSTALL SEALING CONNECTORS FOR PUMP POWER/CONTROL CABLE, TRANSDUCER CABLE AND LEVEL SENSING PROBE CABLE.
9. MANUFACTURER SUPPLIED CABLE FROM PRESSURE TRANSDUCER TO JUNCTION BOX.
10. ALL JUNCTION BOX TERMINAL BLOCKS NEED TO BE LUG TYPE TERMINAL BLOCKS.
11. BELOW GROUND CONDUIT SHALL BE SCHEDULE 80 PVC.
12. ALL CONDUIT SHALL BE SCHEDULE 80.
13. MINIMUM DIAMETER CONDUIT FOR POWER SHALL BE 4" DIA. CONTROL WIRE CONDUIT SHALL BE 3" DIA. MINIMUM.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

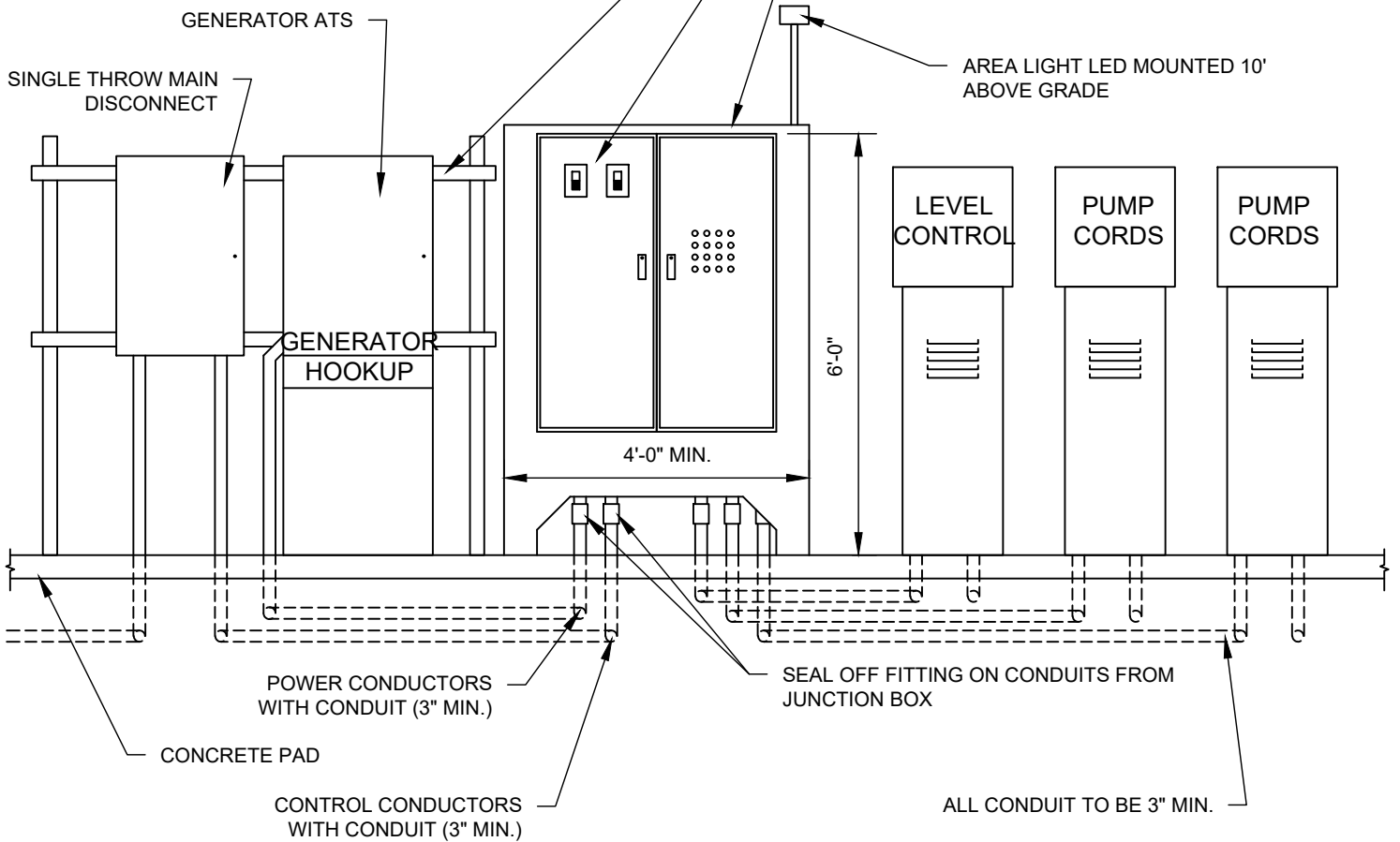
PUMP/FLOAT CABLE WET WELL JUNCTION BOX
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	27



SIDE VIEW

- NOTES:**
1. SEE SITE PLAN FOR EXACT LOCATION OF CONTROL PANEL EQUIPMENT
 2. ALL CONDUITS AND WIRING TO BE SIZED APPROPRIATELY BY DESIGN ENGINEER. CONDUIT SHALL BE SCHEDULE 80
 3. ALL PANELS SHALL BE NEMA 4X STAINLESS STEEL
 4. ALL LIFT STATIONS SHALL BE 3PHASE , 460 VOLT IF UTILITY POWER IS AVAILABLE.
 5. WIDTH OF CONCRETE PAD AS REQUIRED TO ACCOMMODATE PANELS PROVIDED.
 6. PROVIDE APPROPRIATE BRACING SO THAT EQUIPMENT STAND IS STURDY ONCE ALL EQUIPMENT IS ATTACHED.
 7. ALL CABINET PENETRATIONS SHALL BE FROM THE BOTTOM.
 8. PROVIDE WIRING DIAGRAM INSIDE CONTROL PANEL DOOR



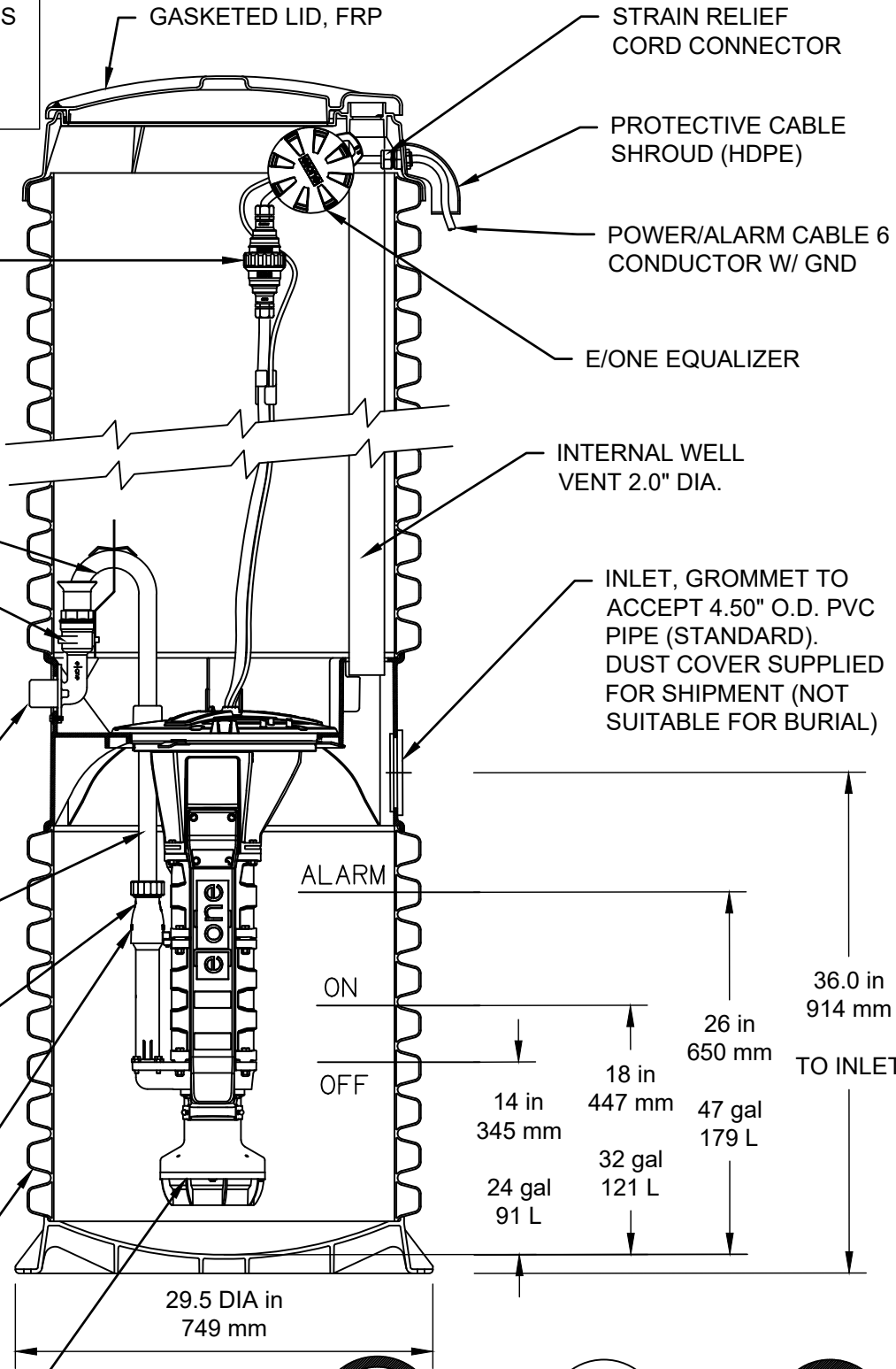
FRONT VIEW

REVISIONS			
NO.	DESCRIPTION	DATE	BY

ELECTRICAL DIAGRAM
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	28

FIELD JOINT REQUIRED FOR MODELS
DH071-129 / DR071-129
&
DH071-160 / DR017-160



ELECTRICAL QUICK
DISCONNECT NEMA 6P
(EQD)

QUICK DISCONNECT
ASSY. (304 S.S.)
S.S. CAST BALL VALVE

DISCHARGE
1-1/4" FPT

1-1/4" DISCHARGE
LINE (304 S.S.)

CHECK VALVE
(NORYL)

ANTI-SIPHON
VALVE
(NORYL)

HDPE TANK DUAL WALL,
CORRUGATED 70 GALLON
CAPACITY

SEMI-POSITIVE DISPLACEMENT
TYPE PUMP DIRECTLY DRIVEN BY A
1 HP MOTOR

GASKETED LID, FRP

STRAIN RELIEF
CORD CONNECTOR

PROTECTIVE CABLE
SHROUD (HDPE)

POWER/ALARM CABLE 6
CONDUCTOR W/ GND

E/ONE EQUALIZER

INTERNAL WELL
VENT 2.0" DIA.

INLET, GROMMET TO
ACCEPT 4.50" O.D. PVC
PIPE (STANDARD).
DUST COVER SUPPLIED
FOR SHIPMENT (NOT
SUITABLE FOR BURIAL)

ALARM

ON

OFF

41.6 in
1057 mm
TO DISCHARGE

36.0 in
914 mm
TO INLET

26 in
650 mm
18 in
447 mm
14 in
345 mm
24 gal
91 L
32 gal
121 L
47 gal
179 L

29.5 DIA in
749 mm



REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "I" GRINDER PUMP
70 GAL
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

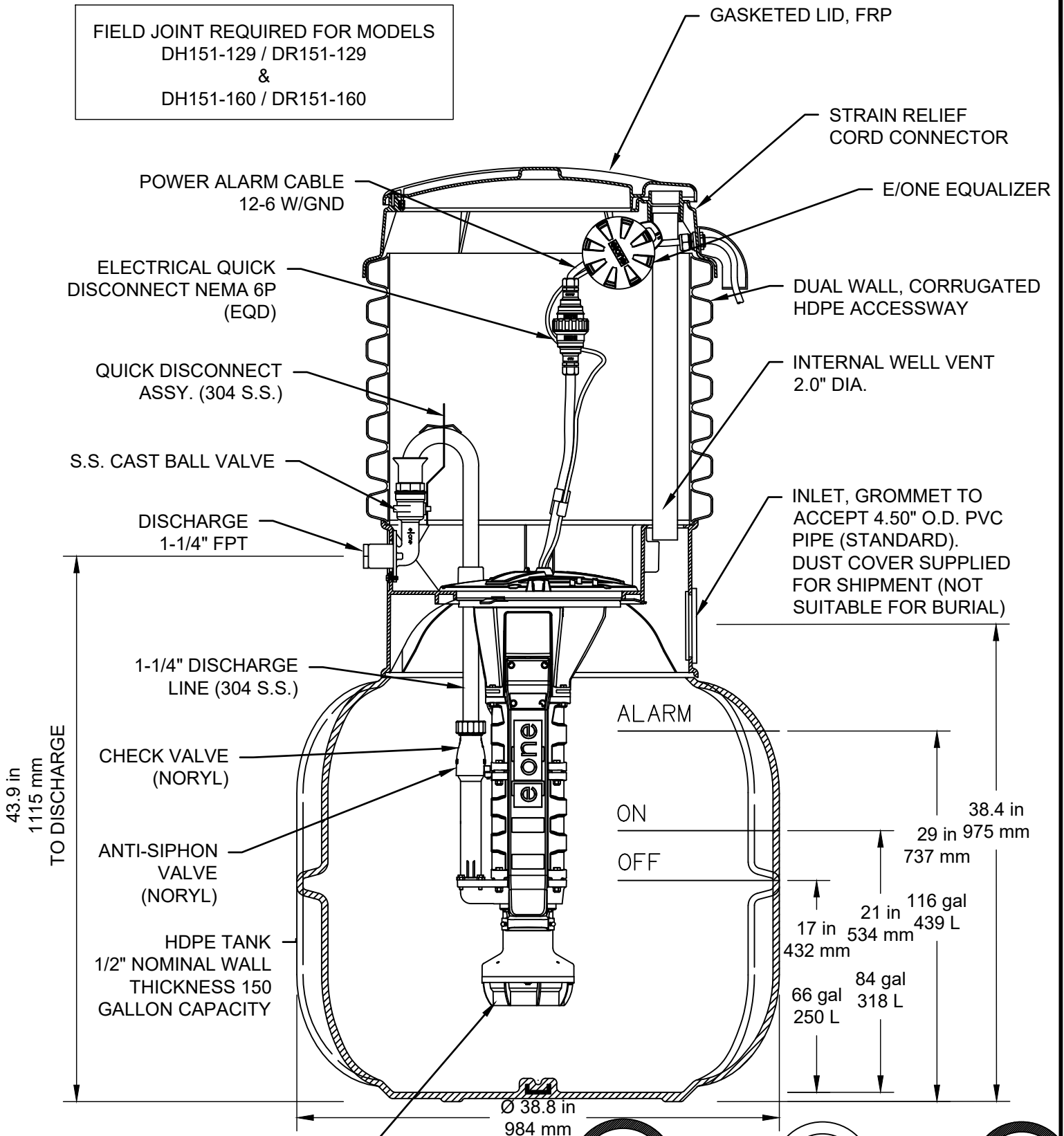
DATE:
03/12/24

SCALE:
NTS

SHEET NO.

29

FIELD JOINT REQUIRED FOR MODELS
DH151-129 / DR151-129
&
DH151-160 / DR151-160



SEMI-POSITIVE DISPLACEMENT
TYPE PUMP DIRECTLY DRIVEN BY A
1 HP MOTOR

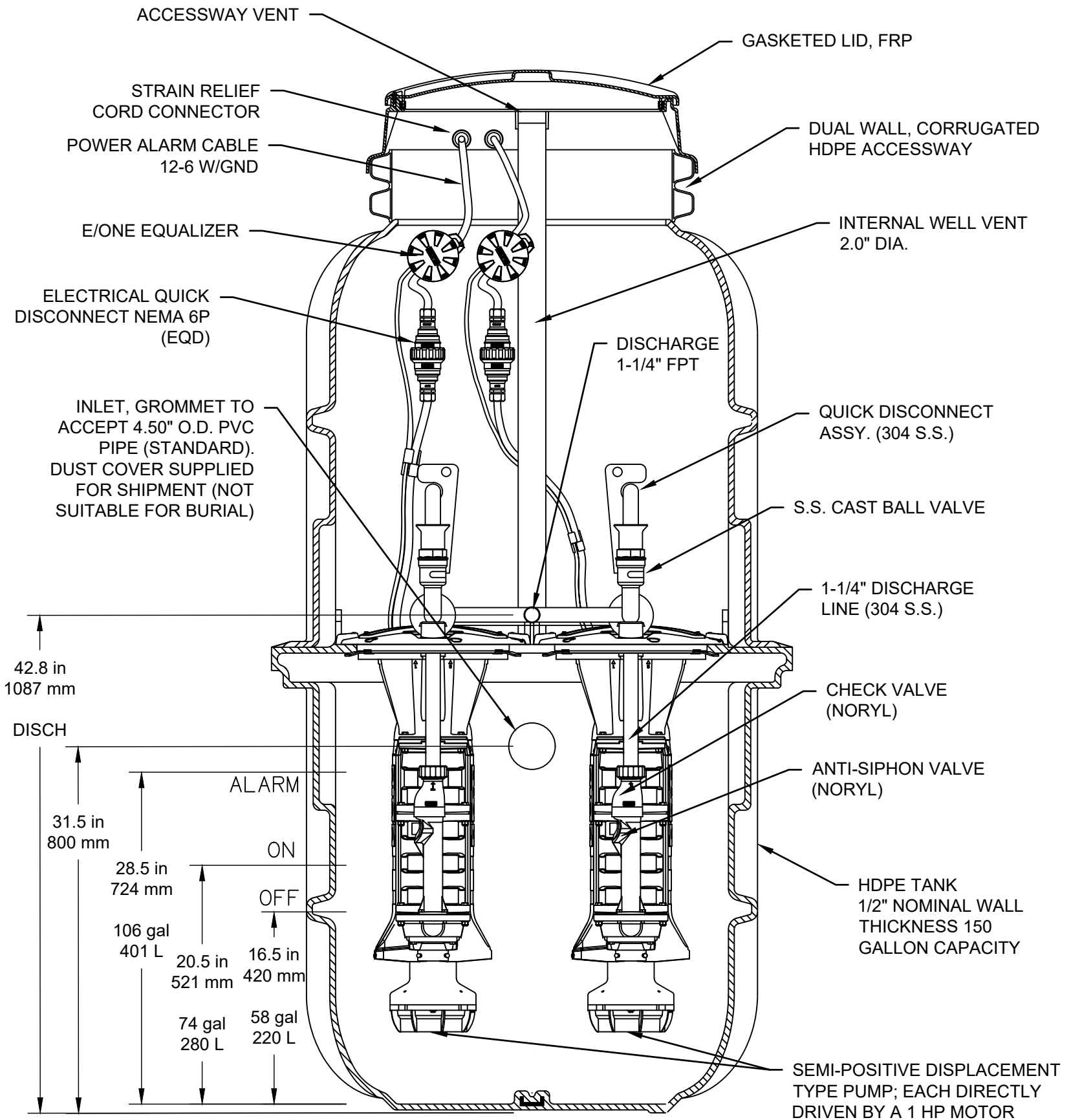


REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "II" GRINDER PUMP
150 GAL
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24
SCALE: NTS
SHEET NO. 30

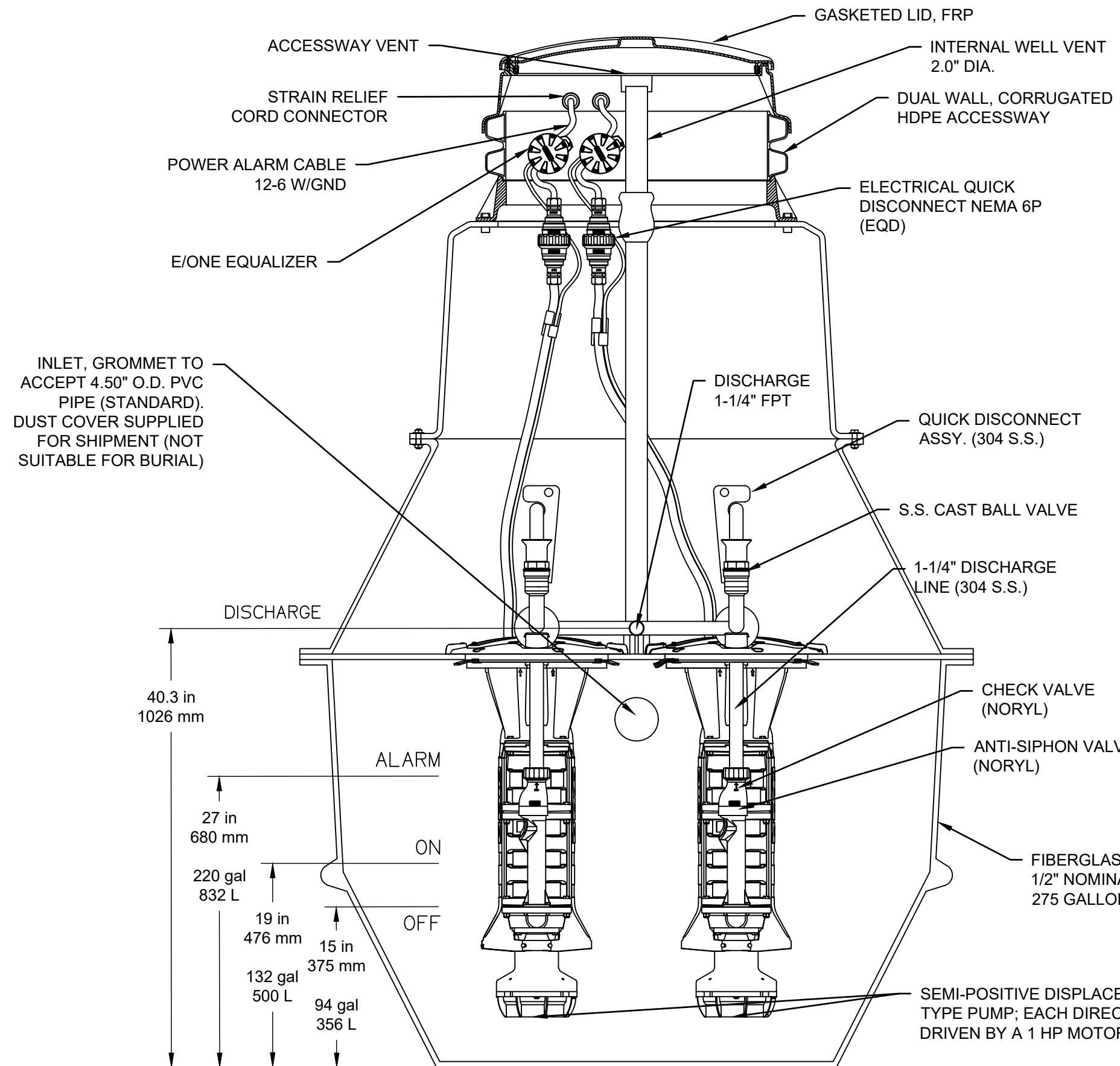
FIELD JOINT REQUIRED FOR MODELS
DH152-129 / DR152-129
&
DH152-160 / DR152-160



REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "III" GRINDER PUMP
150 GAL
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24
SCALE: NTS
SHEET NO. 31



FIELD JOINT REQUIRED FOR MODELS
 DH272-97, DH272-129, DH272-160
 &
 DR272-97, DR272-129, DR272-160



REVISIONS			
NO.	DESCRIPTION	DATE	BY

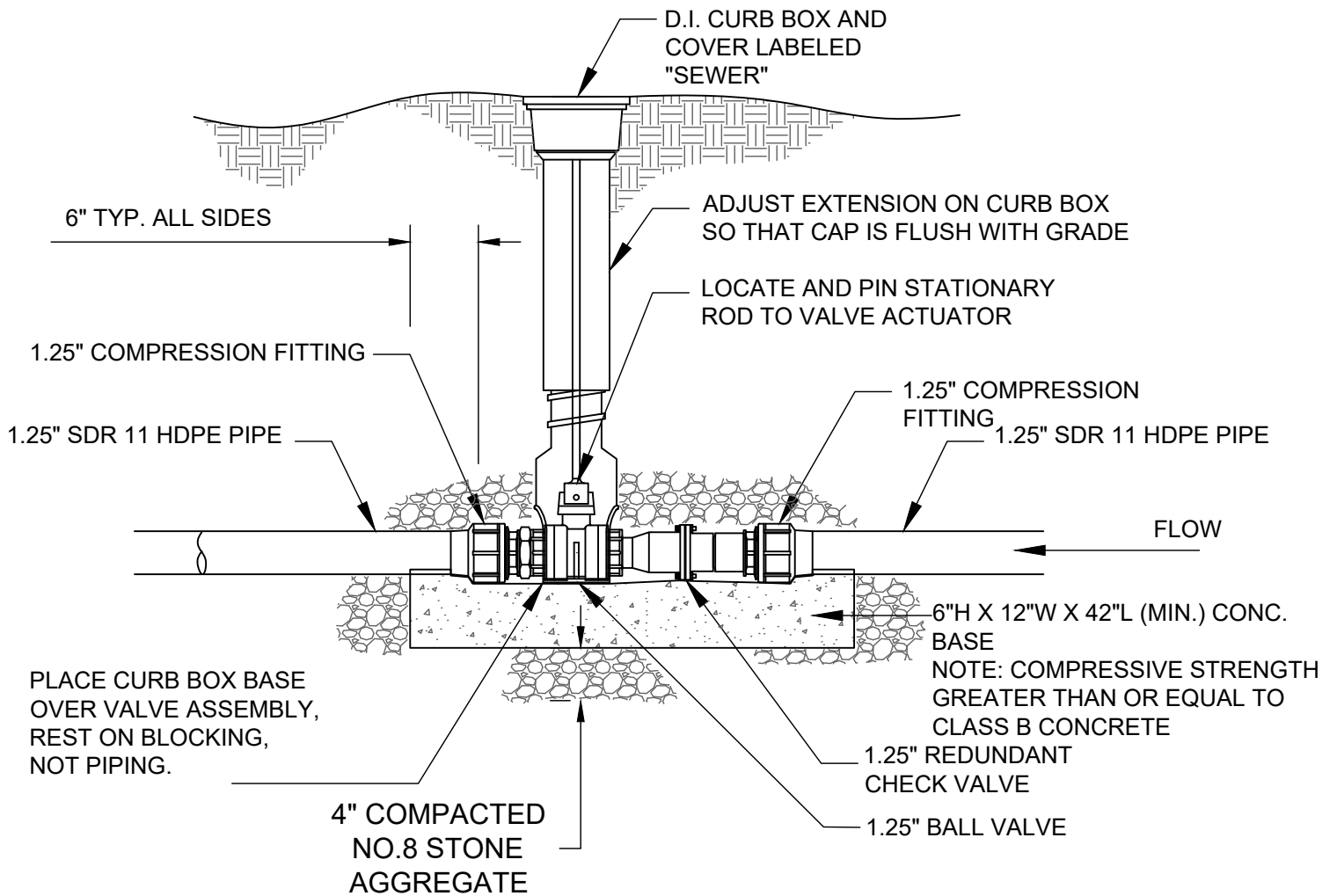
TYPE "IV" GRINDER PUMP
 275 GAL
 STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24

SCALE: NTS

SHEET NO.

32



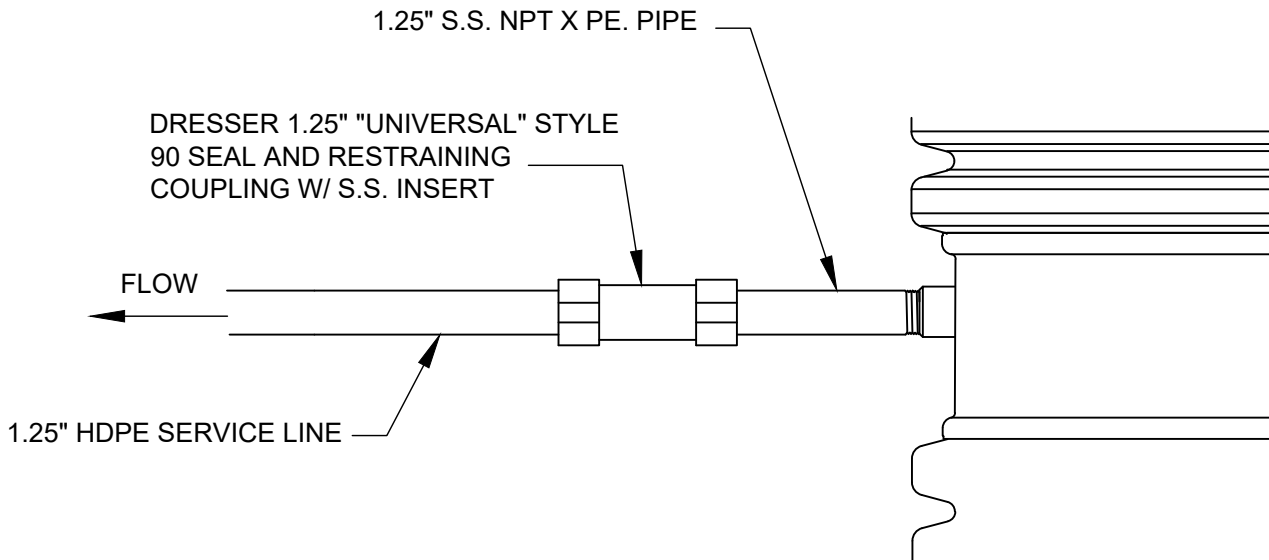
REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPICAL GRINDER PUMP CURB STOP ASSEMBLY

STANDARD DETAILS

LIBERTY REGIONAL WASTE DISTRICT

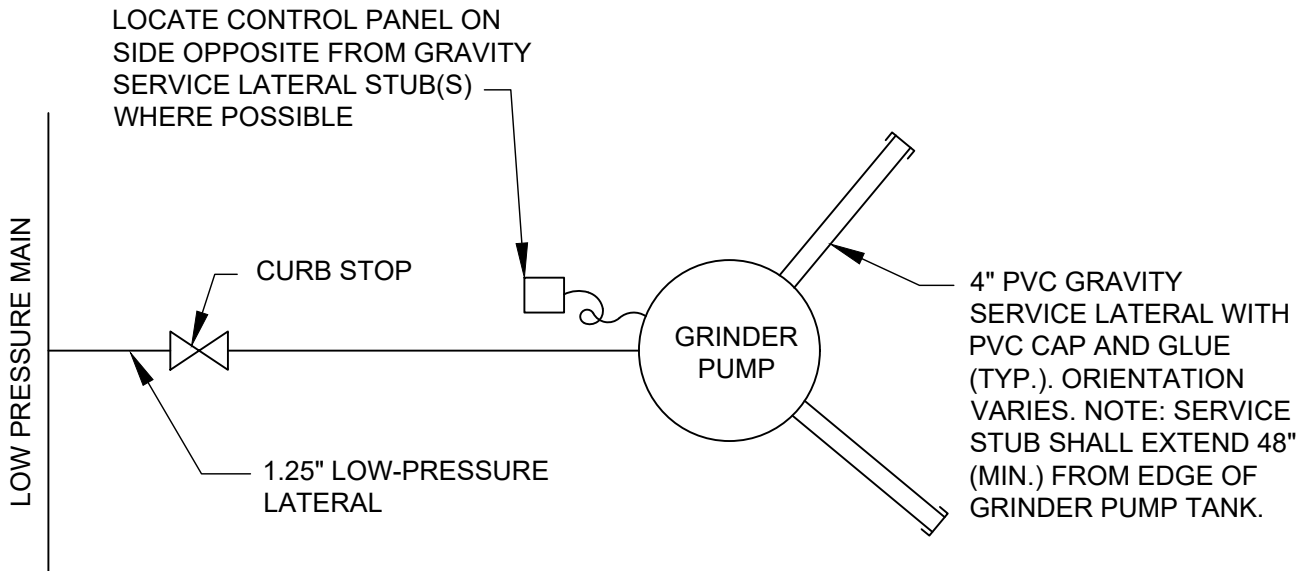
DATE:	03/12/24
SCALE:	NTS
SHEET NO.	33



REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPICAL GRINDER CONNECTION
 STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24
 SCALE: NTS
 SHEET NO.
34



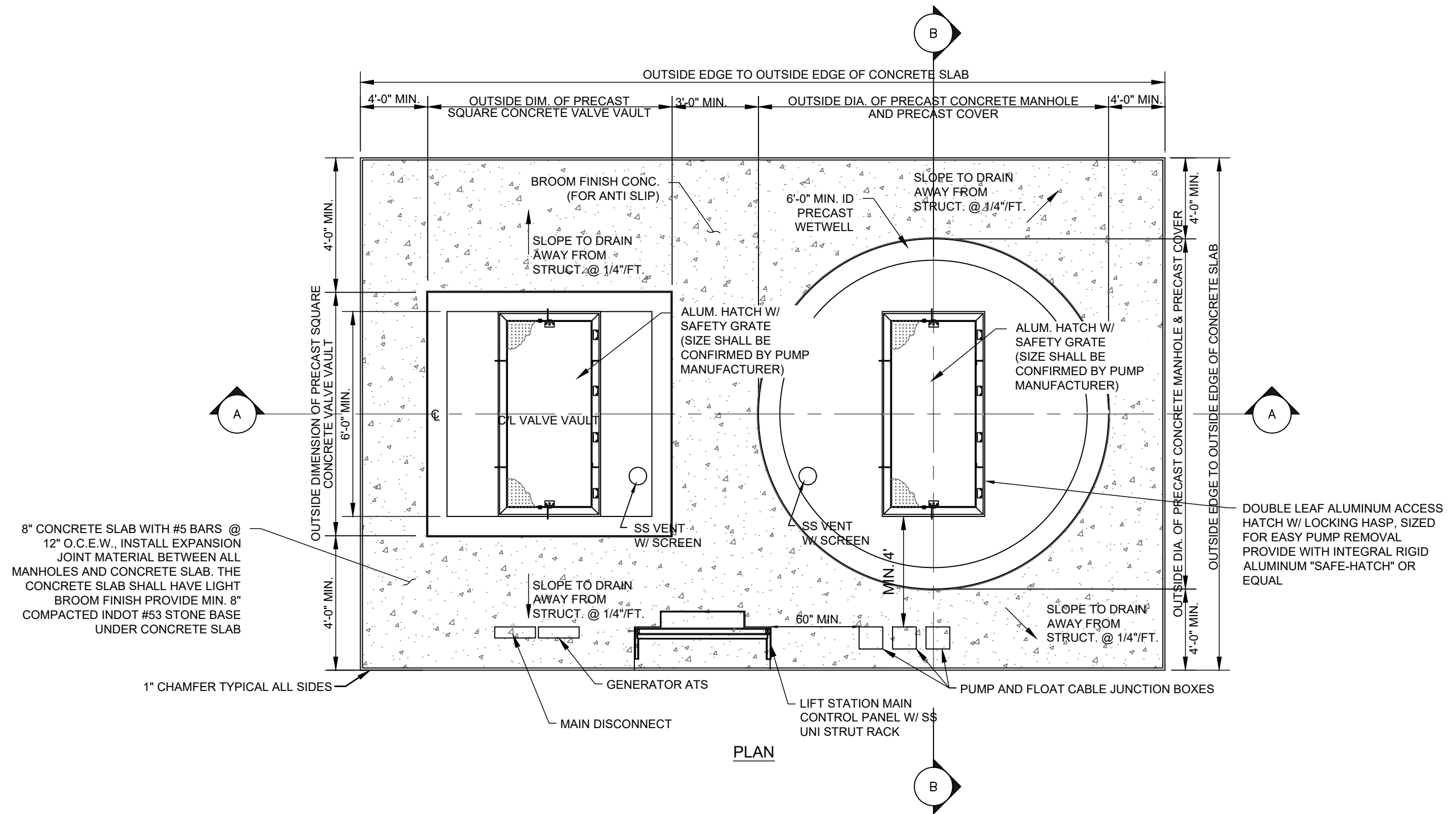
REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPICAL CONTROL PANEL LOCATION

STANDARD DETAILS

LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	35



8" CONCRETE SLAB WITH #5 BARS @ 12" O.C.E.W., INSTALL EXPANSION JOINT MATERIAL BETWEEN ALL MANHOLES AND CONCRETE SLAB. THE CONCRETE SLAB SHALL HAVE LIGHT BROOM FINISH PROVIDE MIN. 8" COMPACTED INDOT #53 STONE BASE UNDER CONCRETE SLAB

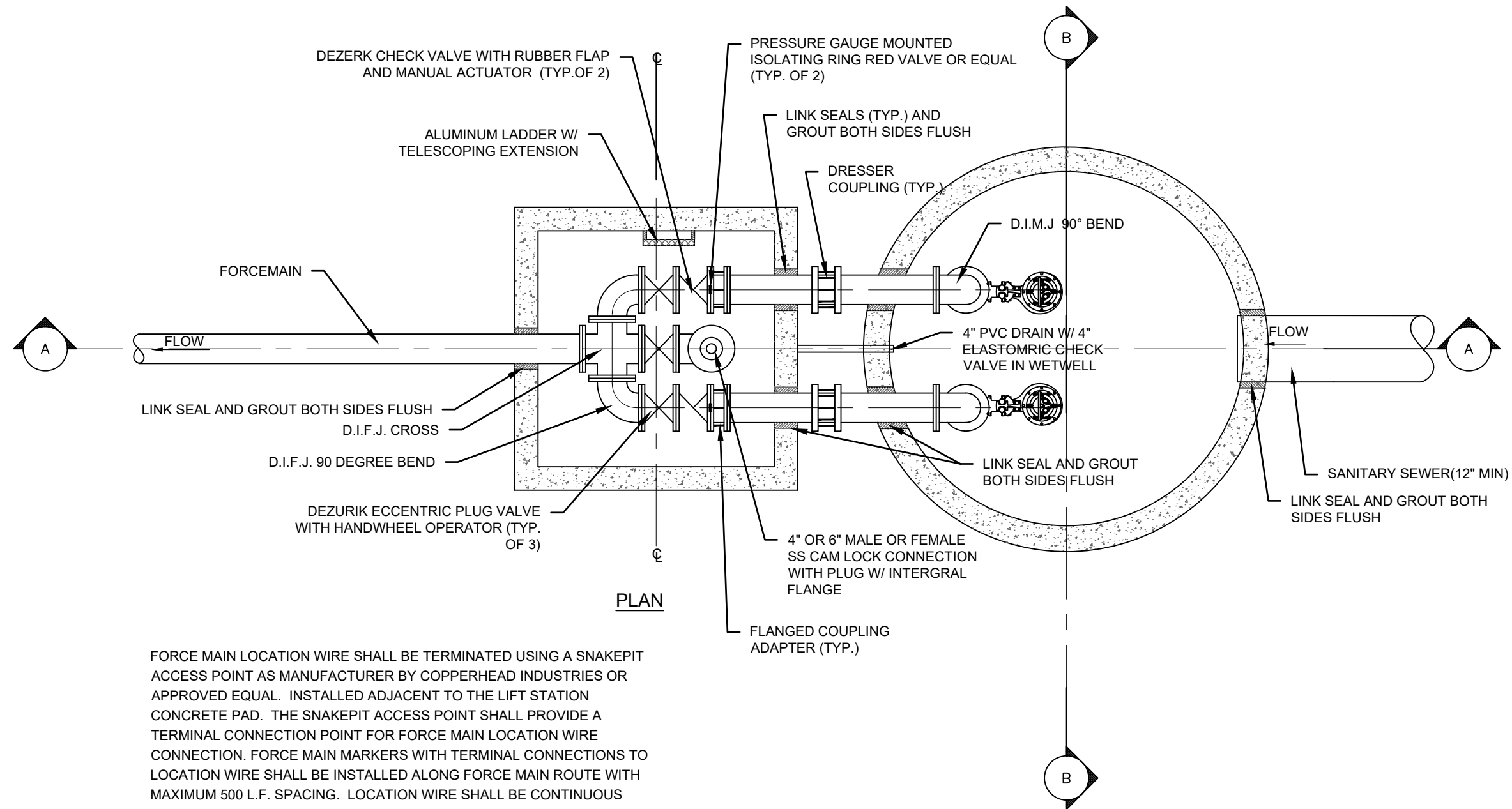
DOUBLE LEAF ALUMINUM ACCESS HATCH W/ LOCKING HASP, SIZED FOR EASY PUMP REMOVAL PROVIDE WITH INTEGRAL RIGID ALUMINUM "SAFE-HATCH" OR EQUAL

PLAN

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "I" LIFT STATION GENERAL CONFIGURATION
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24
 SCALE: NTS
 SHEET NO. 36

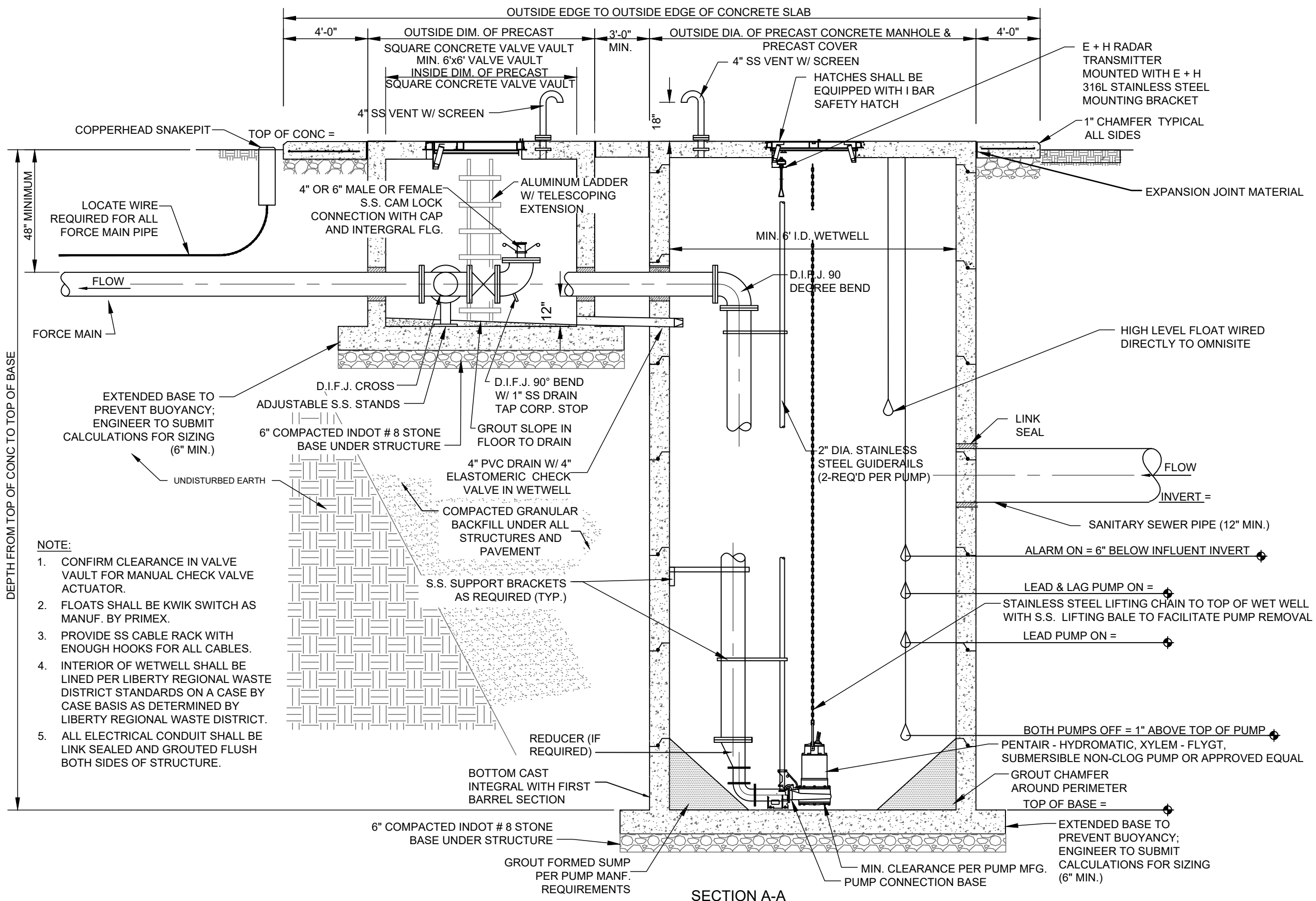


FORCE MAIN LOCATION WIRE SHALL BE TERMINATED USING A SNAKEPIT ACCESS POINT AS MANUFACTURER BY COPPERHEAD INDUSTRIES OR APPROVED EQUAL. INSTALLED ADJACENT TO THE LIFT STATION CONCRETE PAD. THE SNAKEPIT ACCESS POINT SHALL PROVIDE A TERMINAL CONNECTION POINT FOR FORCE MAIN LOCATION WIRE CONNECTION. FORCE MAIN MARKERS WITH TERMINAL CONNECTIONS TO LOCATION WIRE SHALL BE INSTALLED ALONG FORCE MAIN ROUTE WITH MAXIMUM 500 L.F. SPACING. LOCATION WIRE SHALL BE CONTINUOUS BETWEEN LOCATION MARKERS (NO SPLICING). COORDINATE MARKER LOCATIONS WITH THE LIBERTY REGIONAL WASTE DISTRICT. STATION SHALL BE EQUIVALENT TO HANDLEY INDUSTRIES MODEL PMP 7CE WITH LID C2. THE FOLLOWING INFORMATION SHALL BE CLEARLY PRINTED ON FORCE MAIN MARKER POST: "LIBERTY REGIONAL WASTE DISTRICT", "SANITARY SEWER LINE BURIED BELOW", "EMERGENCY CONTACT 765-282-9754" AND "CAUTION SEWER PIPELINE". CONTRACTOR SHALL LOCATE ALL PIPE IN PRESENCE OF LIBERTY REGIONAL WASTE DISTRICT REPRESENTATIVE FOLLOWING COMPLETION OF CONSTRUCTION.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "I" LIFT STATION GENERAL CONFIGURATION
 STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24
 SCALE: NTS
 SHEET NO. 37

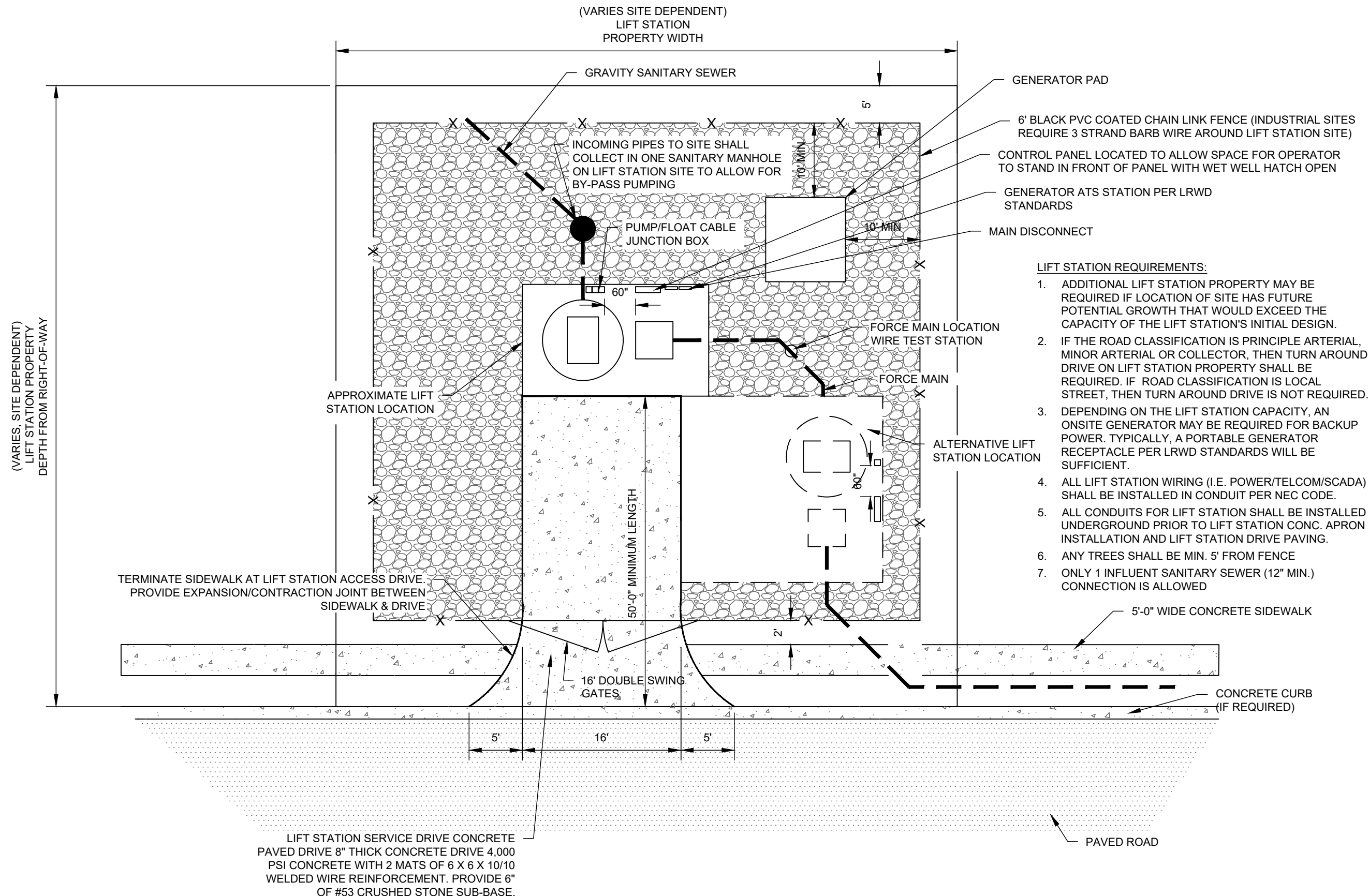


- NOTE:**
1. CONFIRM CLEARANCE IN VALVE VAULT FOR MANUAL CHECK VALVE ACTUATOR.
 2. FLOATS SHALL BE KWIK SWITCH AS MANUF. BY PRIMEX.
 3. PROVIDE SS CABLE RACK WITH ENOUGH HOOKS FOR ALL CABLES.
 4. INTERIOR OF WETWELL SHALL BE LINED PER LIBERTY REGIONAL WASTE DISTRICT STANDARDS ON A CASE BY CASE BASIS AS DETERMINED BY LIBERTY REGIONAL WASTE DISTRICT.
 5. ALL ELECTRICAL CONDUIT SHALL BE LINK SEALED AND GROUTED FLUSH BOTH SIDES OF STRUCTURE.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "I" LIFT STATION GENERAL CONFIGURATION
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24
SCALE: NTS
SHEET NO. 38

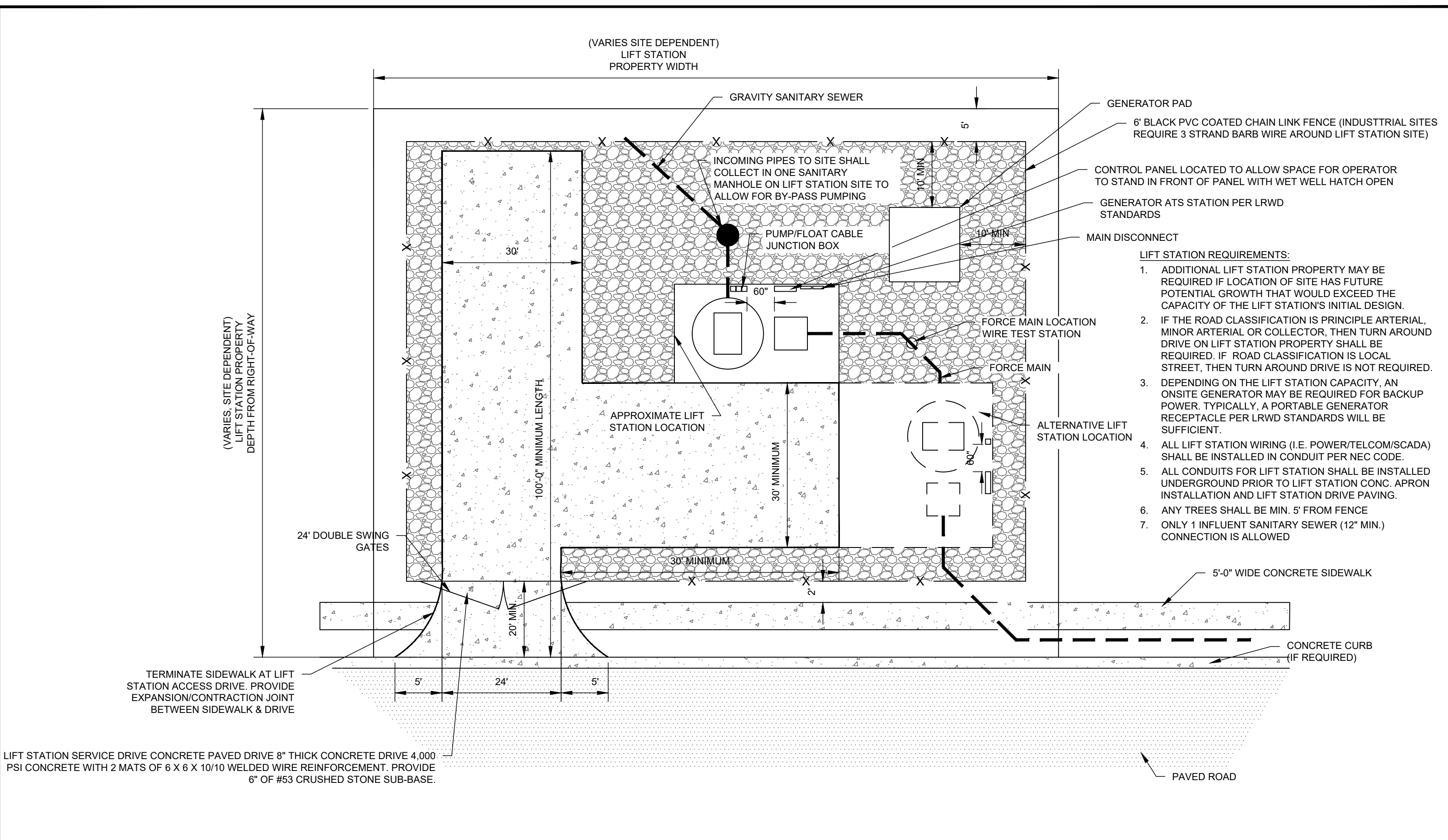


- LIFT STATION REQUIREMENTS:**
1. ADDITIONAL LIFT STATION PROPERTY MAY BE REQUIRED IF LOCATION OF SITE HAS FUTURE POTENTIAL GROWTH THAT WOULD EXCEED THE CAPACITY OF THE LIFT STATION'S INITIAL DESIGN.
 2. IF THE ROAD CLASSIFICATION IS PRINCIPLE ARTERIAL, MINOR ARTERIAL OR COLLECTOR, THEN TURN AROUND DRIVE ON LIFT STATION PROPERTY SHALL BE REQUIRED. IF ROAD CLASSIFICATION IS LOCAL STREET, THEN TURN AROUND DRIVE IS NOT REQUIRED.
 3. DEPENDING ON THE LIFT STATION CAPACITY, AN ONSITE GENERATOR MAY BE REQUIRED FOR BACKUP POWER. TYPICALLY, A PORTABLE GENERATOR RECEPTACLE PER LRWD STANDARDS WILL BE SUFFICIENT.
 4. ALL LIFT STATION WIRING (I.E. POWER/TELCOM/SCADA) SHALL BE INSTALLED IN CONDUIT PER NEC CODE.
 5. ALL CONDUITS FOR LIFT STATION SHALL BE INSTALLED UNDERGROUND PRIOR TO LIFT STATION CONC. APRON INSTALLATION AND LIFT STATION DRIVE PAVING.
 6. ANY TREES SHALL BE MIN. 5' FROM FENCE
 7. ONLY 1 INFLUENT SANITARY SEWER (12" MIN.) CONNECTION IS ALLOWED

REVISIONS			
NO.	DESCRIPTION	DATE	BY

LIFT STATION SITE LAYOUT I
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24
SCALE: NTS
SHEET NO. 39



(VARIES SITE DEPENDENT)
LIFT STATION
PROPERTY WIDTH

(VARIES, SITE DEPENDENT)
LIFT STATION PROPERTY
DEPTH FROM RIGHT-OF-WAY

- GENERATOR PAD
- 6' BLACK PVC COATED CHAIN LINK FENCE (INDUSTRIAL SITES REQUIRE 3 STRAND BARB WIRE AROUND LIFT STATION SITE)
- CONTROL PANEL LOCATED TO ALLOW SPACE FOR OPERATOR TO STAND IN FRONT OF PANEL WITH WET WELL HATCH OPEN
- GENERATOR ATS STATION PER LRWD STANDARDS
- MAIN DISCONNECT

LIFT STATION REQUIREMENTS:

1. ADDITIONAL LIFT STATION PROPERTY MAY BE REQUIRED IF LOCATION OF SITE HAS FUTURE POTENTIAL GROWTH THAT WOULD EXCEED THE CAPACITY OF THE LIFT STATION'S INITIAL DESIGN.
2. IF THE ROAD CLASSIFICATION IS PRINCIPLE ARTERIAL, MINOR ARTERIAL OR COLLECTOR, THEN TURN AROUND DRIVE ON LIFT STATION PROPERTY SHALL BE REQUIRED. IF ROAD CLASSIFICATION IS LOCAL STREET, THEN TURN AROUND DRIVE IS NOT REQUIRED.
3. DEPENDING ON THE LIFT STATION CAPACITY, AN ONSITE GENERATOR MAY BE REQUIRED FOR BACKUP POWER. TYPICALLY, A PORTABLE GENERATOR RECEPTACLE PER LRWD STANDARDS WILL BE SUFFICIENT.
4. ALL LIFT STATION WIRING (I.E. POWER/TELCOM/SCADA) SHALL BE INSTALLED IN CONDUIT PER NEC CODE.
5. ALL CONDUITS FOR LIFT STATION SHALL BE INSTALLED UNDERGROUND PRIOR TO LIFT STATION CONC. APRON INSTALLATION AND LIFT STATION DRIVE PAVING.
6. ANY TREES SHALL BE MIN. 5' FROM FENCE
7. ONLY 1 INFLUENT SANITARY SEWER (12" MIN.) CONNECTION IS ALLOWED

24' DOUBLE SWING GATES

TERMINATE SIDEWALK AT LIFT STATION ACCESS DRIVE. PROVIDE EXPANSION/CONTRACTION JOINT BETWEEN SIDEWALK & DRIVE

LIFT STATION SERVICE DRIVE CONCRETE PAVED DRIVE 8" THICK CONCRETE DRIVE 4,000 PSI CONCRETE WITH 2 MATS OF 6 X 6 X 10/10 WELDED WIRE REINFORCEMENT. PROVIDE 6" OF #53 CRUSHED STONE SUB-BASE.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

LIFT STATION SITE LAYOUT II
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE: 03/12/24
SCALE: NTS
SHEET NO. 40

LIFT STATION DESIGN DATA

DESCRIPTION	LIFT STATION ID NO. LS1	DESCRIPTION	LIFT STATION ID NO. LS1
	INITIAL DESIGN		INITIAL DESIGN
NUMBER OF DWELLINGS		NEMA STARTER SIZE	
GALLONS PER DAY PER RESIDENCE		CHECK VALVE SIZE (IN.)	
TOTAL AVERAGE DAILY FLOW (GPD)		PLUG VALVE SIZE (IN.)	
TOTAL AVERAGE FLOW (GPM)		VALVE VAULT DIMENSIONS	
PEAK FLOW RATE (GPM)		VALVE VAULT ACCESS HATCH SIZE	
PUMP FLOW RATE (GPM) * FUTURE		WETWELL INSIDE DIAMETER (FT.)	
FORCE MAIN DIAMETER (IN.)		WETWELL DEPTH (FT.)	
FORCE MAIN LENGTH (FT.)		WETWELL ACCESS HATCH SIZE	
FORCE MAIN VELOCITY (FT./SEC.)		VISUAL LIGHT & AUDIBLE ALARM	
C' VALUE		EMERGENCY GENERATOR MALE END CONNECTION	
FORCE MAIN HEAD LOSS (FT.)		BUILT-IN EMERGENCY GENERATOR TRANSFER SWITCH	
FORCE MAIN LIFT (FT.)		TOP OF LIFT STATION ELEVATION	
PUMP WEAR ALLOWANCE (FT.)		INFLUENT INVERT ELEVATION	
FITTING MINOR LOSSES (FT.)		BOTTOM OF LIFT STATION ELEVATION	
TOTAL DYNAMIC HEAD (FT.)		HIGH LEVEL ALARM ELEVATION	
MANUFACTURER		LAG PUMP ON ELEVATION	
MODEL NUMBER		LEAD PUMP ON ELEVATION	
PUMP HORSEPOWER		PUMP OFF ELEVATION	
PUMP SPEED (RPM)		VOL. BETWEEN OFF & LEAD PUMP ON (GAL.)	
IMPELLER DIAMETER (IN.)		DETENTION TIME @ TOTAL AVERAGE FLOW (MIN.)	
POWER SUPPLY			

NOTE:
DEVELOPER SHALL COMPLETE AND SUBMIT ABOVE TABLE TO LIBERTY
REGIONAL WASTE DISTRICT WHEN PLANNING A LIFT STATION.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

LIFT STATION DESIGN DATA
STANDARD DETAILS
LIBERTY REGIONAL WASTE DISTRICT

DATE:	03/12/24
SCALE:	NTS
SHEET NO.	41