

**STANDARD CONSTRUCTION SPECIFICATIONS
FOR SANITARY SEWERS
DIVISION 50
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**STANDARD CONSTRUCTION SPECIFICATIONS
FOR SANITARY SEWERS
DIVISION 50**

SECTION 50.01 GENERAL

This Section is to be applied and used for all Sections in Division 50.

Article 1.1 Scope of Work

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, material, transportation, handling and storage, and performing all operations necessary to complete the construction for pipe laying, jointing, and testing of sanitary sewers.

Construction is to be completed according to the Standard Details, Drawings, these specifications, and special provisions.

Requirements for earthwork including, but not limited to trench excavating and backfill are specified in Division 20 - Earthwork.

The Contractor is to locate and treat utilities as described in Division 10, Section 10.04, Article 4.17 – Utilities.

The Contractor, by providing a Bid Proposal and entering into a Contract with the Owner has found that the access, easements, rights-of-way, and other work areas designated in the Drawings are adequate to perform the work and/or the Contractor has secured additional work areas at their own expense that is included in the Bid Proposal to complete the work.

Additional areas secured by the Contractor from parties not associated with the Contract are to be memorialized in the form of a right of entry agreement between the Contractor and party having authority to enter an agreement for the work area. A copy of the right of entry agreement is to be provided to the Owner. The right of entry agreement is to extend the indemnification requirements found in the Contract to Contractor obtained work areas.

The Contractor is to restore the area of Work to preconstruction conditions or better except where shown different on the Drawings or required by the Contract Documents. Where preconstruction conditions cannot be obtained such as items that require growth to obtain height, thickness and other prized attributes then they are to be replaced with standard nursery stock ~~plant material~~ plant material of the same species and type that will grow back to preconstruction conditions and maintained in accordance with the Contract. The Contractor is to secure written approval by the Engineer for replacement material that does not match preconstruction conditions.

Where the requirements in this division ~~call-out~~ call for an Engineer and there is not anyone assigned the duties of the Engineer, then the Utility Company is to be consulted for direction.

Article 1.2 Applicable Standards

The most recent revision of the following standards are made a part of these Specifications:

AASHTO M45	Standard Specification for Aggregate for Masonry Mortar
AASHTO M306	Standard Specification for Drainage, Sewer, Utility, and Related Castings
ASTM A48	Specifications for Gray Iron Castings
ASTM A74	Standard Specification for Cast Iron Soil Pipe & Fittings
ASTM 438	Traverse Testing of Gray Cast Iron
ASTM A746	Specification for Ductile Iron Gravity Sewer
ASTM C14 or ASTM C14M [Metric]	Specification for Concrete Sewer, Storm Drain and Culvert Pipe
ASTM C76 or ASTM C76M [Metric]	Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
ASTM C150	Specification for Portland Cement
ASTM C206	Specification for Finishing Hydrated Lime
ASTM C443 or ASTM C443M [Metric]	Specification for Joints for Circular Concrete Sewer & Culvert Pipe, Using Rubber Gaskets
ASTM C478 or ASTM C478M [Metric]	Specification for Precast Reinforced Concrete Manhole Sections
ASTM C564	Standard Specifications for Rubber Gaskets for Cast Iron Soil Pipe & Fittings
ASTM C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes & Laterals
ASTM D256	Test Methods for D-C Resistance of Plastics and Electrical Insulating Materials
ASTM D2321	Recommended Practice for Underground Installation of Thermoplastic Sewer Pipe
ASTM D3034	Specification for Type of PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3035	Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
ASTM D3350	Specification for Polyethylene Plastic Pipe and Fittings Materials
AASHTO M45	Sand for Cement Mortar

AWWA C104/ ANSI A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105/ ANSI A21.5	Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
AWWA C110/ ANSI A21.10	Ductile-Iron and Gray-Iron Fittings, 3 inch through 48 inch, for Water and Other Liquids
AWWA C111/ ANSI A21.11	Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C151/ ANSI A21.51	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
AWWA C600	AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C901	Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch through 3 inch, for Water Service
AWWA C900 AWWA C905	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inch through 12 inch for Water Transmission and Distribution Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 inch through 48 inch for Water Transmission and Distribution
UPC	Uniform Plumbing Code, latest edition adopted by the Municipality, and current local amendments

Article 1.3 Surveys

Survey must be performed by the Contractor per Division 65 - Construction Survey. Survey is to be incidental to items under construction unless a pay item for Construction Survey Measurement is provided. The Contractor is to as-built and record at a minimum the following items based on the design survey horizontal and vertical control:

- Each pipe invert and length of pipe segment
- Manholes, inverts, cleanouts, service stubs
- Other buried utility conduits, vaults, ~~utilitiders~~utilidors, wires, manholes, catch basins
- Other utility surface features such as pedestals, junction boxes, power poles, light poles

Before working in developed ~~areas~~areas, the Contractor is to take photographs and video documenting existing conditions. Photographs are to include major construction areas and their boundaries as well as a zone fifty feet (50') outside the furthest anticipated impact. Photo and video documentation is incidental to the Work.

Article 1.4 Definitions

The definitions provided within this Article are supplemental to definitions provided in Division 10 and are to govern in the interpretation of all disputes. Industry standard definitions are to apply if a definition is not provided. Where a term, word or phrase has varying meanings, the Engineer will have final say on the interpretation.

Sewer Connection – sewer pipe and associated apparatuses from the point of connection to a collector, trunk or interceptor to the terminus of the Utility Company maintenance responsibility, usually the property or Utility Company easement.

Sewer Extension – sewer pipe and associated apparatuses from the terminus of the Sewer Connection to a point five feet outside the building foundation

Building Sewer – Sewer piping inside the building to five feet outside of the building foundation

Service – connection, extension and/or building sewer from the Utility Company sewer collection system to private property and typically to one structure

Collection system – series of pipes and structures to collect and convey sewer to a treatment facility

Collector – Typically 8” and larger sewer pipe where the majority of sewage is from individual services.

Trunk – Typically 12” and larger sewer pipe where the majority of sewage is from collectors.

Interceptor – Typically 24” and larger sewer pipe where the majority of sewage is from trunks and collectors to a point of treatment.

Article 1.5 Concrete and Mortar

A. Miscellaneous Concrete

All concrete used in the construction of sanitary sewer systems with the exception of precast manholes, manhole risers, cones, and reinforced concrete pipe is to be Class AA-3. Concrete Work is to conform to Division 30 - Portland Cement Concrete.

B. Mortar

Cement for mortar used in the construction of sanitary sewer systems is to conform with the requirements of ASTM C-150, Type II. Sand is to conform with the requirements of AASHTO M-45. The mortar is to be composed of one (1) part cement and three (3) parts sand. The addition of lime is not permitted. The use of five (5) minute or fast-cure mortar requires prior approval of the Utility Company prior to use.

Article 1.6 Payment - General

Payment for all Work included in this Division is to be paid for in accordance with Division 10, Section 10.07 - Measurement and Payment and includes full payment for all Work described.

SECTION 50.02 FURNISH AND INSTALL PIPE

Article 2.1 General

The Work under this Section consists of the performance of all operations pertaining to furnishing and installing pipe for sanitary sewer systems.

The Work under this Section consists of performing all Work required for furnishing and installing an operational piping system in a workman like manner meeting applicable standards. The Contractor is to install piping systems in accordance with these Specifications, manufacturer's recommendations, the Utility Company Design and Construction and Practice Manual and in conformity with the lines and grades as shown on the Drawings. Where the previously stated requirements are in conflict the more stringent requirement is to govern.

Article 2.2 Submittals

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. The Contractor is to clearly demarcate items to be incorporated into the Work. Submittals for pipe and fittings should include, but is not limited to the following information:

- Manufacturer pipe submittal cut sheets
- Manufacturer fitting submittal cut sheets
- Detectable underground warning tape and trace wire
- HDPE welder certificates (pressure sewer pipe only)
- Trace wire (pressure sewer pipe only)
- Anodes, anode connection systems, other corrosion protection components

Article 2.3 Materials

A. General

All piping is to be in accordance with the Contract Documents conforming to the size and class shown and specified. Changes in class are to be made within one-half of a pipe length of the station indicated on the Drawings. The use of pipe containing asbestos materials is prohibited.

Detectable underground warning tape is required for installation of all pipe types. Warning tape must not be less than five (5) mil, foil backed, six inches (6") wide vinyl tape, colored green, with "Caution Buried Sewer Line Below" continuously printed in black along the tape length.

B. Ductile Iron Pipe

Ductile iron pipe is to conform to ASTM A 746 (AWWA C 151) with a cement mortar lining conforming to AWWA C-104. Cast and ductile iron fittings and pipe bells are to conform to AWWA C110 or AWWA C-153. Rubber gasket joints for ductile iron pipe fittings are to conform to AWWA C-111.

C. Cast Iron Pipe

All cast iron pipe and fittings are to be hub and spigot service weight soil pipe conforming to the requirements of ASTM A74. Gaskets are to conform to the requirements of ASTM C564.

D. Concrete Pipe and Fittings

Reinforced concrete pipe and fittings must conform to the requirements of ASTM C 76. Non-reinforced concrete sanitary sewer pipe is to conform to ASTM C 14.

E. Concrete Pipe Joints

Joints for concrete pipe are to conform to ASTM C-14 and ASTM C-443. Joints are to be of the "O" Ring type and be subject to the approval of the Engineer as to configuration. All repair clamps are to be approved stainless steel clamps.

F. High Density Polyethylene Pipe (HDPE)

High Density Polyethylene Pipe (HDPE) and fittings are to be manufactured in accordance with AWWA C906. In addition to the requirements of AWWA C906, HDPE is to be manufactured from PE4710 polyethylene compounds that meet or exceed ASTM D3350 Cell Classification 445574. All HDPE pipe and fittings must be certified by the NSF for potable water service. HDPE pipe and fitting material compound are to contain color and ultraviolet (UV) stabilizer meeting or exceeding the requirements of Code C per ASTM D3350. Electrofusion fittings are not allowed. All fittings will have pressure class ratings not less than the pressure class rating of the pipe to which they are joined.

The pipe is to be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. It is to be uniform in color, opacity, density and other physical properties.

Butt fusion of the pipe and fittings is to be performed in accordance with the pipe manufacturer's recommendations as to equipment and technique. The fusion operation is to be performed by an individual who has demonstrated the ability to fuse polyethylene pipe in the manner recommended by the pipe supplier.

G. Polyvinyl Chloride Pipe (PVC)

Four inch (4") through twelve inch (12") Polyvinyl Chloride Pipe must conform to the requirements of AWWA C900 and as otherwise required by the Contract Documents. DR 18 pipe must be used for C900 PVC pipe, unless otherwise specified.

Fourteen inch (14") through sixteen inch (16") Polyvinyl Chloride Pipe must conform to the requirements of AWWA C900~~5~~ and as otherwise required by the Contract Documents. DR 21 must be used for C900~~5~~ PVC pipe, unless otherwise specified. Pipe greater than sixteen inches (16") in diameter will not be allowed unless approved by the Utility Company's Engineering Director.

H. Cleanouts

Building sewer cleanouts are to be restrained at the wye to the surface. Horizontal gravity piping systems does not need to be restrained.

I. Polyethylene Encasement

Polyethylene encasement material for pipe is to be eight (8) mils thick and conform to AWWA C105. Polyethylene encasement is to include a VBio film system incorporating corrosion control additives and MIC control additives as provided by US Pipe or approved equal.

J. Trace Wire

Tracer wire for sewer lines is to be #10 AWG high-strength copper clad steel with a 30-mil HDPE insulation jacket (color blue) and have a 600-pound average tensile break load. Tracer wire is to be manufactured by Copperhead Industries or an approved equal.

Grounding rods are to a minimum of twenty four inches (24") long and copper clad.

The direct burial grounding clamps are to be EK17 as manufactured by Erico or approved equal.

All splice connections are to be constructed using 3M DBR watertight connectors, or approved equal.

DryConn Waterproof Direct Bury Lugs as manufactured by King Innovation, or approved equal, are to be used to splice into the main line tracer wire.

K. Material Limitations

Cast iron pipe may be used for repairs that are less than ten feet (10') long for sewer extensions.

Repair clamps or pipe couplers are to ~~to be~~ constructed of stainless steel components with ridged with at least three inches (3") bearing on each side of the coupled pipe joint. Couplers may be, but not limited to, the ROMAC LSS1, 2, & 3's, Powerseal's 3121CS series and Ford FS1 series. The coupler limitation is being required to prevent pipe joint offsets inside of the fittings.

Couplers such as solid sleeve, alpha, macro hp and others that allow for pipe offsets within the coupler require pre-approval and more intensive inspection requirements by the Utility Company and the Engineer.

Article 2.4 Construction

A. Excavation and Backfill

Excavation and backfill for furnishing and installing of sanitary sewer pipe is to be in accordance with Division 20, Section 20.13 - Trench Excavation and Backfill.

The Contractor must remove and dispose of all sewage-saturated soils encountered within the trench area. All sewage-saturated soils are to be considered unsuitable material, not to be used as fill material anywhere within the Municipality and must be disposed of at the Municipal Landfill. There is to be no separate payment and is considered incidental to the pay item under construction for removal and disposal of sewage-saturated soils.

B. Pipe Grade and Alignment

Piping is to be laid at the grade and alignment shown on the Drawings. For projects that do not require Drawings, the Contractor must ensure a functioning sanitary sewer system meeting the minimum separation, slope and burial requirements.

Minimum slopes for gravity sewers are as follow:

<u>Pipe Diameter</u>	<u>Slope</u>	
4"	2.08%	.0208 feet per foot
6"	1.00%	.0100 feet per foot
8"	0.40%	.0040 feet per foot
10"	0.28%	.0028 feet per foot

The minimum standard depth of bury for gravity sewer is eight feet (8'). Where this cannot be achieved, the sewer pipe is to be laid at the minimum slope to achieve the greatest depth of bury possible. Where the depth of bury is reduced to five and one-half feet (5 ½'), but greater than four and one-half feet (4 ½') the sewer pipe is to be ~~fully encapsulated with a minimum of three inches of rigid foam~~insulated in compliance with the Utility Company's standards. Pressure sewer is to have a minimum cover of ten feet (10') with no reduction allowance for insulation.

Pipe installation with less than minimum separation, slope, or bury will be cause for rejection.

Allowable variances for individual pipe sections from established line and grade must not be greater than those listed in the table below, provided that such variance does not result in a level or reverse sloping pipeinvert.

<u>Diameters</u> <u>(Inches)</u>	<u>Allowance Tolerance</u> <u>(Feet)</u>
8-12	0.03
14-16	0.04
18+	0.05

During the progress of the Work, the Contractor shall provide instruments such as transits, levels, laser devices, and other facilities for transferring grades from offset hubs or for setting of batter boards or other construction guides from the control points and bench marks ~~provided by the Contractor~~. The Contractor is to provide qualified personnel to use such instruments and who have the duty and responsibility for placing and maintaining such construction guides.

Backfill over a section of pipe to provide a platform for transit, level alignment and grade observations is subject to the approval of the Engineer. If intermittent backfilling is allowed, backfilling is to be accomplished in accordance with Division 20, Section 20.13 - Trench Excavation and Backfill.

C. Pipe Laying

In all cases pipe installation is to proceed from lower to higher elevations with the spigot ends of the pipe at the lower end of each pipe segment. Each pipe is to be laid true to line and grade. Joints may not deflect or be offset. The alignment of the installed pipe is to appear visually straight so that a full circle of light can be seen between manholes.

Each section of pipe is to be handled carefully, placed accurately; and joined in accordance with the pipe manufacturer's recommended standards. Each section of pipe is to be properly supported to ensure true alignment and an invert which is smooth and free from roughness or irregularity.

The Contractor is to stagger the joints for sanitary sewer pipe such that no sewer pipeline joint is closer than nine feet (9') measured horizontally (outside of pipe to outside of pipe) from its intersection with water mains encountered in the Work.

The Contractor shall take every precaution to preclude foreign debris from entering the sanitary sewer system. Temporary screening techniques of the downstream manholes proposed for use by the Contractor must first be reviewed and approved by the Engineer prior to their use in the Work. ~~Contractor~~The Contractor is responsible for removing and cleaning any foreign debris that enters the sanitary sewer system. All costs associated with the removal of foreign debris from the sanitary sewer system resulting from the Contractor's activities is considered incidental to the Contract.

At all times, when Work is not in progress, open ends of pipe and fittings are to be securely and satisfactorily closed so that no undesirable substance will enter the pipe or fittings.

The pipe is to be laid in trenches when the trench bottom and sides to one foot (1') above the pipe are in a thawed state. The trench is to be ~~immediate~~immediately backfilled with completely thawed material. The trench is to be backfilled at the end of the work shift during freezing and near freezing temperatures to prevent the pipe zone from freezing.

Tracer wire must be installed on all non-metallic pressure sewer pipes. Tracer wire must be brought to the surface near sewer structures.

The warning tape must be continuously laid with the pipe and be at least twenty four inches (24") and no more than thirty six inches (36") above the pipe.

D. Polyethylene Encasement

The polyethylene encasement is to be installed in strict conformance with Method A described in the most current editions of AWWA C105/ANSI A21.5 and the Ductile Iron Pipe Research Association's "A Guide for the Installation of Ductile Iron Pipe."

Bedding and backfill material around pipelines with polyethylene encasement is to be placed using protective measures such as shields, guards, coating systems, and/or other methods as needed to protect the polyethylene encasement from becoming torn, punctured or otherwise damaged during the Work. Damage to the integrity of the polyethylene encasement must be either repaired or the pipeline removed and the polyethylene encasement replaced as directed by the Engineer. Costs for repair and/or replacement of damaged polyethylene encasement is to be considered incidental to the installation of the polyethylene encasement and/or the installation of the pipeline protected by the encasement.

E. Bedding of Sanitary Sewer Pipe

All pipe is to be bedded with Class E bedding, unless another material is authorized in writing by the Utility Company. Bedding is to be laid the full width of the ditch and compacted to a minimum of ninety-five percent (95%) of the maximum density.

Sanitary sewer pipe bedding is to extend six (6) inches below and above the pipe and constructed in accordance with Standard Detail 20-8.

F. Laying Instructions for Concrete Pipe with "O" Ring Bell End Joint

To allow a watertight joint and to ensure an installation which will allow the pipe to perform as designed, the following recommendations of the pipe manufacturer are to be observed:

1. Spigot groove and bell surface is to be clean and free of foreign material.
2. Apply joint lubricant freely to the bell including the tapered surface and completely coat the rubber gasket.
3. After placing gasket in groove, run a small tool completely around between gasket and groove to equalize gasket stretch.
4. Exercise care at first contact of the pipe. Avoid bumping which may damage spigot. Stop any swaying motion before contact is made.
5. To couple pipe, insert spigot slowly and carefully straight into bell, to allow the gasket to cushion the initial contact and center the spigot as it enters the tapered portion of the bell.
6. Completed joints should have spigot inserted into the bell in conformance with the pipe manufacturer's recommendations. Sewer collectors are to be laid in a straight run with no deflections or alignment changes except at manholes. Sewer services alignment changes are to happen through fittings.
7. Check all around pipe for rolled or "fish mouthed" gaskets after coupling.
8. Do not pick up and drop coupled pipe to adjust grade.
9. Ensure that the pipe is not supported only at the bell nor is the pipe barrel resting on a high spot. The bottom quarter of the pipe is to be uniformly supported through its length in order for the pipe to resist the design loads.

G. Laying Instructions for Other Pipe

All other pipe is to be laid in accordance with the manufacturer's published recommendations and as directed by the Engineer.

Article 2.5 Testing

A. General

The Contractor is to provide all materials, equipment and labor related to testing that is acceptable to the Engineer and Utility Company. Testing, retesting, and any required repairs to pass testing of the installed sewer pipe is an obligation of the Contractor to perform and is incidental to the bid item under construction. After

testing, if repairs are needed then the previous testing will be considered void and the segment of pipe in which the repair took place is to be retested.

The Contractor may test any portion of the installed sewer pipe at any time for their convenience, but acceptance testing is to be performed in the presence of the Engineer or Inspector and a Utility Company representative. The Engineer will provide the Contractor written confirmation that acceptance testing is satisfactory.

All sanitary sewer pipe installed is subject to either an infiltration test or an exfiltration test and lamping or CCTV inspection.

The Contractor is to clean and flush all sanitary sewer pipe installed prior to testing and substantial completion inspection. Testing for the purpose of acceptance will be done after trenches are backfilled, planned surrounding utilities have been installed and the road structural section is in place. It is recommended to complete testing prior to installation of curb and gutter and pavement.

Pneumatic Exfiltration testing is the standard method of testing. Exfiltration and Infiltration testing using water may occur when requested by the Contractor and if the Engineer and the Utility Company finds that the groundwater and soil conditions are satisfactory to complete an infiltration test.

All wyes, tees, and pipe ends are to be plugged or capped and secured to withstand the test pressures. Plugs or caps are to be readily removable and their removal is to provide a bell suitable for extending the sanitary sewer extension.

The Contractor shall take precautions to prevent sewage from entering the new sanitary sewer pipeline until it has been inspected, tested and accepted for operation by the Engineer. The Contractor may request inspection, testing and acceptance of incremental segments of the Work. An incremental segment is considered buried sewer pipe between two completed manholes.

Before the Contractor requests the Inspector to perform conformance testing on any portion of the Work, the Contractor is to complete tests and observations to assuage themselves that the Work is ready for inspection. At the discretion of the Engineer, the Contractor will be required to pay for all Owner related costs associated with conformance testing when the inspection fails more than once.

B. Hydrostatic Exfiltration Test

Upon completion of a section of sanitary sewer between manholes the Contractor is to plug all ends of the pipe, including service piping prior to commencing testing.

A minimum head of six feet (6') of water above the crown at the upper end of the test section is to be maintained for a period of four (4) hours during which time it will be presumed that full absorption of the pipe body has taken place and thereafter for a further period of one (1) hour for the actual test of leakage. During this one-hour period, the measured loss must not exceed the rate of fifty (50) gallons per inch diameter per mile per twenty-four (24) hours.

The above listed leakage rate is also to be applied to infiltration from ground water and infiltration or exfiltration in greater amounts will be cause for rejection of the sanitary sewer.

The maximum length of sanitary sewer for the above allowable leakage test is one thousand feet (1,000'). If it is not apparent that leakage test results between any two (2) manholes is satisfactory, then the Engineer may require subsequent tests to establish the more exact location of the leakage areas. Any section of sanitary sewer between any two (2) manholes that does not meet the above requirements will be rejected.

C. Low Pressure Pneumatic Exfiltration Test

Safety braces are required to hold plugs in place and to prevent a sudden release of compressed air. Due to the large forces that could be exerted by an escaping plug during the testing of the pipe, workmen must not be allowed in the manholes in which plugs have been placed while internal pipe pressure is above atmospheric pressure. ~~Such~~ Such as while testing is in progress. The Contractor's testing equipment is to be arranged in such a manner that a pressure relief device will prohibit the pressure in the pipeline from exceeding ten pounds per square inch (10 PSI).

All air used to pressure up the line being tested is to pass through a single above ground control panel. The above ground air control equipment is to include a shut-off valve, pressure relief valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range from 0 to at least 10 PSI and no more than 20 PSI. The continuous monitoring gauge is to be no less than three inches (3") in diameter with a minimum division of 0.5 PSI and an accuracy of plus or minus three percent ($\pm 3\%$) (Miljoco Part # P3508L-02 or equal). Two separate hoses connected to their own dedicated plug connection are to be used to:

- connect the control panel to the sealed line for introducing low-pressure air, and
- a separate hose connection for constant monitoring of air pressure build-up in the line.

Air is to be slowly supplied to the test section until the internal air pressure reaches four (4.0) pounds per square inch. Where the groundwater table is above the sewer test section, then the air test pressure is ~~to be increased~~ increased by the head of ground water above the lowest invert of the test section to a maximum test pressure of 9 PSI. A conversion of 0.43 PSI/ft of head is to be used to convert head pressure to PSI. At least two (2) minutes will be allowed for temperature stabilization before proceeding further.

To obtain the groundwater table height above the lowest invert of the pipe; the Contractor is to install a temporary slotted 3/4" PVC pipe at the exterior of ~~the all~~ manholes. The ground water level will be measured ~~from the pipe~~ after a minimum of forty-eight hours (48hrs) have passed ~~from the~~ after installation to allow the ground water to reach equilibrium. The Contractor, as witnessed by the Inspector, is to measure the ground water level. After completion of the testing, the PVC pipe is to be cut off 1' below grade and buried.

When temperatures have been equalized and the pressure stabilized at 4.0 PSI plus the groundwater pressure increase, the air hose from the control panel to the air supply is to be disconnected. The pressure is to be decreased through bleeding

to the test pressure ~~which is to be~~ 3.5 PSI plus the groundwater pressure increase. Upon reaching the test pressure the Inspector is to begin timing with a stopwatch.

If the pressure drops 1.0 PSI before time expires as found in the table ~~below~~, then the section undergoing testing has failed and must be repaired and/or retested.

Table 1

Nominal Pipe Diameter (Inches)	Minimum test time by length (Minutes:Seconds Minutes: Seconds)							
	100ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47 21:47	25:38
16	14:10	19:13	25:38	32:03	38:27	44:52	51:16	57:41
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
20	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33

If a pipe diameter is not list in Table 1, then the Contractor is to request, receive and follow the direction provided by the Engineer.

Pipes that are thirty-six inches (36") in diameter or larger at the option of the Contractor, may reduce the testing requirements to joints only.

D. Infiltration Test

Infiltration testing may be allowed at the Engineer's option when the natural ground water table is six feet (6') above the crown of the higher end of the test section. The maximum allowable limit for infiltration is not to exceed the rate of fifty (50) gallons s per inch diameter per mile per twenty-four (24) hours.

The Engineer may require the Contractor to repair obvious leaks even though the total leakage of the test section falls within the maximum allowable leakage for the test used.

E. Check Line and Grade

After backfilling and cleaning, but before final acceptance, all sections of installed line are to be checked for line and grade. At the request of the Contractor, the Utility Company inspector will lamp the sewer line to check line and grade after the Contractor makes the lines accessible and safe. A full circle of light must be seen, and no pipe misplaced in line or grade. A physical inspection of the

interior of all sanitary sewer lines thirty inches (30") in diameter and above will be made before acceptance. Any excess deviation in line and grade must be corrected by the Contractor prior to Final Acceptance of the Project.

~~Excluding service connections, a~~All size sanitary sewer pipes thirty inches (30") and smaller in diameter may be checked for line and grade by closed circuit television per the corresponding requirements in the Contract Documents.

Sewer Services lines of all sizes that do not have manholes at both ends of a pipe segment cannot be checked for line and grade by lamping. In such cases, the line and grade may be checked by the Contractor utilizing CCTV.

Article 2.6 Measurement

Measurement for furnishing and installing sewer pipe is to be per linear foot of horizontal distance of the various sizes as set forth in the Bid Schedule. Measurement will be from center to center of manholes or from center of manhole to center of cleanout, bend or fitting. Polyethylene encasement will not be measured for payment.

Article 2.7 Basis of Payment

Payment for this Work is to be as specified in Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Testing and any required repairs to pass testing of the installed sewer pipe is an obligation of the Contractor to perform and is incidental to the bid item under construction.

Unless specifically identified for payment under a separate bid item, the unit price bid for Furnish and Install Pipe (size, shape, type material, class, and/or gauge) includes all labor, equipment, and materials to furnish and install a functional sanitary sewer system including but not limited to the following incidental items:

- polyethylene encasement;
- asphalt surfacing removal and/or replacement;
- concrete sidewalk removal and/or replacement;
- curb, and/or gutter removal and replacement;
- clearing and grubbing;
- trench excavation, backfill and compaction;
- excavation dewatering;
- trench support system;
- furnishing and installing Class E pipe bedding;
- installation of pipe, fittings, adapters, or other necessary appurtenances;
- surveying;
- testing;
- disposal of unusable or surplus material;
- protection, bracing and/or shoring of existing utilities;
- restoration of existing drainage patterns;
- removal and replacement of existing culverts, fences, landscaping, and other public or private improvements or natural features impacted by the Work;
- finish grading;

- cleanup

Unit cost payment is to be made on the following basis:

ITEM	UNIT	
Furnish and Install Pipe (Nominal Size, Material)		Linear Foot

SECTION 50.03 SANITARY SEWER CONCRETE STRUCTURES

Article 3.1 General

The Work under this Section consists of the performance of all operations pertaining to the construction and installation of sanitary sewer manholes, vaults, dry wells, wet wells and discharge structures, complete with frames and covers.

Article 3.2 Submittals

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. The Contractor is to clearly demarcate items to be incorporated into the Work. Submittals for concrete structures and components are to include at a minimum the following information:

A. Structure Shop Drawing:

1. Manhole or structure identification that matches plan labeling
2. Elevation, size and location of penetrations. Elevations may be from a common reference point that can be translated back to the construction Drawings.
3. Number, height, width of grade rings
4. Number and height of risers
5. Type and height of cone
6. Ability to calculate the elevation of the manhole from the bottom of the manhole base to rim of casting
7. Reinforcing type and placement for all concrete components
8. Ladder rung type, size and placement
9. Exterior and interior diameter or dimensions

B. Components

1. Cast in place resilient connectors between reinforced concrete manhole structures and pipe (boot connectors)
2. Casting, size, type, lettering, load ratings, certifications and locking mechanism (if specified)
3. Concrete mix design and compression testing (ASTM C497) of concrete cylinder samples that are representative of the mix design used in the construction of the manhole components that have been completed within thirty (30) days of casting the manhole
4. Access port(s) size, type, load rating, and certification

C. Coatings and Waterproofing

- ~~1.~~ 1. External coatings
- ~~2.~~ 2. Internal and external joint sealer
- ~~3.~~ 3. Internal coatings when required

4. Concrete admixture

D. Cast in place sewer structures

Submittal of formwork and shoring plan that is prepared by a qualified designer

Article 3.3 Material

A. Sewer structures, manhole cones, risers, bases and grade rings

Materials used in the construction of manholes is to conform to the requirements of ASTM-C-478 (AASHTO-199), these specifications and the Standard Details.

Concrete is to be of a suitable mixture of aggregates, cement, and water to achieve a 28-day break strength of 4,000 psi per ASTM C39. Maximum aggregate size is to be no greater than one and one-half inch (1-1/2"), one fifth (1/5) the wall thickness and 1/2 of the minimum space between reinforcement to other reinforcement or forms.

Mortar is to be composed of one (1) part cement and three (3) parts sand. Sand must conform to AASHTO Specification M-45. Only enough water is to be added to provide plasticity in placing the mortarmortar.

Cement is to conform to ASTM C150 Type II or Type III. The water to cement ratio isdoes not to exceed 0.53 by weight.

Concrete for manhole flow channel forming is to be Class A-3 concrete per Division 30.

Reinforcement steel must conform to the requirements of ASTM A-1064, ASTM A-615, Grade 40 or 60 steel, or ASTM A706, Grade 60 steel, and the Standard Details. Reinforcement steel is to be installed through the transition from the base to the vertical walls of the manhole.

Cones are to be eccentric, unless otherwise approved.

The base is to be integrally cast with the first section for all manholes and structures, except for horseshoe and type C manholes.

Grade rings are to be a minimum of three inches (3") thick and provide a clear opening that is at least as large as what the casting provides.

B. Castings

Frames and covers are to conform to the Standard Details, meet the requirements of ASTM A-48, and be rated Heavy Duty (H-20 loading minimum). Gray cast iron is to have a minimum tensile strength of 30,000 pounds per square inch (PSI).

Castings placed within airport properties and other heavy load areas are to be specified in the special provisions to resist loading forces associated with those areas.

Gray iron castings are to have appropriate certifications and be individually marked in accordance with the requirements of AASHTO M-306. Castings which do not possess appropriate AASHTO M-306 certifications and markings must be replaced by the Contractor at no expense to the Owner.

C. Access portals

Access portals are concrete structure opening covers other than frames and covers and typically cover large rectangular aluminum hatches into wet and dry wells. Access portals are to be as specified in the special provision.

D. Coatings and Waterproofing

External cold joint sealant is to be WrapidSeal (18" wide), manufactured by CCI Pipeline Systems, Viscotaq ViscoWrap (12" wide) or approved equal for external joint sealing.

GMX Ultra-Shield WB, or approved equal for exterior buried concrete structure ~~coatings~~coatings.

Clear or opaque 8-mil polyethylene tube or sheeting for encasement.

Cold joint gaskets are to be Ram-Nek preformed concrete joint sealant by Henry Company, Inc., Viscotaq ViscoPaste (1/2"x1" profile) or equal

Internal coatings are to be resistant to low PH (1.5), bond well to concrete, and withstand submersion in industrial sewerage, such as but not limited to a 150 mil thick Carboline "Semstone 140" 100% solids, high performance epoxy liner system with primer.

E. Pipe Connections to new manholes (boots)

Material and manufacture of waterstops is to conform to applicable provision of the ASTM Standard Specifications for Resilient Connectors between Reinforced Concrete Manhole Structure and Pipes, ASTM C923. Pipe connectors' metallic components are to be stainless steel.

Z Lok Connector by A•Lok® Products Inc. or equal is to be cast integral with the concrete structure.

G3 Boot by A•Lok® Products Inc., Kor-N-Seal I and II, Wedge Style Pipe to Manhole connector or equal are to be used for core drilled penetrations.

F. Accessory components

Ladder rungs are to meet the requirements of ASTM C-478 and AASHTO M-199 constructed with Grade 60 rebar with copolymer polypropylene molded cover with footing grip pegs, contoured back side for fingers and reflective surface on each side of the rung visible from above, such as, but not limited to the polypropylene steps by Lane International Corporation.

G. Internal Drop Connect

Internal drop connect is to be a Reliner internal drop connect or equal. The drop connects are to be constructed of a fiberglass or plastic drop bowl, PVC pipe, PVC fittings, clamps, anchors, and restraints. The bowl material is to be resistant to damage from typical sewer discharge chemical and physical properties. Clamps, bolts and wedge anchors are to be made of stainless steel. The bowl to drop pipe connect is to be a flexible external pipe coupler (fernco or equal). The bowl is to be sized based on the inlet pipe.

Article 3.4 Construction

A. General

The precast concrete structure manufacturer is to provide timely notice (at least two working days in advance) to allow time for the Engineer to arrange for necessary inspections. Installation, of manhole sections will not be allowed without prior review by the Engineer. This approval does not relieve the Contractor of the responsibility for protection against damage during storage, handling and installation.

Precast manholes are to comply with ASTM C478 for acceptability, including but not limited to; cracks, dimension tolerances, acceptance testing submittals and surface defects caused by pour placement and vibrating of concrete into formwork, transportation and handling. Damaged joints may be accepted by the Engineer for incorporation into the work by written order. Additional damage ~~of joints~~to the joints will not be covered by a previous order of acceptance.

The exterior surfaces of newly installed structures are to have an exterior coating field or shop applied. The coating installation is to meet the coating manufacturer's recommendations.

Precast structures are to be lifted with rigging, hoists, and machinery appropriate for the application and must not damage the structure or exterior coatings. Lifting lugs, devices, and eyes are to be rated for anticipated applied loads. Lifting devices are to be removed and holes filled with mortar prior to backfill around the structure.

Structures are to be installed at the locations and elevations shown on the Drawings. The base section is to be set on a prepared firm and stable surface. The base section and remaining precast components are to be set true and plumb. The rim elevation is to be per the standard details. Each manhole must have a minimum of one (1) six inch (6") grade ring.

Ladder rungs for manholes must align on a bench and be located on an unobstructed side of the manhole. The last rung is to be within twelve inches (12") of the landing pad, the top rung is to be within eight inches (8") of the top of the cone and the spacing is to be twelve inches (12") on center.

Preformed gasket joint sealer is to be applied per the manufacturer's recommendation between each cold joint except for grade ring joints. Gaskets are to be trimmed on the inside of the manhole to prevent the excess gasket material from entering the sanitary sewer lines. Grade rings are to be bed in mortar. ~~Smearing of~~Smearing mortar to cover the joint on the inside of the grade ring will be cause for rejection. Heat shrink external joint sealer is to be applied per the manufacturer's recommendation over the casting, grade rings and over the eccentric cone joint.

Manholes and other unheated underground structures are to have a minimum of three (3) layers of 8-mil polyethylene encasement on the outside. The polyethylene encasement may be applied one layer at a time with three individual tubes, continuously wrapping, or three separate tape secured layers of polyethylene.

Polyethylene joints are to overlap a minimum of twelve inches and be secured with tape.

The boot pipe connector is to be installed so that leakage between the pipe and structure is eliminated. Pipe-to-structure boot connections are to fit snugly over a pipe and be cast integrally with the structure. The boot is to be held firmly against the pipe surface by means of a ~~stainless-steel~~stainless-steel mechanical take-up device which, when tightened, will compress the boot to provide a water tight fit. The mechanical take-up device is to remain accessible from the interior of the manhole. Pipes are to be stabbed into the structure through the boots such that at least two inches (2") but no more than three (3") of pipe extend past the inside face of the manhole.

When directed by the Engineer, the Contractor may core in new penetration(s) when in the opinion of the Engineer a pre-cast pipe penetration is not feasible. Boots for cored in pipe connectors are to be secured in place with stainless steel mechanical devices that will seal the rubber boot against the concrete structure. Mortar is not to be placed on the boot inside the structure.

Excavation and backfill for furnishing and installing sanitary sewer manholes is to be as specified in Division 20, Section 20.13 - Trench Excavation and Backfill. Type IIA or Class 'E' Bedding material is to be placed a minimum of three feet (3') outside the manhole and compacted to a minimum of 95% of the modified proctor.

In the case of poured-in-place manhole construction, if the Contractor elects to accomplish the manhole construction utilizing more than one continuous concrete pour, a keyed construction joint must be used. Pre-cast bases may not be used in conjunction with poured-in-place manhole sections.

B. Sanitary Sewer Manhole Flow Channel Construction

Sewer flow channels must be smooth and semicircular in shape providing a smooth flow path from inlet pipe(s) to the outlet pipe. Changes in directions of flow are to be made by forming a smooth radius that is sized to allow adequate access for a closed circuit camera (CCTV) and/or maintenance equipment into the served sanitary sewer pipe. Manhole benches at the top of the flow channels are to be smooth and slope towards the channels at a grade of one inch (1"/ft) per foot.

Channels may be formed during the manhole casting process or constructed after installation by trowelling the channels in place.

Where manholes are not being used to change alignment or grade the Contractor may lay a full stick of pipe through and centered in the manhole, place concrete around the pipe and then ~~breakout~~cleanly and carefully remove the top half of the pipe after the surrounding concrete has sufficiently set.

Horseshoe manhole channels are to be constructed by placing concrete around the existing pipe and troweling in channels for new pipe penetrations. When the concrete has sufficiently set, the existing pipe is to be cleanly and carefully removed to create a semicircular channel. ~~broken-out.~~

Where pipe is to be ~~broken-out~~removed, the Contractor is to capture and remove all pipe fragments.

The use of Transite or Asbestos Cement -(AC) pipe to form manhole inverts is ~~prohibited~~prohibited.

C. Beaver Slide Invert Construction

Beaver slides are to be constructed to provide a smooth continuous channel directed into and with the flow of the receiving sanitary sewer as shown in the Standard Details.

Beaver slides are required where the invert of the connecting sanitary sewer is above the crown of the receiving sewer and the drop in the manhole does not exceed the maximum height of ~~twenty-four~~twenty-four inches (24”).

D. External Drop Connect

Installation of an external drop connect is to be as shown in the Standard Details, Drawings and as specified.

Pipe and fittings are to be restrained and metallic which meet the requirements of Section 50.02 Furnish and Install Pipe. Over-excavation under a drop connection requires compaction of not less than ninety-five percent (95%) of the maximum density prior to installation of the pipe and fittings, or the concrete cradle. The lower invert of the exterior drop connect must be bedded in set concrete before backfill of the manhole is completed.

E. Internal Drop Connect

Installation of an internal drop connect is to be as provided in the manufacturer’s instructions, in these specifications, and as shown in the Standard Details and Drawings.

The drop bowl and pipe are to be anchored into the manhole wall with clamps attached with wedge anchors. The clamps are not to be spaced more than three feet (3’) and at each end. All metallic components of the internal drop connect are to be stainless steel.

One internal drop connect per manhole is allowed by the Utility Company.

F. Additional Depth for Manholes

This item is for construction of manholes deeper than twelve feet (12’). Additional depth to manholes is to be constructed per the Standard Details and Drawings.

Article 3.5 Measurement

Concrete structures are to be measured as units complete in place, including all component parts such as, but not limited to, pre-cast concrete sections, lids, frames, water proofing, coatings, joint sealants, ladders and flow channels.

Where the use of watertight frames and covers are specified on the Drawings they are to be measured separately.

When inverts of entering pipes are greater than one pipe diameter (nominal) higher than the existing ~~pipe~~pipe, invert beaver slides and external drop connects are to be measured separate from the concrete structure. Beaver Slides and External Drop Connects are to be measured as units, complete in place.

Depth of manholes will be based upon a measurement to the nearest foot, for payment purposes, from top of casting to the top of the base slab. All depths over the specified standard depth will be paid under "Additional Depth to Manholes."

Article 3.6 Basis of Payment

Payment for this Work will be as specified in Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Related component parts to the bid items under construction (including steps, etc.) as shown in the Standard Details and Drawings are incidental to that bid item.

Payment for ~~water tight~~watertight frames and covers represents the additional cost for the equipment and labor to provide a water tight frame and cover over the standard frame and cover included in the base bid for Construct Sanitary Sewer Manhole (type).

Unless specifically identified for payment under a separate bid item, the unit bid price includes all labor, equipment, and materials to furnish and install a functional sanitary sewer structure including but not limited to the following incidental items:

- asphalt surfacing removal and replacement;
- concrete sidewalk, curb, and/or gutter removal and replacement;
- clearing and grubbing;
- trench excavation and backfill;
- excavation dewatering; trench support system;
- furnishing and installing Class E pipe bedding; compaction;
- installation of pipe, fittings, adapters, or other necessary appurtenances;
- polyethylene encasement;
- surveying;
- testing; disposal of unusable or surplus material;
- protection, bracing and/or shoring of existing utilities;
- restoration of existing drainage patterns;
- removal and replacement of existing culverts, fences, landscaping, and other public or private improvements or natural features impacted by the Work;
- finish grading;
- cleanup

Payment is to be made on the following basis:

ITEM	UNIT
Construct Sanitary Sewer Manhole (Type)	Each
Additional Depth to Manhole (Type)	Vertical Foot
Concrete Sewer Structure (LxWxH – Wall Thickness)	Each
Construct Beaver Slide	Each
Construct External Drop Connect	Each
Construct Internal Drop Connect	Each
Watertight Manhole Frame and Cover	Each
Access Port (Material, Size)	Each

SECTION 50.04 SANITARY SEWER PIPE CONNECTIONS AND EXTENSIONS

Article 4.1 General

The Work under this Section consists of the construction of sewer sanitary sewer pipe to pipe connections, Sewer Connections and Sewer Extensions. Generally the following conditions are covered by this Section:

- Sewer service extension to service extension
- Sewer service extension to buried building sewer
- Sewer service connection to sewer service extension
- Sewer service connection to sewer collector
- Sewer service connection to sewer trunk
- Sewer service connection to sewer interceptor
- Sewer lateral to sewer interceptor

The Contractor shall take all necessary measures to ensure that connection to the existing sewer main does not damage the existing main. The connection is to be as shown on the Drawings except where existing pipe joints or other obstacles require location adjustments. Care shall be taken not to damage or move the existing sewer main while excavating to expose the existing pipe and determine the best connection location for the new pipe being connected.

The exact location, type, and size of existing Service Connections are to be considered unknown. All information provided in the Contract Documents and provided by the Utility Company is from maintenance records, record drawings, field surveys and represents the Utility Company's best indication of location and size. The Utility Company cannot be held liable for accuracy of the information. The Contractor shall locate and confirm that the service extension will function prior to beginning the work.

Article 4.2 Submittals

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. Submittals, at a minimum, are to include applicable items identified below:

- A. Contractor obtained sewer service permits
- B. Construction schedules
- C. By-pass plan, where required to by-pass sewer flow. See other MASS Sections for plan requirements
- D. Material, such as but not limited to;
 - 1. ~~1.~~ Grout
 - 2. ~~2.~~ Fittings, bolts, anchors and gaskets
 - 3. ~~3.~~ Cleanout
 - 4. ~~4.~~ Pipe
 - 5. ~~5.~~ Bedding

~~6.~~ ~~6.~~ Backfill

~~7.~~ ~~7.~~ Surface material (asphalt pavement, concrete, topsoil and seed, turf)

~~8.~~ ~~8.~~ Insulation

Article 4.3 Material

Pipe and fitting materials are to comply with Section 50.02 – Furnish and Install Pipe, Article 2.2 – Materials. The Contractor is to supply all necessary fittings, adapters and other appurtenances to make a complete working system.

The minimum diameter of a gravity sewer collector is eight inches (8”), a gravity sewer service is four inches (4”) and a pressure sewer service is two inches (2”).

Connections of four and six inch (4” & 6”) sewer pipe to non-concrete collectors, trunks and interceptors are to be accomplished with an epoxy coated ROMAC CB saddle or equal.

Connection to concrete pipe is to be accomplished with an Inserta Tee™, Romac SST, modified Romac SST or equal. To modify a Romac SST is to remove bolts and receiver lugs so that the tee, half clamshell and partial gasket remain. The clamshell gasket and tee are to be connected to the concrete sewer pipe with stainless steel concrete wedge anchors at each corner and fastened tightly to the concrete sewer pipe.

A connection of eight inch (8”) and larger sewer pipe to larger pipe is to be accomplished with a manhole, Inserta Tee™, Romac SST, modified Romac SST or equal.

A Romac SST or equal is to be used for deep service riser connects.

When connecting a sanitary sewer pipe ends through the use of couplers, the couplers may be, but not limited to, the ROMAC LSS1, 2, & 3's, Powerseal's 3121CS series and Ford FS1 series. The coupler limitation is required to prevent pipe joint offsets inside of the fittings. These fittings do not allow for deflections. In cases where a deflection is needed, the Contractor is to use a bend fitting

~~connection to a sanitary sewer extension a ROMAC 501, Romac Macro HP or their equal is required when a satisfactory pipe bell is not present.~~

~~When making a repair to Sanitary Sewer Extensions the Romac SC or equal may be used but the ROMAC 501, Romac Macro HP or their equal is strongly recommended and is required for repairs replacing pipe longer than eight feet (8') in length.~~

Pressure sewer pipe connections are to utilize ROMAC 305, 306 stainless steel service saddles or equal.

Cement containing products are to comply with Section 50.01 – General, Article 1.4 Concrete and Mortar.

Article 4.4 Construction

A. GENERAL

Pipe and associated fittings s construction ~~is~~are to comply with Section 50.02 – Furnish and Install Pipe, Article 2.3 – Construction with the following additional requirements.

The Contractor is to provide general cleanup, flush and test the system; protect/restore existing utilities, driveways, trees, utility markers, survey monuments, fences, retaining walls, buildings, walkways, gardens, landscaping, and other improvements damaged by the Contractor. The Contractor must use appropriately sized construction equipment to minimize the impact to on-lot improvements and vegetation.

The Utility Company will not approve any installation that is not in accordance with the Uniform Plumbing Code, these Specifications, and the AWWU Design and Construction Manual. The Contractor may not start the excavation for Work until all permits are obtained. Sewer Utility Company permits are to be posted at the job prior to earth disturbing activities.

The Contractor is to notify the Engineer and property owners seventy-two (72) hours in advance of any interruption to sanitary sewer service. The Contractor must provide temporary service during the period of interruption in accordance with their approved bypass plan.

A Utility Company representative is to perform the field inspection at the initial connection, extension and building sewer either concurrently or consecutively. The Contractor is to leave the work uncovered until it passes the Utility Company inspection. Work completed under a Utility Company mainline extension agreement is to be inspected as specified in the agreement.

The Contractor is to record and transmit to the Engineer the location of points in the Work such as but not limited to service connection at the main, connection of the service extension, service length, service invert elevations at the main and property line and distance to nearest property corner, building corner or other permanently fixed objects. The fixed point cannot be living, movable (e.g. boulders, rocks, fence posts), or changing attributes of something larger (e.g. sidewalk cracks, building paint schemes).

B. SANITARY SEWER CONNECTIONS

Multiple connections are not to be made any closer together than three feet (3') to another connection or joint. Taps completed with saddles are to be made with a mechanical hole cutter or equal. Taps not using a saddle are to be pre-approved in writing and listed on the permit by the Utility Company prior to installation.

Saddles for gravity sewer connections are to be centered over a circular hole sawed one-eighth inch (1/8") larger than the inside diameter of the saddle. The hole is to be made above the spring line of the main being tapped. The strap(s) are to be tightened in accordance with the manufacturer's instructions.

Where leakage testing of the service connection is required, the connection is to have a removable plug installed at the terminus that is capable of passing the leakage test. The terminus of the Sanitary Sewer Connection is to end in a bell if it is not immediately continued by construction of the complete Sanitary Sewer Extension.

Services stubbed to the property line or beyond for future use is to terminate with a pipe bell. The bell is to be plugged and marked at the end of the service with a 2" X

4" marker ~~of a adequate to~~ protruding three feet (3') above final grade, painted green, and stenciled with the word "SEWER" in white two inch (2") high letters.

No portion of the sanitary sewer connection is to be closer than five feet (5') to a side lot line or manhole.

Connections with deep service risers can be installed where the service to collector connection is in excess of twelve feet (12') deep and eight feet (8') of cover can be maintained over the entire service. Deep service risers must be fully restrained pipe and fittings to the edge of right-of-way or easement. No more than two sanitary sewer service connections are to be installed on a single deep service riser.

Connections utilizing a steep sewer riser maybe installed where the sewer main is more than 10' below final grade and the service connection and extension will have greater than minimum slope and 8' of cover in their entirety.

C. SANITARY SEWER EXTENSION AND BURIED BUILDING SEWER

The exact location, type, and size of existing Service Connections are to be considered unknown. All information provided in the Contract Documents and provided by the Utility Company is from maintenance records, record drawings, field surveys and represents the Utility Company's best indication of location and size. The Utility Company cannot be held liable for accuracy of this information. The Contractor must locate and confirm that the service extension will function prior to beginning the work.

Upon exposing an existing sanitary sewer service connection and/or extension the Contractor must ensure that the line has proper slope, bearing, and is free and clear of obstructions prior to continuing the Work. If the service line is found to be either plugged or if a gravity sewer service is found to have reverse grade, the Contractor is required to notify the Utility Company immediately or be liable for correcting the misalignment or unplugging the line at the Contractors' expense.

Extensions are to utilize existing pipe bells, except where no bell exists or the pipe diameter changes such that the bell does not allow a bell to spigot connection. Connection other than through a bell to spigot marriage is to be completed with a pipe coupler.

Pressure sewer service extensions are to be constructed with dual two inch (2") HDPE pipes and connect to the sanitary sewer connection per the Standard Detail.

Cleanouts are required on service lines (connection and extension) greater than one hundred feet (100') long installed without a manhole, at a single bend greater than forty five degrees (45°), and where a combination of bends adding up to more than forty five degrees (45°) in alignment change taking place within ten linear feet (10'). The cleanout assembly is to be restrained in the vertical direction from and including the wye to the surface. The horizontal piping does not need to be restrained to the wye.

The Contractor may be required to adjust more than one type of cleanout under this Contract. All adjustments will be accomplished as directed by the Engineer. Any damage to cleanouts resulting from construction under this Contract is to be

repaired or the damaged portion replaced at the Contractor's expense. All vertical cleanout joints and fittings must be restrained. All vertical components of cleanouts are to be encapsulated with three layers of eight mil polyethylene.

D. ELEVATION CONFLICTS

The Contractor is to notify the Engineer where a conflict in grade occurs between a gravity sewer and another utility. Except when otherwise directed by the Engineer, the Contractor is required to excavate gravity utilities from the point of interception for a sufficient distance to gather elevation information such that the Engineer can provide direction to raise or lower one or both of the utilities such that the grade conflict will be eliminated.

The Contractor may not lower or raise the conflicting utilities without first providing the elevations of the conflicting utilities to the Engineer in writing and allowing the Engineer five (5) days to analyze the information and provide the Contractor direction.

Where a conflict in grade occurs between a gravity sewer and a non-gravity utility, the non-gravity utility is to be relocated unless the Engineer provides direction to raise or lower the sewer service.

E. EIGHT INCH (8") AND LARGER DIAMETER PIPE TO PIPE CONNECTIONS

Connections are to be water tight, have smooth flow surfaces, protrude less than one-half inch past the inside wall of the existing pipe and be completed in the top quadrant of the pipe.

Holes are to be completed through drill coring a neat round penetration. Breaking into the pipes by use of a chipping gun, jackhammer, saw or other similar method will not be allowed.

Article 4.5 Measurement

Sanitary Sewer Service Connections are to be measured per linear foot.

Sanitary Sewer Service Extensions including any buried building sewer is to be measured per linear foot.

Deep service riser connections are to be measured as complete units in place regardless of the number of services connected to the riser.

Steep service riser connections will not be measured separately from the service connection.

Cleanouts will be measured as complete units in place adjusted to final grade.

Cleanout adjustments will be measured per unit where an existing cleanout is adjusted to grade.

Large diameter pipe to pipe connections will be paid for as a complete units in place which includes all pipe and fittings from the manhole to the existing pipe to pipe connection

Raising or lowering sewer services will be measured per linear foot of horizontal distance of pipe exposure and includes all fittings necessary to restore and make functioning the utilities impacted.

The item under construction as listed in the Bid Proposal will include all materials, excavation, import materials, installation, compaction, and backfill..

Unless specifically identified for payment under a separate bid item, the unit price bid for includes all labor, equipment and materials to furnish and install a functional unit including but not limited to the following incidental items:

- Location and verification of customers' existing service location, size, and elevation
- disconnection and reconnection of existing services where the Work includes replacement of existing service pipe
- Sewer main and service flow control regardless of size
- clearing and grubbing;
- trench excavation and backfill;
- excavation dewatering;
- trench support system;
- furnishing and installing Type II-A Classified Fill and Backfill;
- bedding; compaction;
- installation of pipe, fittings, adapters, or other necessary appurtenances;
- sanitary sewer service insulation;
- polyethylene encasement; when applicable,
- Permits, permit fees, taxes;
- disposal of unusable or surplus material;
- protection of existing utilities, removal, restoration, replacement of disturbed private or public property, drainage patterns, existing utilities, existing culverts, fences, landscaping, grass, asphalt, curb, gutter and sidewalk, retaining walls, and any other public or private improvements;
- finish grading; and
- cleanup.

Where the Work includes disconnecting existing sanitary sewer services from an existing sewer main and reconnecting them to a new sewer main, the disconnection and reconnection of those existing sewer services will be considered incidental to the installation of the new sewer pipe.

Any conflicts with a property owner concerning the Work and restoration of the property after construction are to be resolved by the Contractor at no additional cost to the Owner.

Article 4.6 Basis of Payment

Payment for this Work will be as specified in Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Payment will be made on the following basis:

ITEM

UNIT

Sanitary Sewer Connection (Size)	LF
Sanitary Sewer Extension and Buried Building Sewer (Size)	LF
Deep Service Riser (Size)	Each
Cleanout (Size)	Each
Adjust Cleanout to Finish Grade	Each
Eight Inch (8") and Larger Diameter Pipe to Pipe Connection	Each
Raise or Lower Sewer	Linear Foot

SECTION 50.05 SANITARY SEWER FLOW CONTROL

Article 5.1 General

The Work under this Section consists of providing all labor, equipment, materials, planning, coordination, operations, permits, and facilities to control sewer flow for inspection, maintenance, repair or replacement of sewer assets.

Definitions:

Bypass – a diversionary flow path for sewer that will utilize pipes, pumps, tanks and other equipment to maintain an area suitable for maintenance, repair, rehabilitation, installation and/or CCTV inspection.

Property Owner – The authorized agent that can legally obligate debt and risk to real property from which sewer is being collected

Resident – person(s) occupying a property from which sewer is being collected who may or may not be the Property Owner.

Sewer Flow Control Supervisor – A Contractor personnel who has authority to make changes to the by-pass system, buy replacement parts, and assign other personnel to monitor the system.

Sewer flow control is to be completed such that it will not damage public or private property. Repair and reparations for property damage associated with the Work is the sole responsibility of the Contractor to fix, repair clean and make whole. This includes payment of all fines and penalties levied by other agencies such as the Environmental Protection Agency, Alaska Department of Environmental Conservation, or other governing bodies for unauthorized discharges of sewer.

Article 5.2 Submittals

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data.

The Contractor is to prepare, submit and receive acceptance of a detailed sewer flow control plan that describes the measures to be used to control flows prior to implementation of such plans.

The plan, at a minimum, is to contain the following items:

- Plug types and sizes
- Pump types, sizes, and power source
- Conduit types, sizes, connections, valves and fittings
- Name and telephone number of the Sewer Flow Control Supervisor, who is responsible for Flow Control.
- Key personnel being used for 24 hour operations
- Copy of noise permit application and approved permit when it is received
- Diagram(s) indicating pump, pipes, catch points, portable restrooms and discharge point showing applicable elevations

- Identification of structures with basements
- Diagram and state location of provisions being made for vehicular and pedestrian traffic. Provide details of ramps, trenches, temporary surfaces etc...
- Calculations used to size system
- Copy of property access agreement between the Contractor and the Property Owner (may be a delayed submittal, but must be obtained and provided prior to flow control implementation)
- Provisions for repair and re-instatement of the sanitary sewer flow control system, including but not limited to back up pumps, repair clamps, extra hosing/piping and alternate power sources.

Article 5.3 Materials

Bypass systems are to have sufficient equipment and materials on site to ensure immediate repair or modification of any part of the system.

A. Conduit and pipes

Provide water tight hoses, piping and fittings of sufficient capacity and pressure rating to accomplish the sewer bypass. The Contractor is to have replacement conduit and fittings on-site to make multiple repairs to the conduit.

Where hoses are provided, the Contractor is to have on hand two sections of replacement hose that are capable of covering the longest single hose in the flow control system.

The conduit, pipe, repair and transition materials are to be of a common size and material that purveyors of such materials will have a ready supply as a backup to the on-site replacement conduit.

B. Pumping and suction equipment

Pumps are to be adequately sized, well maintained and of an appropriate type for sewer. They are to be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system and are to allow dry run for longer periods of time to accommodate the cyclical nature of sewer flow.

Pumps with engines or associated combustion power generation units must be in compliance with the MOA noise ordinance. The Contractor is to apply for and receive a noise permit when required by the MOA noise ordinance.

All pumps used to bypass mainlines and services six inches (6") and larger are to have a reliable standby pump of equal capacity to the primary bypass pump. These backup pumps are to be on-line and isolated from the primary system through the use of valves.

All bypass pumps for services smaller than six inches (6") in size are to have a primary pump and a backup for each lot of five operationally identical primary pumps.

Backup pumps are to be on-site and ready for replacement and incorporation into the by-pass system.

C. Plugs

All sewer line plugs are to be permanently marked with a Contractor identification marker. Secure plugs with a tag line. The tag line is to extend and be secured to a point outside of the manhole or wet well in which it is being used. Airlines are not considered tag lines.

Temporary plugs must be removed and the flow restored after planned interruptions. If the sewer flow control work has not been completed prior to the end of the planned interruption, the Contractor is then required to restore sewer flow by providing, operating and maintaining a sewer bypass until sewer flow is restored to normal.

D. Portable Toilets

Portable toilets are to be provided for buildings with temporarily blocked services. One portable toilet is to be provided per each two residential units or eight employees. Each business complex with a plugged sewer service is to be supplied at least one handicap accessible portable toilet with a wash station. Businesses with more than twenty four (24) employees are not eligible for portable toilet service and must have the sewer service bypass the work. Residential units housing disabled sewer customers must agree in advance and in writing to portable toilets or must have their sewer services bypass the work.

E. Holding Tanks

Tanks are to be metal or plastic, free of leaks, designed to contain fluids and closed to the atmosphere except to allow for venting. Vents are to be smaller than the feed lines and installed at the highest point of the system. The tank size is to be no less than double the anticipated daily flow. Filling and discharging of tanks is to take place through securable ports.

Article 5.4 Construction

A. General

Unless the anticipated flow is provided in the special provisions, the Contractor is to assume that the sewer flow is to be equivalent to the capacity of the sewer system being bypassed based on the as-built information. When flows are ~~bypassed~~bypassed, the discharge must be to a sanitary sewer collection system.

The Contractor is to provide notice to affected parties who may be impacted by planned sewer flow control. Interruptions are not to exceed six hours.

The Contractor, at a minimum, is to provide periodic monitoring and observations of any active sewer flow control. The maximum period between observations is limited to two hours and is to be recorded in a ~~log book~~logbook that is available to the Engineer.

In addition to having the bypass system monitored, the Contractor is to provide to the Engineer and on all notices for temporary service the name and 24-hour contact number for the person(s) responsible for continuous operation of the bypass system. This person is to be known as the Sewer Flow Control Supervisor. After approval of the sewer flow control plan, any substitutions of the Sewer Flow

Control Supervisor is to be approved by the Engineer and new notices are to be sent out to sewer customers previously notified.

The Contractor is to provide a sewer flow control plan showing all components of the sewer flow control equipment, materials, location personnel and schedule.

B. Conduits

Conduits are to be constructed leak and repair band free. Repair bands may be used after the flow control system has been accepted for operation. Insertion of the conduit into the sewer collection system is to be done such that the system is not damaged. New penetrations for bypass conduits into the piping of the sewer collection system is not allowed except where the connection is to be made into pipes being removed by the project.

Sewage will not be allowed to free flow in gutters, streets, streams or over sidewalks, etc., nor is any sewage allowed to flow into storm inlets or ~~stormwater~~stormwater piping.

Where conduits pass over traveled ways, the conduit is to be protected from vehicular and pedestrian traffic and vice versa.

C. Notifications

Notification is to be given to the sewer utility, Property Owner(s), business manager(s), and Resident(s) whose sewer service is being plugged, bypassed, or affected by the planned sewer flow control. Notices are to be provided a minimum of a minimum of seventy two (72) hours to a maximum of one hundred forty-four (144) hours prior to commencement of the flow control. Notices at a minimum will require a written statement of when utility interruption will begin and end, form and/or amount of compensation for impacts, twenty four hour (24hr) emergency contacts, indemnification of the MOA and AWWU, signatures of both the Contractor and Property Owner.

Where signatures cannot be obtained from the Property Owner after a minimum of three days of well documented attempts during the hours of 7am-8am, 12pm-1pm, and 6pm-7pm each day, the Contractor may complete the flow control Work within permitted Rights-of-Ways and easements. Work on private property may not commence without permission from the Property Owner.

D. Plugs

When plugs are inserted to control the flow, the Contractor is to monitor upstream components of the services and sewer collection system.

After the Work has been completed and restricting the flow is no longer needed for the work, then the flow is to be restored to normal. Flow is to be restored by removing the plugs in an order that permits flow to slowly return to normal without surcharging or causing other major disturbances downstream.

E. Service Disconnection

Services are to be disconnected preferably at the property line or intercepted with a vacuum at the exterior structure cleanout for all rehabilitation work. All work on property requires the Contractor to obtain written permission from the Property

Owner. Disconnected and intercepted sewer service flows are to be captured, collected and transferred to the sewer collection system downstream of the work. The Contractor is to restore all disconnected services unless it is in the Contract to abandon the sewer service.

~~Alternatively~~Alternatively, the Contractor may request permission from Businesses, Property Owner(s) and Primary Resident(s) of single family and duplex structures for permission to block the service during the work or find alternative accommodations for residences.

Article 5.5 Measurement

Sewer flow control is to be measured on a lump sum basis regardless of the method used by the Contractor.

Article 5.6 Basis of Payment

Payment for this Work will be as specified in Division 10, Section 10.07 - Measurement and Payment.

All work including but not limited to disconnection, interception, plugging, bypassing, pumping around, public coordination, permitting, and repairing damage caused by sewer flow control is included in the lump sum price.

Payment will be made under the following units:

ITEM	UNIT
Sewer Main (8"Ø-16 Ø") Flow Control	Lump Sum
Sewer Main (16" Ø +) Flow Control	Lump Sum
Sewer Service (4" Ø) Flow Control	Lump Sum
Sewer Service (4" Ø +) Flow Control	Lump Sum

SECTION 50.06 EXISTING MANHOLE MODIFICATIONS

Article 6.1 General

The Work under this Section consists of rehabilitation of existing manholes, adjusting their grade, or providing new penetrations. The Contractor is to provide all labor, materials, and supervision required to furnish and install new manhole components needed to rehabilitate existing manholes.

Rehabilitation of existing manholes can include, but are not limited to the following items of Work:

- Removal and replacement of manhole covers and frames.
- Removal and replacement of grade rings.
- Removal and replacement of manhole ladder rungs.
- Removal and replacement of cone section.
- Removal and replacement of barrel ring/riser section.
- Removal and replacement of base section.
- Removal and replacement of entire manhole assembly.
- Remove entire manhole
- Furnish and install new pipe penetration

Article 6.2 Submittals

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data.

The Contractor will prepare and submit a Work Plan to the Engineer that identifies how the manhole rehabilitation effort will proceed without interruption of existing sanitary sewer service. Where interruption is anticipated, the work plan is to contain Sewer Flow Control as required by other Sections in this Division. The plan will also address maintenance of vehicular traffic and pedestrian traffic. Manhole rehabilitation efforts may not proceed without the Engineer's acceptance.

See Section 50.03 - SANITARY SEWER CONCRETE STRUCTURES for submittal requirements for new material.

Article 6.3 Material

The replacement component materials of construction to be deployed in the Work are to comply with the requirements of this Division, the Standard Details and Drawings. The Contractor must furnish new, unused materials for those manhole components identified in the Drawings to be replaced.

Article 6.4 Construction

A. Re-use of components

The Contractor is to reuse those manhole components that are not to be replaced in assembly of the rehabilitated manhole. Where a component is to be re-used, the bid item will call out re-use or resetting of the component.

The Contractor must take due care not to destroy or damage existing component parts of manholes that are to remain or be reset in place. Damage by the Contractor that renders a component unusable is to be replaced by the Contractor with new material at no additional cost to the Owner or Utility Company.

The Engineer is to be notified when the Contractor finds that an existing component identified for re-use cannot be moved, adjusted, repaired or worked on without damaging the component. The Engineer is to investigate and respond to the Contractor with a final determination of the component's fitness to be re-used.

B. Sewer Flow Control

The Contractor is required to maintain sanitary sewer flows during the execution of the Work. Any Sewer Flow Control required to complete the Work will be considered incidental to the manhole rehabilitation effort and will not be paid for separately.

C. Earthwork

The Contractor is to excavate the manhole as needed to access the Work. All excavation, shoring, dewatering, backfill and compaction efforts required to access the Work is to be per Division 20 – Earthwork.

D. Restoration

Upon completion of the manhole assembly effort, the Contractor is to restore the existing grades and surrounding area to preconstruction conditions including but not limited to pavement, sidewalk, curb and gutter, landscaping, and other improvements or natural features disturbed and/or damaged by the manhole rehabilitation effort.

E. Manhole Rehabilitation

The Contractor is to remove and replace those manhole components identified in the Drawings. The rehabilitated manhole is to be re-constructed as required in the Contract Documents. Where the existing manhole does not meet current requirements, the manhole is to be improved to meet the current requirements. E.g. where a manhole scheduled to be rehabilitated and that manhole does not have polyethylene wrapping, then all new and re-used components are to be wrapped with polyethylene. Existing components not accessible are exempted from the upgrade requirements.

Where the Work requires disassembly and reuse of components that are assembled with grout and/or mastic/sealant/gasket materials, the Contractor must completely remove these materials from the components and replace them with new materials approved by the Utility Company for manhole construction in the reassembly of the rehabilitated manhole.

Where the Work requires the removal and replacement of existing ladder rungs, all ladder rungs within the existing manhole must be removed and replaced. The

Contractor must cut off existing rungs and grind smooth against the interior wall of manhole. New ladder rungs are to be installed per the Standard Details.

The Contractor is to dispose of manhole components not used in the manhole rehabilitation effort and all other unsuitable or waste materials created in the execution of the Work.

FD. Component Part Replacements

The manhole components to be removed and replaced for a specific manhole are identified in the Drawings.

The Contractor must furnish and install barrel sections and grade rings to adjust the top of sanitary sewer manholes to grade as required in this Division and per the Drawings.

Installation of new sections is to be constructed to produce a smooth, regular, watertight surface.

GE. Removal of Existing Manhole and Component Parts

Upon removal of manhole component parts, the Contractor is to clean and prepare existing component parts prior to installation of replacement parts. This will include, but not be limited to, removing existing grout and Ramnek-type sealant from remaining and connecting component parts.

Damage caused to component parts to remain by the removal of component parts is to be repaired by means acceptable to the Engineer.

Materials that can be reused (manhole covers, frames, etc.) are to be salvaged and removed in a workmanlike manner and delivered to the Utility Company's Operation and Maintenance Yard. Prior to removal, salvaging, and delivery the Contractor is to confirm salvageable parts are desired. The Contractor is to provide a disposal site for non-salvageable and rejected salvageable materials.

HF. Connect to Existing Sanitary Sewer Manhole

Prior to connecting to the existing manhole, the Contractor is to excavate the existing manhole to clean and prepare the exterior surface. The downstream pipe in manholes must be screened to prevent entry of mortar or other debris from entering the system. Upstream pipe inverts entering the manhole are to be cleaned prior to the removal of the downstream screen. At no additional cost to the Owner, the Contractor may elect to install a sewer by-pass system.

Connections to existing manholes are to be made by core drilling the new penetration into the manhole, modifying the existing flow channel and installing a pipe to manhole connector to produce a water tight seal for each penetration at the invert elevations shown in the Drawings. The use of impact tools to form new penetrations is prohibited and will be cause for replacement of all damaged components of the manhole at no additional cost to the Owner.

Modification of the existing flow channel includes all work to modify and remove the existing flow channel concrete and forming new flow channels.

Pipes are to be stabbed into the manhole through the boots such that at least two inches (2") but no more than three (3") of pipe extend past the inside face of the manhole.

Connections to existing sanitary sewer manholes will be allowed only after all portions of the Contractor's Work tributary to the connection point has been cleaned and flushed, inspected and tested. Under certain conditions, connections prior to the completion of the system may be permitted subject to the Engineer's prior written approval and the provision of suitable and adequate debris and sand traps and sumps upstream from the connection.

If the connection to existing manhole occurs near the existing ladder rungs of the existing manhole, the Contractor must remove the existing ladder rungs and install new ladder rungs so that the ladder rungs are not above a pipe penetration. (The Contractor may rotate the barrel sections and cone section of the manhole rather than removing old ladder rungs and installing new ladder rungs.)

Article 6.5 Measurement

Rehabilitated manholes and manhole components are to be measured as units complete in place with the components identified in the Drawings. ~~replaced, tested and accepted by the Engineer.~~

Unless specifically identified for payment under a separate bid item, the unit price bid to complete the Work ~~for~~ includes all labor, equipment and materials to modify an existing manhole including but not limited to the following incidental items:

- Development of a Work Plan acceptable to the Engineer;
- temporary bypass piping;
- temporary sanitary sewer service;
- excavation;
- shoring;
- dewatering;
- backfilling;
- integrity testing;
- restoration of Work area to existing preconstruction conditions;
- ~~excavation;~~
- import;
- export and disposal;
- disposal fees;
- backfill;
- compaction;
- grade adjustment;
- repair of damage to components to remain caused by the removal of components;
- and/or other items of Work needed to complete the manhole rehabilitation effort is to be considered incidental to the completion of the Work and will not be paid separately.

Component parts of existing or new manholes is to be included in the unit price for the bid item being constructed, reset, or replaced, and be paid for by a cumulative total of each unit constructed.

No measurement for Sewer Flow Control will be made. Sewer Flow Control is incidental to the bid item under construction.

Restoration of existing conditions is to be considered incidental to the manhole rehabilitation effort and will not be paid for separately.

Article 6.6 Basis of Payment

Payment for this Work is as specified in Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Payment will be made on the following basis:

ITEM	UNIT
Remove and Replace Manhole Cover and Frame (Manhole #)	Each
<u>Remove and Reset Manhole Cover and Frame to grade (Manhole #)</u>	<u>Each</u>
Remove and Replace Manhole Grade Rings	Each
Remove and Replace Manhole Ladder Rungs	Each
Remove and Replace Manhole Cone Section (Manhole #, Height)	Each
Remove and Replace Manhole Barrel Ring/Riser Section (Manhole #, Type, Number of Rings Replaced, Depth Below Grade measured to bottom of lowest ring to be replaced)	Each
Remove and Replace Manhole Base Section (Manhole #, Type, Depth of Base Section Below Grade measured to the bottom of base section)	Each
Remove Existing Sanitary Sewer Manhole	Each
Connect to Existing Sanitary Sewer Manhole (Size)	Each

SECTION 50.07 SEWER CLOSED CIRCUIT TELEVISION INSPECTIONS

Article 7.1 General

The Work under this Section consists of providing all operations associated with video inspection and recording of sewer assets.

Sewer mainline Closed Circuit Television (CCTV) work is to be completed by a currently certified National Association of Sewer Service Companies (NASSCO) camera operator in the specialty of Pipeline Assessment and Certification Program (PACP). The sewer mainline CCTV video inspection is to code observations and defects as specified in the PACP reference manual (version 6.0.1).

Video inspections for other sewer assets (non-mainline) do not require NASSCO certification.

This Work may be required multiple times and at different phases of construction. Sewer line cleaning, flow control and atmospheric conditioning will be required to obtain access, ease camera travel, remove visual impediments and remove debris. Traffic control may be required to access sanitary sewer manholes, cleanouts, pipes and other sewer assets. The MOA makes no warranty as to the condition of the pipe, manholes or access points.

Article 7.2 Submittals

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. Submittals, at a minimum, are to include applicable items identified below:

- Video
- PACP data
- Sewer flow control, when required
- CCTV Equipment, when requested

Article 7.3 Material

CCTV equipment includes vehicles, computers, software programs, viewing devices, cameras, cables, portable power sources, lights, blowers, winches and all related equipment needed to satisfactorily complete a CCTV inspection.

The camera is to process video in color with a lens having a focal distance between one inch (1") and infinity (∞), be capable of autofocus, manual focus and have an adjustable iris. The in-pipe target is to be viewable with the camera at a perpendicular angle to the target and the camera at zero zoom. For cameras with zoom lens capability, calibration and in-pipe measurements are to be taken at zero zoom. Analog Video output and capture is to be a minimum of 400 lines per inch.

The camera is to be transporter mounted for six inch diameter (6"Ø) and larger pipe line inspections, have built in lighting with pan and tilt capabilities of 360° rotation and 270° tilt. Illumination is to be adjustable and capable of providing a clear and well lit picture. Lighting is to be planned and executed based upon the size and type of pipe being inspected.

Push cameras may be used to video sewer services which are typically less than eight inches (8") in diameter. Push cameras are to have built in lighting, be self-leveling, be flexible for navigating around bends, and have a sonde device. Push cameras may be used from the ground surface or transporter mounted for use from within the mainline pipe for lateral inspection. Push cameras are not to be used as the primary image source for pipes six inch diameter (6"Ø) and larger.

CCTV performed using digital high-resolution camera(s) equipped with wide angled lenses(s) that provide three hundred and sixty degree (360°) spherical and side scanning capabilities that provide "unfolded" views of the pipe, and propelled by a transporter that travels faster than 30 feet per minute, may be used as an alternative to a pan and tilt camera / transporter. This alternative will only be used if the Contractor can comply with all other requirements of this specification section.

Pole mounted cameras may be used to video manholes and pipe connections.

All in pipe equipment is to be certified to operate in conditions found in wet/submerged sewer pipes and manholes without adverse effects to the equipment or the sewer system. Typically this will require, but not limit, the camera to operate in grease, sludge, mud, gravel, one hundred percent (100%) humidity, and other adverse environments.

Article 7.4 Construction

Where required, the Contractor is to complete a CCTV inspection at the following points of construction;

- Condition Assessment – The primary goal of this inspection is to document the condition of an existing sewer asset through the use of PACP codes, video and photographic documentation. This information will assist engineers and planners to plan and prioritize any needed repairs.
- Pre-rehabilitation – This inspection takes place prior to the rehabilitation of a sewer asset to look for places that may interfere with the planned rehabilitation. This inspection does not require PACP coding. The video and photographic documentation is to be provided to the Engineer for review prior to beginning rehabilitation.
- Prior to Acceptance of New Pipe – Prior to acceptance of newly installed pipe a CCTV inspection is to look for deficiencies in the work. If no deficiencies are found the CCTV of sewer pipe is to set baseline condition of the newly installed pipe from which future CCTV inspections will used to document changes in the condition of the pipe. PACP coding is required.
- Post rehabilitation – This inspection takes place after rehabilitation of the pipe has been accomplished and will be used to determine Substantial Completion. PACP coding is required.
- Rehabilitation acceptance – This inspection will take place approximately one month prior to the end of the Warranty Period. It is the responsibility of the Contractor to request CCTV the rehabilitated sewer asset. The Warranty will be automatically extended to 30 days past the Rehabilitation Acceptance CCTV or Warranty expiration date, whichever is later. PACP coding is required.

The Engineer or their designee is to be provided unobstructed access to CCTV facilities from set up to tear down of the CCTV equipment. During the CCTV inspection the Engineer or their designee may require the Contractor to backup, adjust the camera and investigate with the CCTV equipment any points they may deem of interest.

The Engineer will review the CCTV video and PACP observations and defect codes to determine conformance with the specification. The Contractor is to correct deficiencies where the video and coding do not meet the standards stated herein at no additional cost to the Owner.

A. Sewer Main CCTV Inspection

The camera is to be centered in the pipe and move in a downstream direction at a uniform rate stopping and recording all joints and points of coding. At no time is the rate to exceed a rate of thirty feet per minute (30 ft/min). When the camera is not able to complete the inspection, after several attempts and cleaning of the sewer pipe, then the inspection of the current segment is to be abandoned and started from a reverse setup going against the sewer flow.

The camera lens is to be kept clear of condensation, oils, grease and debris during the CCTV inspection. Lighting intensity is to be adjusted to minimize glare. Picture quality must be adjusted to provide a clear in-focus picture of the entire periphery of the pipeline.

The Contractor is to record and code the sewer mainline inspection using PACP codes in a NASSCO certified software. The Engineer will provide the sewer main names to the Contractor. The Contractor is to request a list of the NASSCO PACP non-mandatory fields that are required to successfully complete the CCTV inspection from the Engineer. If an unknown/new access point is found or created to CCTV the sewer pipe, then the Contractor is to obtain the name from the Engineer.

The Contractor is to complete a thorough examination of stopping points prior to continuing the inspection. The following partial list of required stopping points are provided below and a more complete list is provided in the NASSCO PACP requirements.

- Manholes – Pipe penetrations, flow channel, bench, and barrel sections are to be videoed.
- Joints – camera shall rotate 360° to provide a potential view of all portions of the joint. The rotation is to occur at a metered rate over no less than twenty seconds.
- Cracks and fractures – provide a close up view of the point of interested (POI) and a perspective view indicating the extent and/or length of the POI and how close the nearest pipe joint is.
- Holes, breaks, lining failures and/or deformations – provide a close up and perspective view of the POI. Adjust the view to make apparent any voids behind the POI.

- Service connects – inspect the hole cut into the pipe and associated repairs at all service connections.
- Changes in alignment, sags or crests – The view should be long enough and lit such that the change can be estimated.

Video and photographs are to be captured but not coded for sewer assets that are not sewer mainlines.

B. Sewer Cleaning

The Contractor is to clean the sewer lines for sewer CCTV by removing grit, loose solids, grease, and any debris that is present. All debris is to be trapped at the end of the CCTV inspection run and properly hauled off and disposed.

Sewer line cleaning is to be accomplished using a high velocity jet or mechanically powered equipment. Selection of the equipment used is to be based on the condition of the sewer line at the time the work commences.

The Contractor is to take due care to avoid damaging the pipe or impact connected sewer customers.

Cleaning is to be completed by the Contractor within 144 hours and no less than one hour prior to inspection.

3. Flow Control

CCTV video will not be accepted when the water depth is greater than twenty percent (20%) of the pipe diameter for pipes twelve inch in diameter (12"Ø) and smaller. Larger pipes will have an additional five percent (5%) allowance.

Flow control is required for the successful completion of the CCTV inspection. The Contractor is to work with property owners, schedule inspections at low usage times, assist with a high velocity hydraulic jet, provide sewer flow control or any combination of the above to meet the water depth requirement.

4. Distance Measurement

The distance is to be measured between the exit of the start manhole and the entrance of the finish manhole for a true measurement of the length of the pipe segment, as required by PACP. It shall be recorded in standard units and the video display readout shall display units to one-tenth of a foot. The camera cable shall be retracted to remove slack to ensure an accurate footage reading. The cable footage counter is to be accurate to the nearest third of a foot (1/3') except where a higher accuracy is required to reinstate services. Accuracy to reinstate services is to be to the nearest inch.

5. Deliverables

A minimum of two digital photos are to be taken of each defect, one showing a perspective view and one showing a close up view. The photo is to have on-screen information such as the distance into the inspection, the starting asset number and the ending asset number.

The Contractor is to submit to the Engineer within five days of completing the CCTV inspection video files, photographs, and the sewer main inspection

database. The database will be in an unmodified NASSCO-PACP Certified database with a MS Access format. Photographs, video, folders, and other data will be properly referenced within the Contractor's database. This integration will provide a seamlessly export from the Contractor's NASSCO-certified PACP software and then import into the AWWU's NASSCO-certified PACP software. CCTV inspection data from the Contractor that cannot be seamlessly imported will be cause for rejection.

This may be provided on CD's, DVD's USB Thumb Drives, or portable hard drive.

Recorded images showing steam, inadequate lighting, or poor image quality will be cause for rejection.

If the Engineer determines that corrections are needed, the documentation is to be resubmitted after corrective action has taken place.

Article 7.5 Measurement

CCTV measurement is not to overlap and is to occur once per bid item under which it is being paid for regardless of the number of times the CCTV camera views any one piece of pipe during that pay item. Measurement of footage is to be based on footage counter shown in the video.

Article 7.6 Payment

Payment for this Work is to be as specified in Division 10, Section 10.07 - Measurement and Payment, and include full payment for all Work described in this Section. Payment includes all labor, tools, equipment, apparatus and incidentals required to complete the Work. At a minimum, no additional payment will be granted for setups, reverse setups, tear downs, relocation, overlapping video footage per bid item, lost or damaged equipment, property owner coordination, and jetting during CCTV activities. Sewer flow control is considered incidental, unless provided for as a bid item.

Payment will be made under the following units:

ITEM	UNIT
Sewer line cleaning for CCTV	Linear Foot
Condition Assessment CCTV	Linear Foot
Acceptance of New Pipe CCTV	Linear Foot
Pre-rehabilitation CCTV	Linear Foot
Post Rehabilitation CCTV	Linear Foot
Rehabilitation Acceptance CCTV	Linear Foot

SECTION 50.08 REMOVE AND DISPOSE OF EXISTING CESSPOOLS OR SEPTIC TANKS

Article 8.1 General

The Work under this Section consists of providing all operations for removing and disposing of existing cesspools or septic tanks.

Disposal of Unusable or Surplus Material, import of Classified Fill and Backfill, providing Sanitary Sewer Flow Control, construction of the Sewer Service Connection and Construction of the Sewer Service Extension are to be constructed and paid for under the appropriate bid item.

Article 8.2 Submittals

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. Submittals for this Work will include a plan for removal and disposal of the septic tank and is to include at a minimum disposal locations and approvals.

Article 8.3 Construction

The following procedures apply for removing cesspools or septic tanks:

1. The liquid and sludge from the existing structure is to be pumped into a watertight ~~container, and~~ container and transported to and disposed of at an approved sanitary sewer dump station. Care is to be exercised in transporting cesspool liquid and sludge so that no spillage occurs during transport and disposal.
2. Remove and dispose of any remaining sludge, septic tank, cesspool or privy pit, logs or cribbing, and saturated gravel remaining in the trench area. Disposal of this material must be at a Contractor provided disposal area approved by the Municipality of Anchorage Department of Health and Human Services and the Engineer.
3. Fill the void created by removal of the cesspool with Type III material as specified in Division 20, Section 20.21 – Classified Fill and Backfill.
4. As soon as the downstream portion of the new sanitary sewer has been tested and accepted, the Contractor is to furnish and install a sewer service connection and extension to the existing service line that drained into the cesspool or septic tank.
5. Schedule inspection of the abandoned systems with AWWU Field Service office. The abandoned disposal system must be shown on the record drawings.

Article 8.4 Measurement

Removal of existing cesspool or septic tank with the associated drainfield is to be measured per each unit.

Disposal of logs, cribbing, tanks and saturated gravel will be measured as unsuitable material.

Article 8.5 Basis of Payment

Payment for this Work will be as specified in Division 10, Section 10.07, -Measurement and Payment, and includes full payment for all Work described in this Section.

Payment will be made on the following basis:

ITEM	UNIT
Remove Cesspool or Septic Tank and Drain Field	Each

**MUNICIPALITY OF ANCHORAGE
STANDARD SPECIFICATIONS**

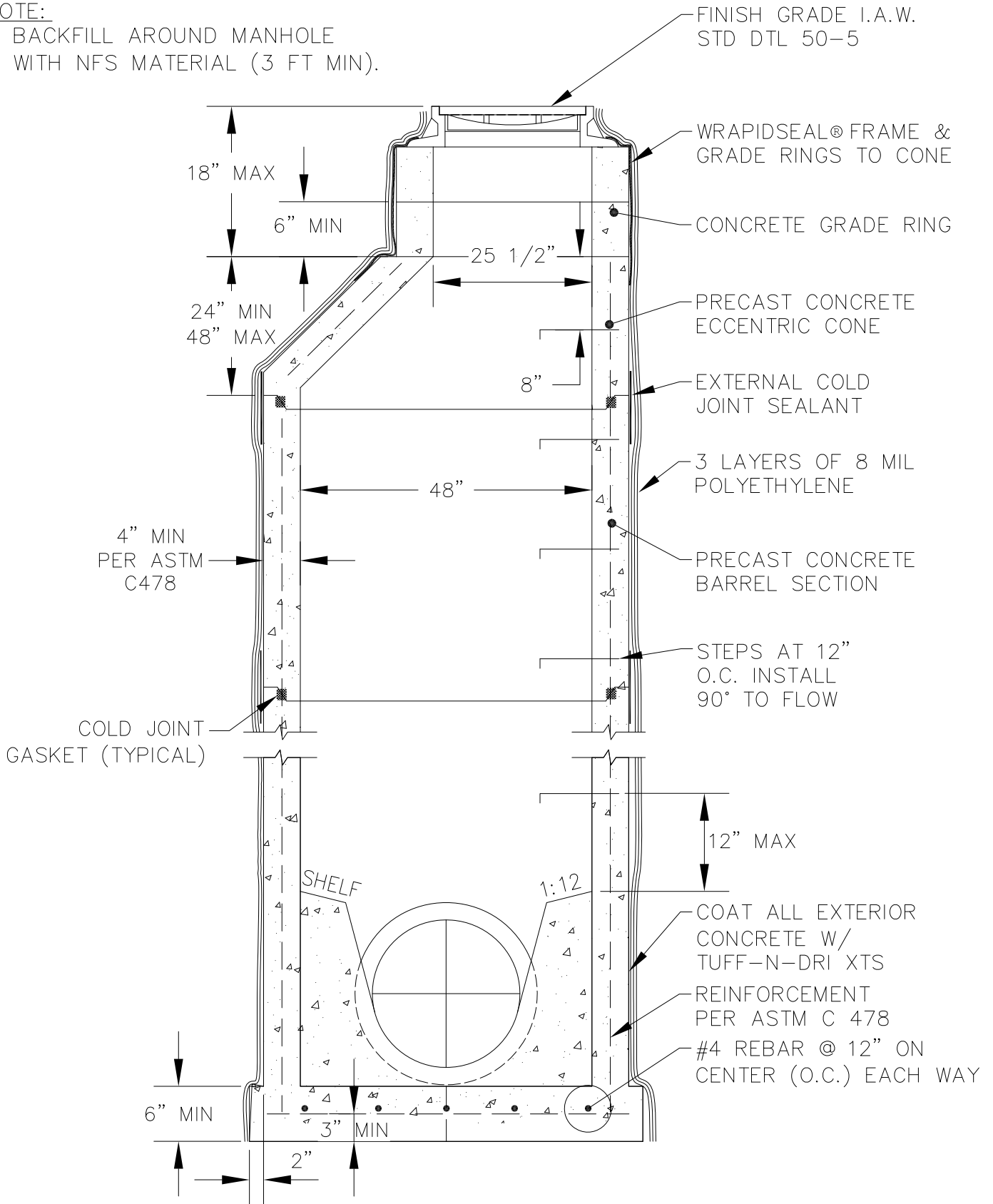
**DIVISION 50
SANITARY SEWERS
STANDARD DETAILS**

**STANDARD CONSTRUCTION SPECIFICATIONS
DIVISION 50
INDEX OF STANDARD DETAILS**

50-1	Sanitary Manhole - Type A - Pipe 8" to 24"
50-2	Sanitary Manhole - Type B - Pipe Dia 30" to 36"
50-3	Sanitary Manhole - Type C - Pipe Dia 40" to 48"
50-4	Type A and B Manhole Base Plan
50-5	Manhole Heights
50-6	Copolymer Polypropylene Manhole Step
50-7	Sewer Service Connect for On-Site Lift Station 1-1/2" and 2"
50-8	Manhole Cover
50-9	Manhole Frame
50-10	Watertight Manhole Ring
50-11	External Drop Connection
50-12	Internal Drop Connect
50-13	Typical Beaver Slide Manhole
50-14	Sanitary Sewer Service (Complete)
50-15	Large Diameter Lateral Connection to Concrete Pipe
50-16	New Construction of Sewer Lines Service Riser/Top Entry for Deep Sewer – Ductile Iron
50-17	Sanitary Sewer Service Connection (R.O.W. Only)
50-18	Sanitary Sewer Cleanout Cover
50-19	Sanitary Cleanout
50-20	Special Manhole and Cleanout Detail (inside protective well radius)
50-21	Special Manhole and Cleanout Detail (inside protective well radius)
50-22	Special Manhole and Cleanout Detail (inside protective well radius)
50-23	Horse Shoe Sanitary Sewer Manhole Detail
50-24	Contractor Field Installation Notes Sanitary Example
50-25	Manhole Cone Adjustment
50-26	Manhole Ring Adjustment
<u>50-27</u>	<u>Steep Sewer Riser</u>

NOTE:

1. BACKFILL AROUND MANHOLE WITH NFS MATERIAL (3 FT MIN).



SCALE:
NTS

APPROVED:

REVISED:
01/2015

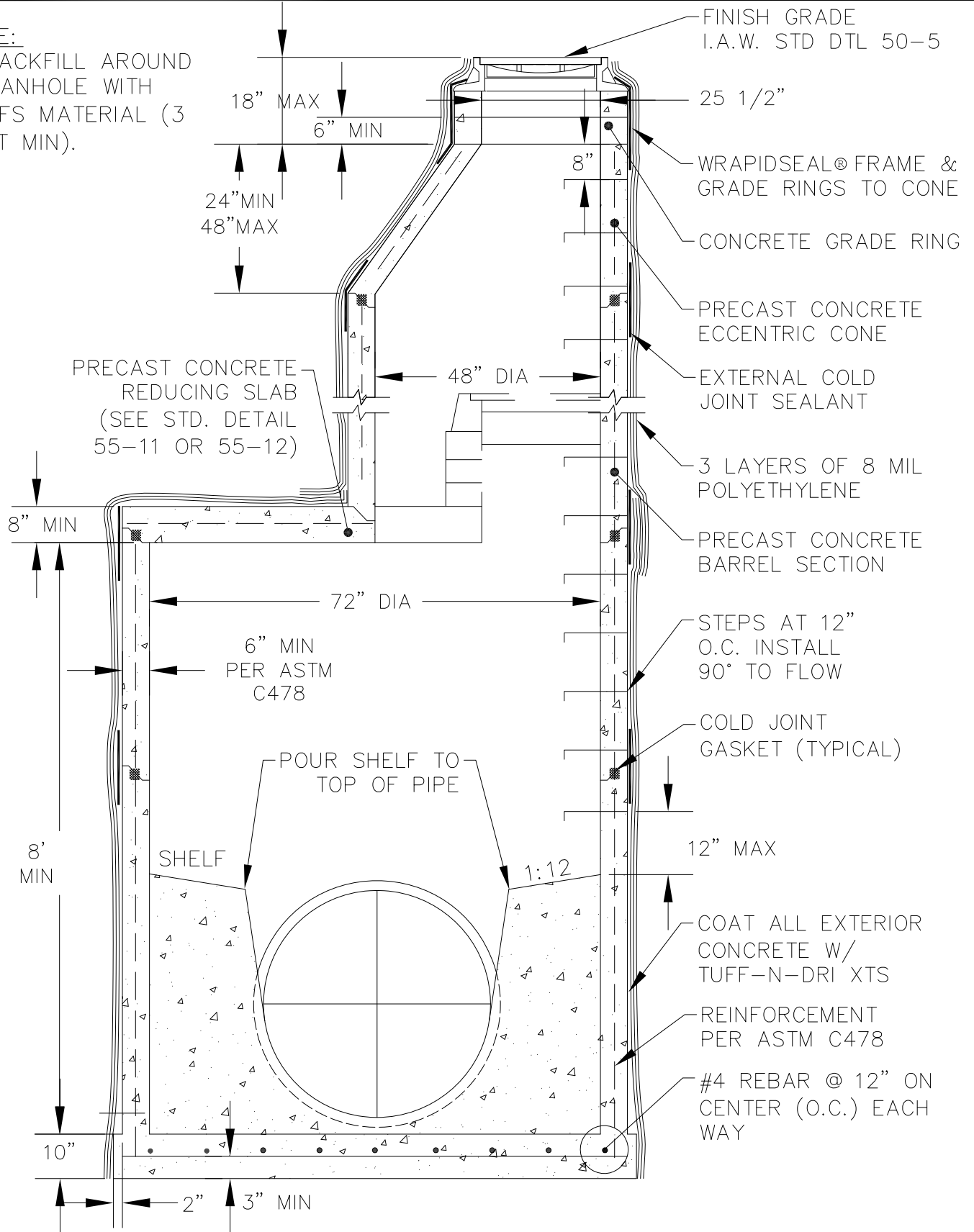
**SANITARY MANHOLE
TYPE 'A'
PIPE 8" TO 24"**

SECTION #
50.03

DETAIL #
50-01

NOTE:

- BACKFILL AROUND MANHOLE WITH NFS MATERIAL (3 FT MIN).



SCALE:
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APPROVED:

REVISED:
01/2015

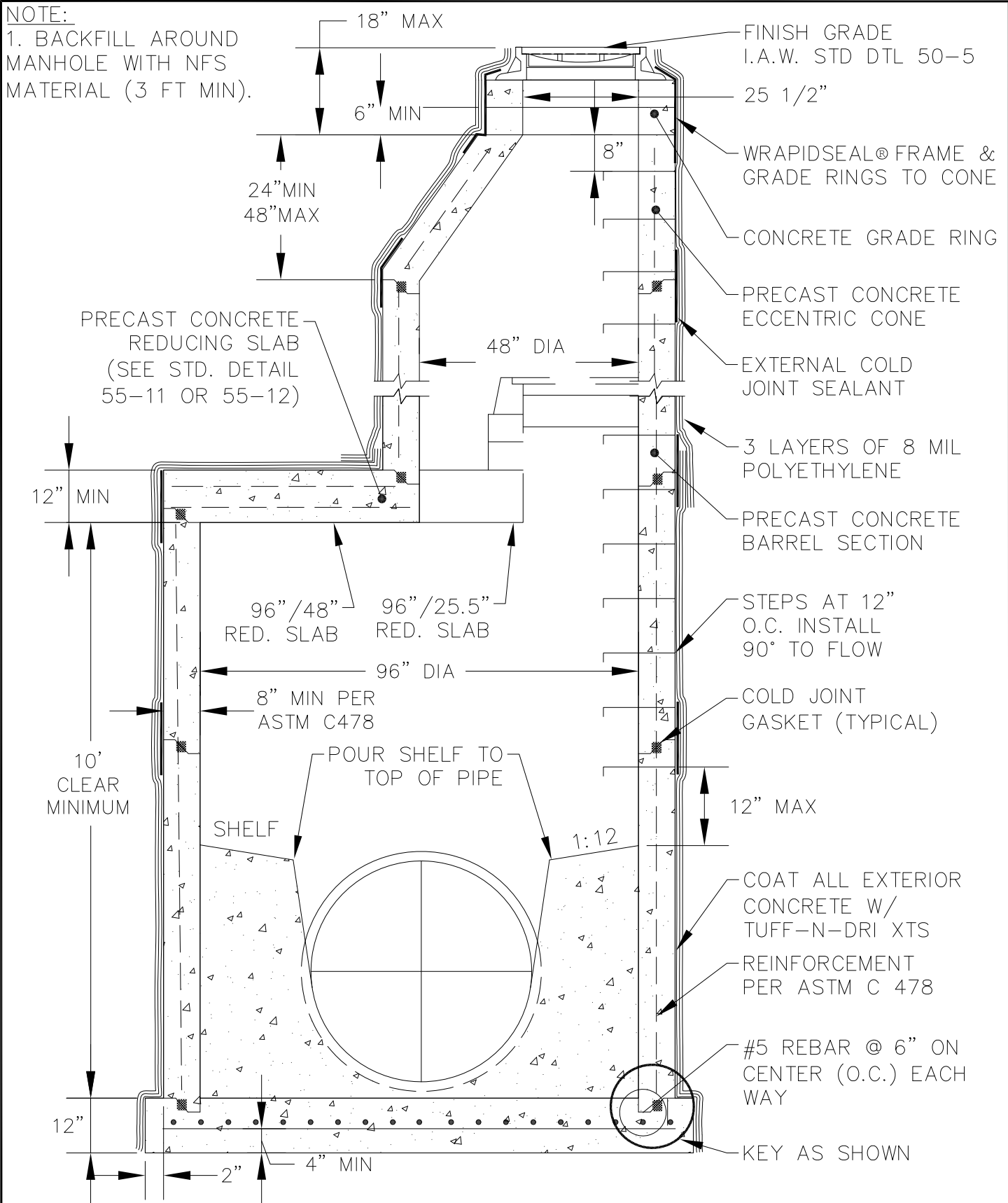
**SANITARY MANHOLE
TYPE B
PIPE DIA. 30" TO 36"**

SECTION #
50.03

DETAIL #
50-02

NOTE:

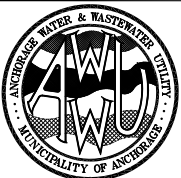
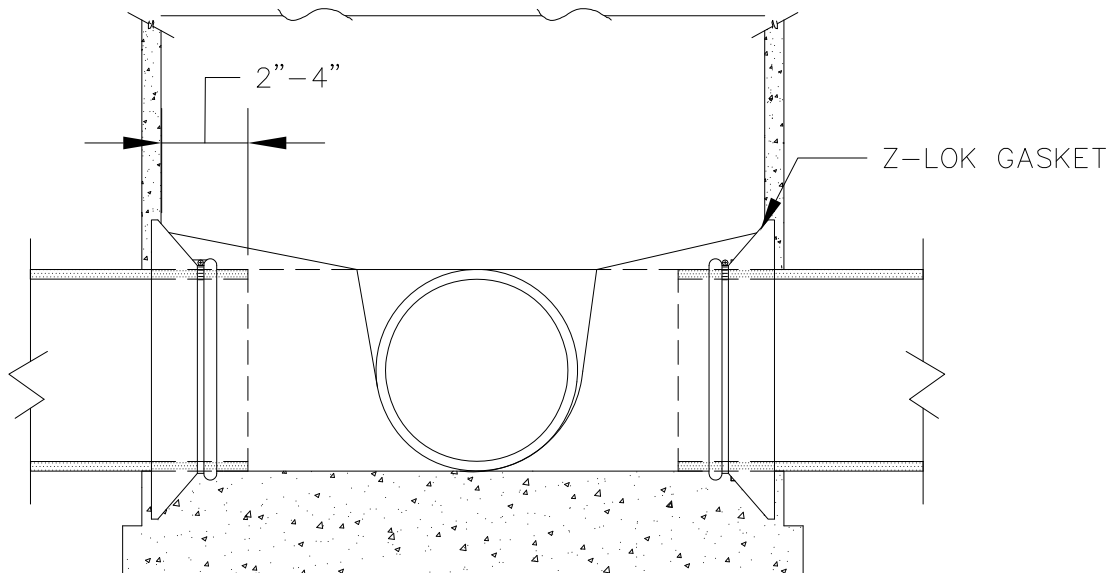
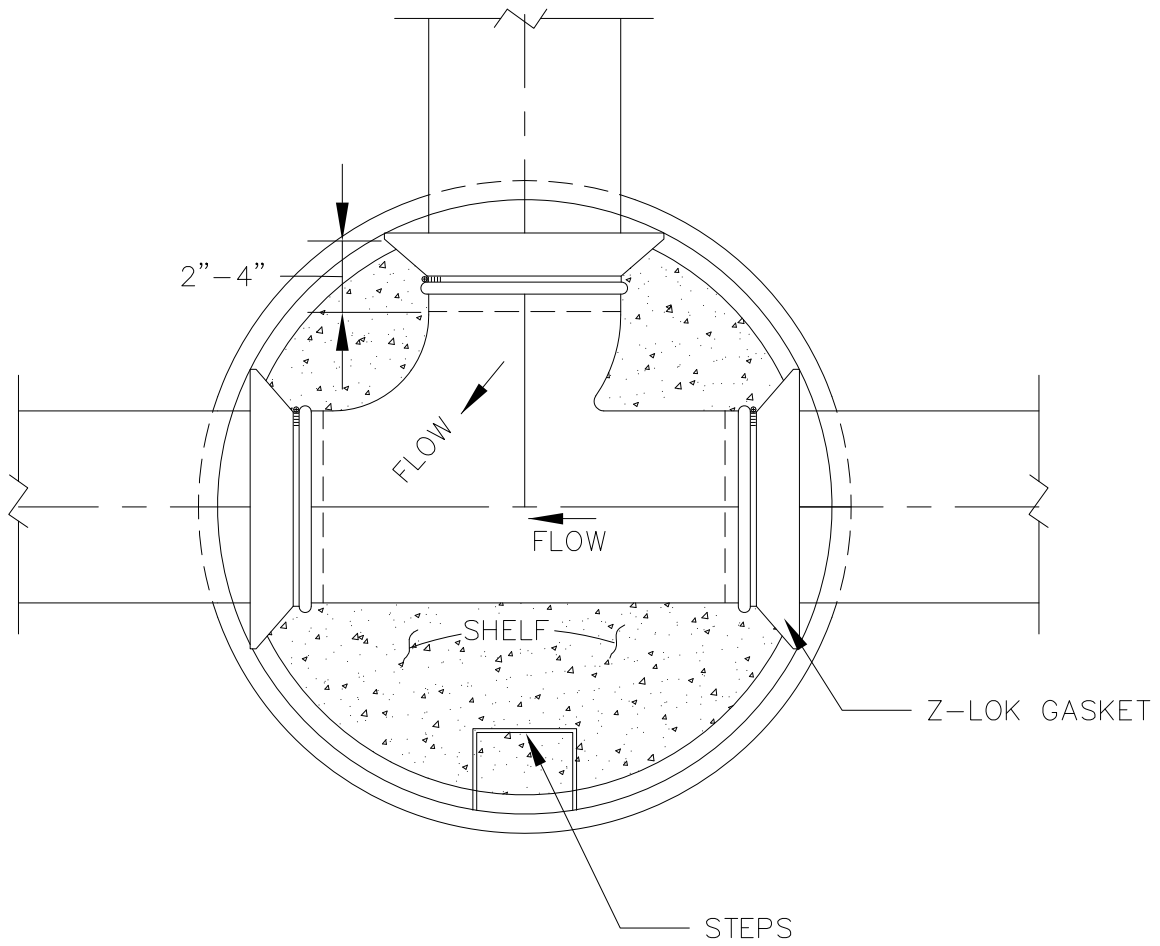
1. BACKFILL AROUND
MANHOLE WITH NFS
MATERIAL (3 FT MIN).



SCALE:
NTS
APPROVED:
REVISED:
01/2015

**SANITARY MANHOLE
TYPE C
PIPE DIA. 40" TO 48"**

SECTION #
50.03
DETAIL #
50-03



SCALE:
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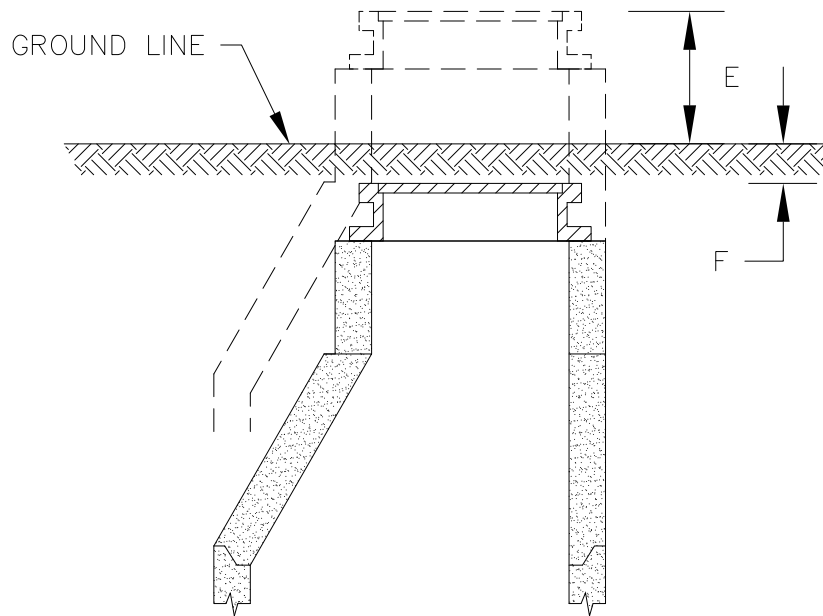
APPROVED:

REVISED:
01/2015

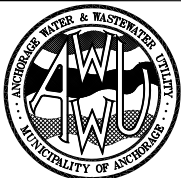
TYPE A AND B MANHOLE BASE PLAN

SECTION #
50.03

DETAIL #
50-04



LOCATION	E-MIN	E-MAX	F MIN	F-MAX
LANDSCAPED AREAS, GRAVEL STREETS, AND ALLEY AREAS WHERE TRAVELED.			0"	2"
UNDEVELOPED AND SWAMPY AREAS.	24"	36"		
HIGHWAY R.O.W.S OUTSIDE TRAFFIC AREAS.	6"	10"		
PAVED STREETS.			1/2"	1"



SCALE:
NTS

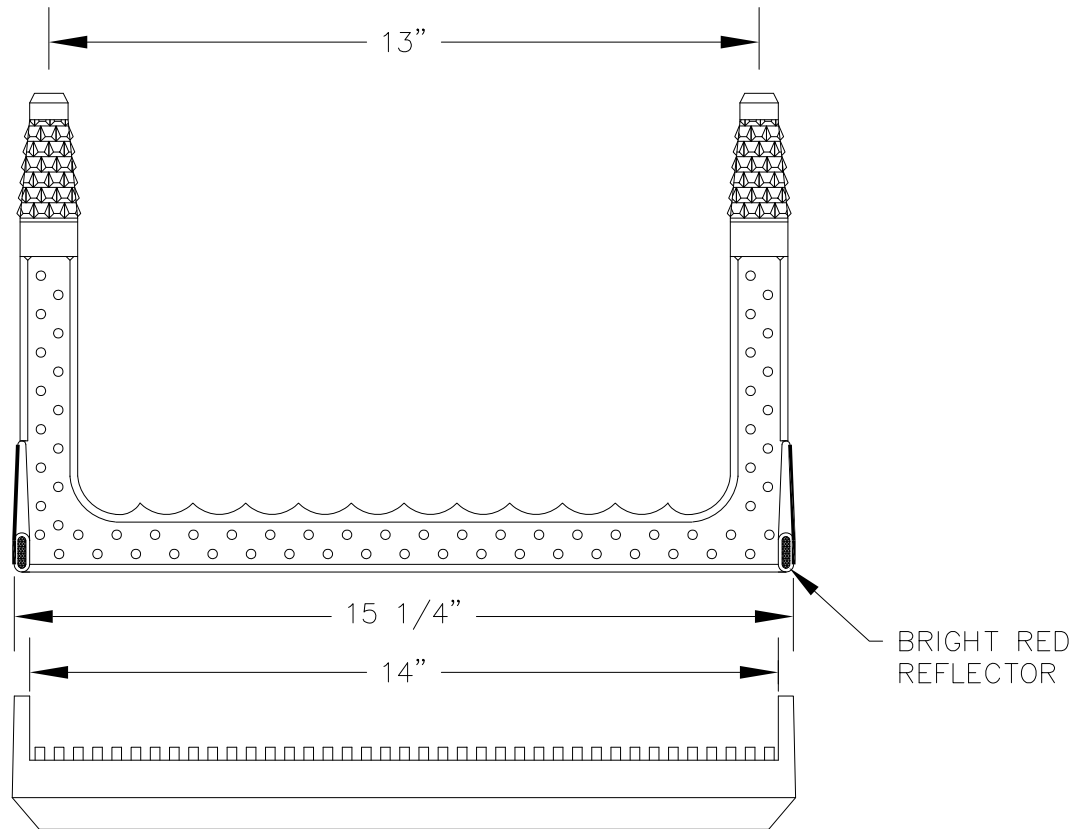
APPROVED:

REVISED:
1/2015

MANHOLE HEIGHTS

SECTION #
50.03

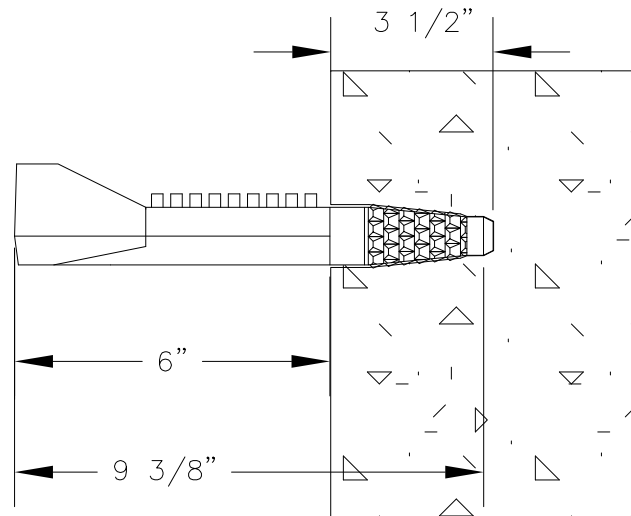
DETAIL #
50-05



INJECTION MOLDED
COPOLYMER
POLYPROPYLENE

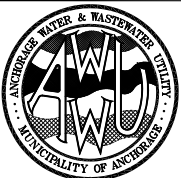
1/2"

#4 DEFORMED
STEEL BAR



NOTE:

1. DRIVE RUNG INTO PREFORMED OR DRILLED HOLES WITH A 6 TO 10 LB. SLEDGE HAMMER, AFTER CONCRETE IS CURED TO 3000 PSI MIN.
2. THE INSTALLED STEP SHALL RESIST A PULLOUT FORCE OF 1500 LBS.



SCALE:
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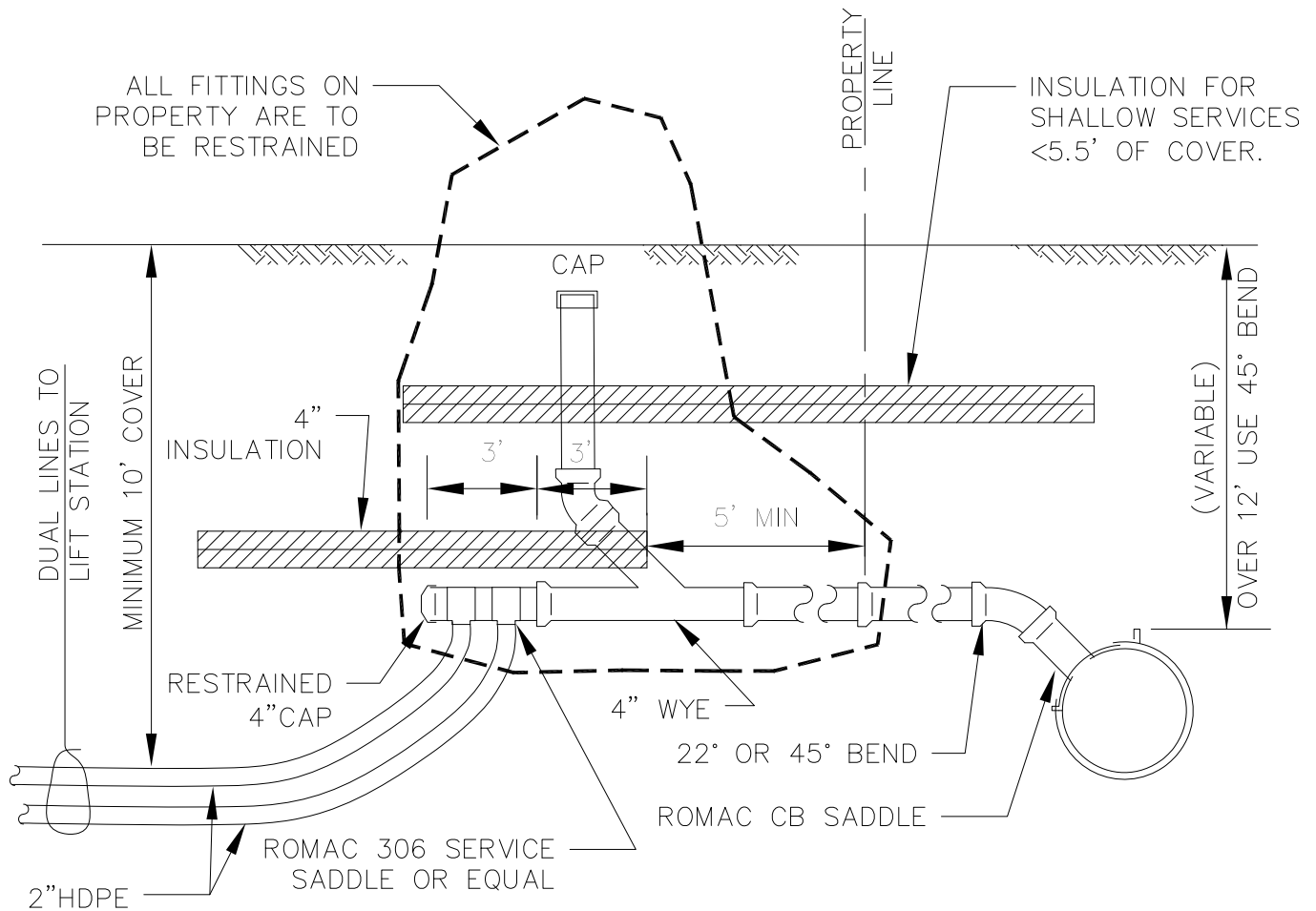
APPROVED:

REVISED:
01/2015

COPOLYMER POLYPROPYLENE MANHOLE STEP

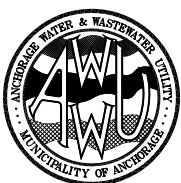
SECTION #
50.03

DETAIL #
50-06



NOTES:

1. THE USE OF HDPE ARCTIC PIPE WITH ELECTRIC HEAT TRACE SHALL ONLY BE USED WITH PRIOR WRITTEN APPROVAL BY AWWU ENGINEERING. ENDS OF HEAT TRACE CHANNEL SHALL BE SEALED WATER TIGHT.



SCALE:
NTS

APPROVED:

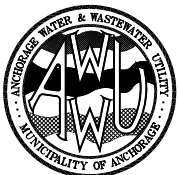
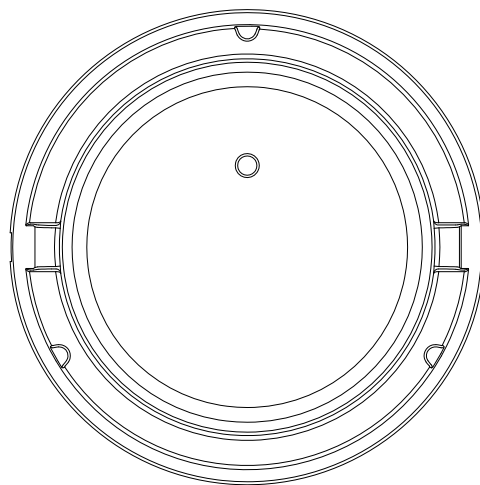
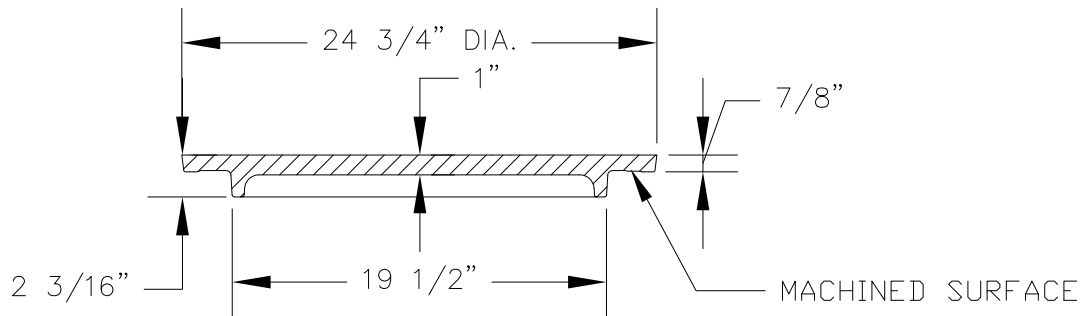
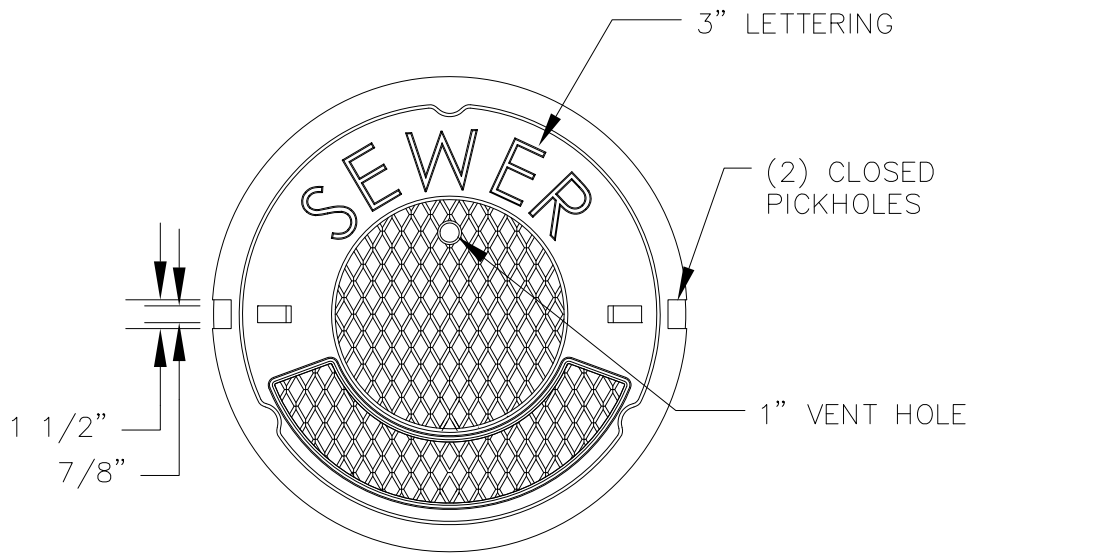
REVISED:
1/2015

SEWER SERVICE CONNECT FOR ON-SITE LIFT STATION

1-1/2" AND 2"

SECTION #
50.03

DETAIL #
50-07



SCALE:
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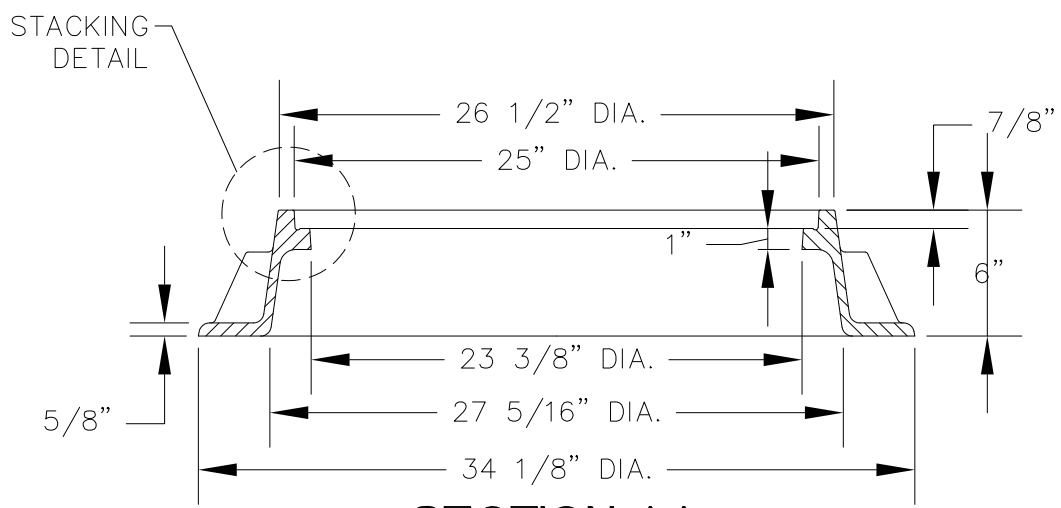
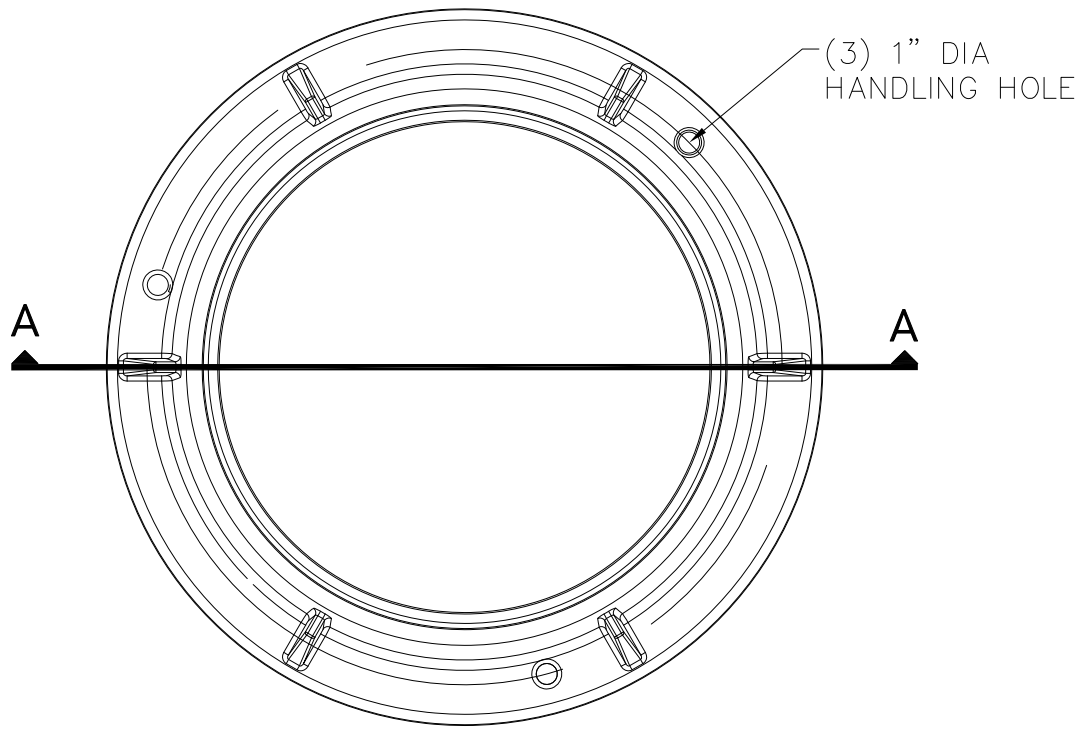
APPROVED:

REVISED:
01/2015

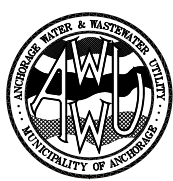
SEWER MANHOLE COVER

SECTION #
50.03

DETAIL #
50-08



SECTION AA



SCALE:
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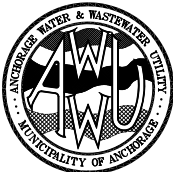
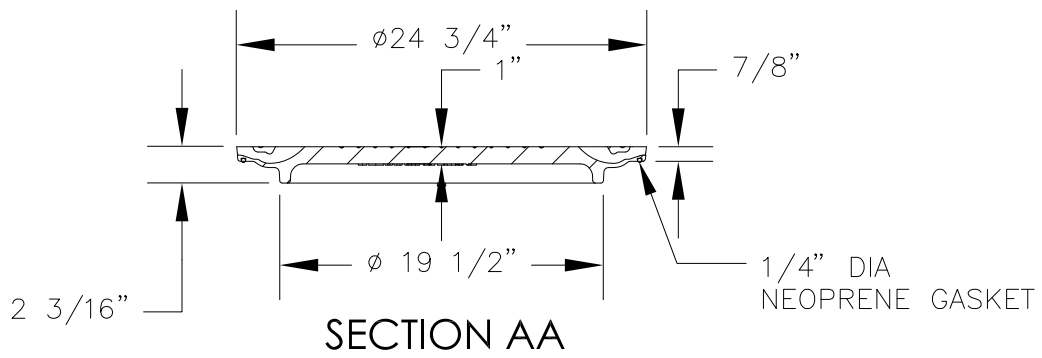
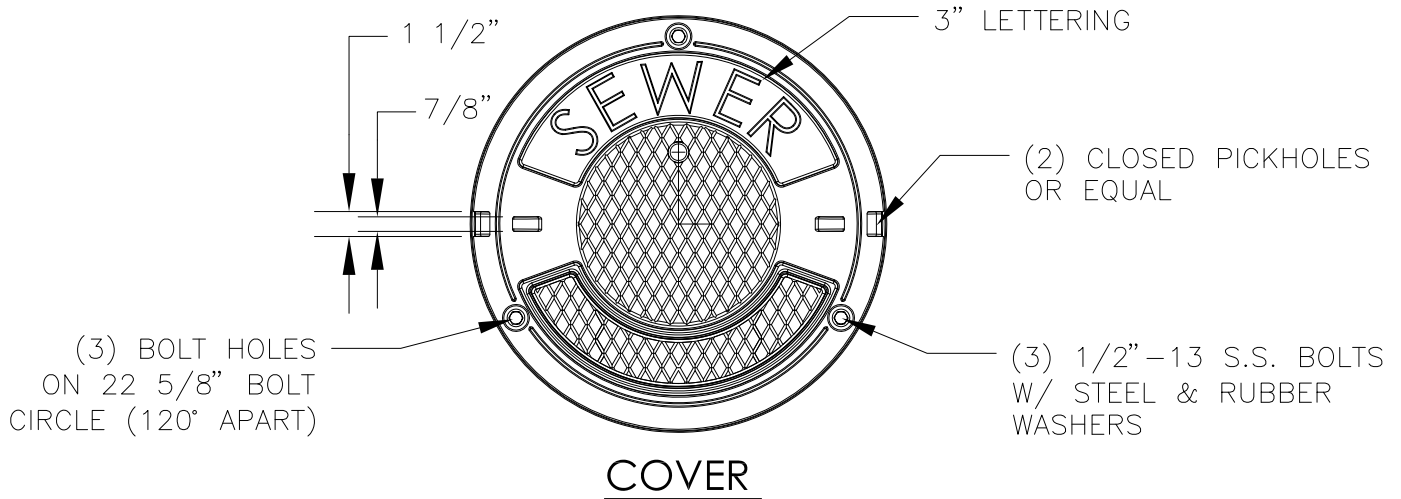
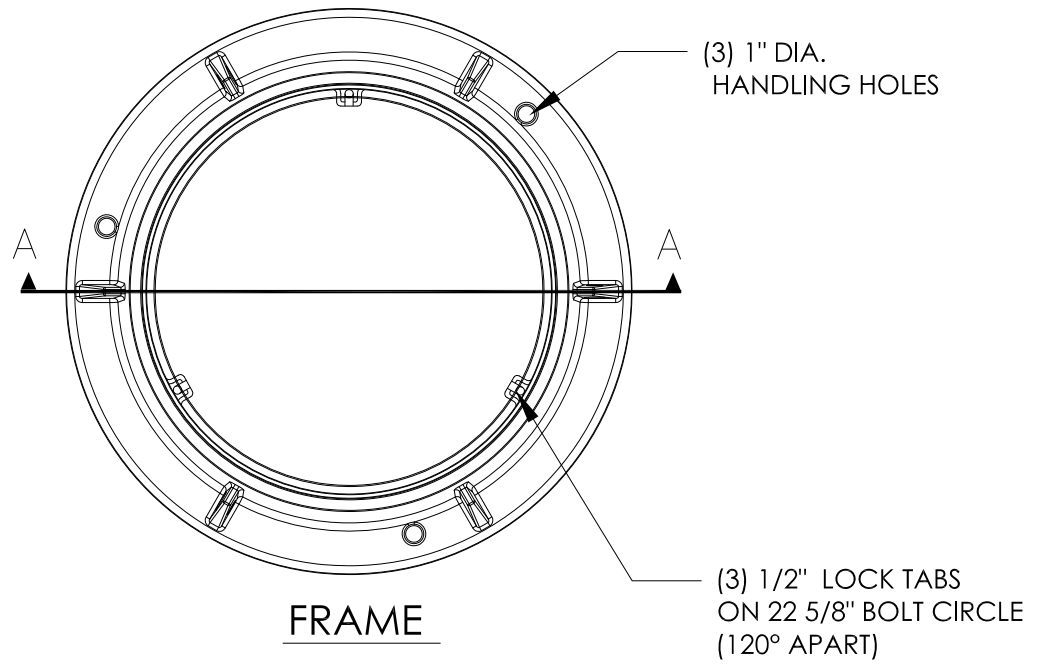
APPROVED:

REVISED:
01/2015

MANHOLE FRAME

SECTION #
50.03

DETAIL #
50-09



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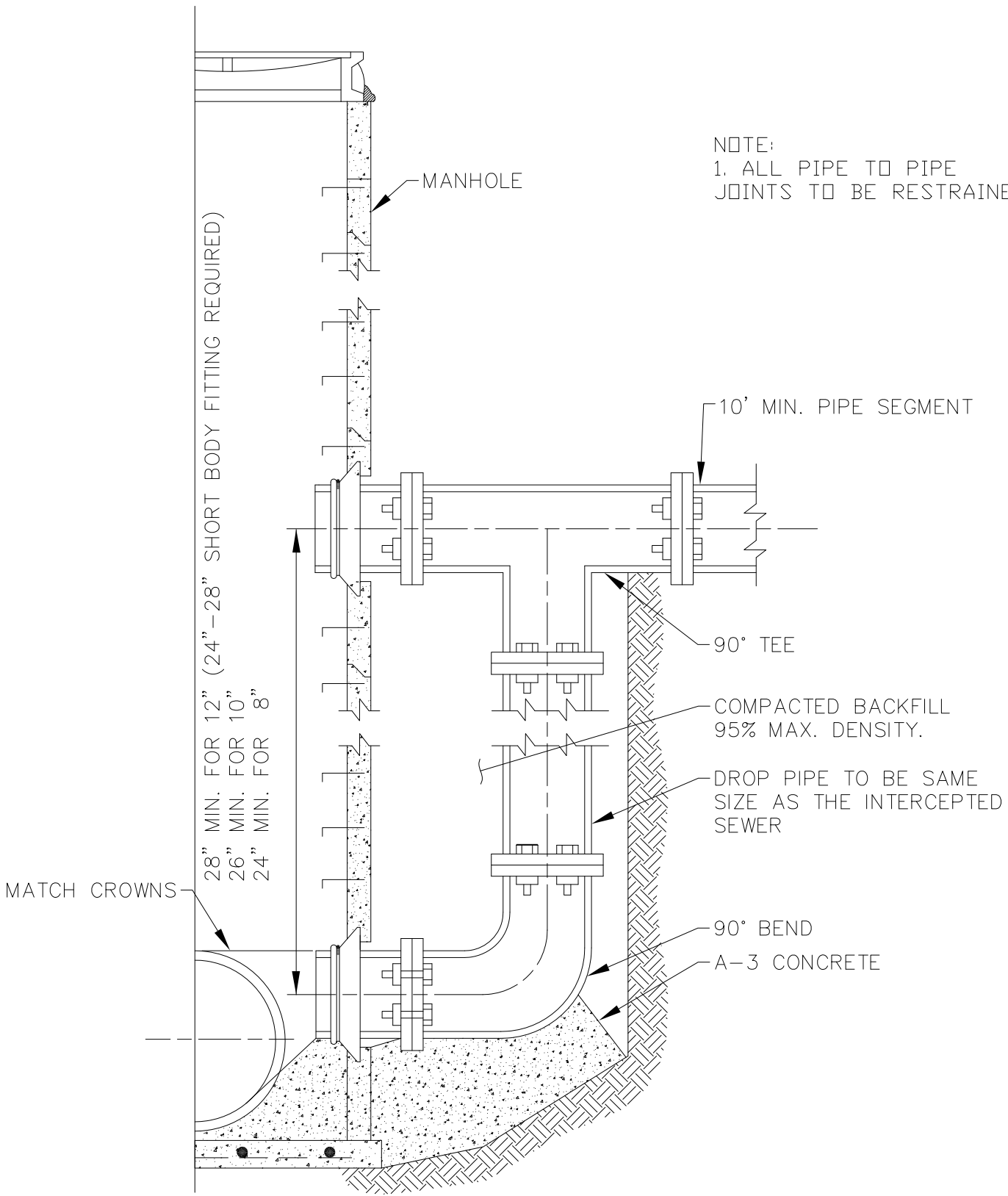
APPROVED:

REVISED:
1/2015

WATERTIGHT MANHOLE RING

SECTION #
50.03

DETAIL #
50-10



NOTE:
 1. ALL PIPE TO PIPE JOINTS TO BE RESTRAINED

28" MIN. FOR 12" - 28" SHORT BODY FITTING REQUIRED
 26" MIN. FOR 10"
 24" MIN. FOR 8"

MATCH CROWNS



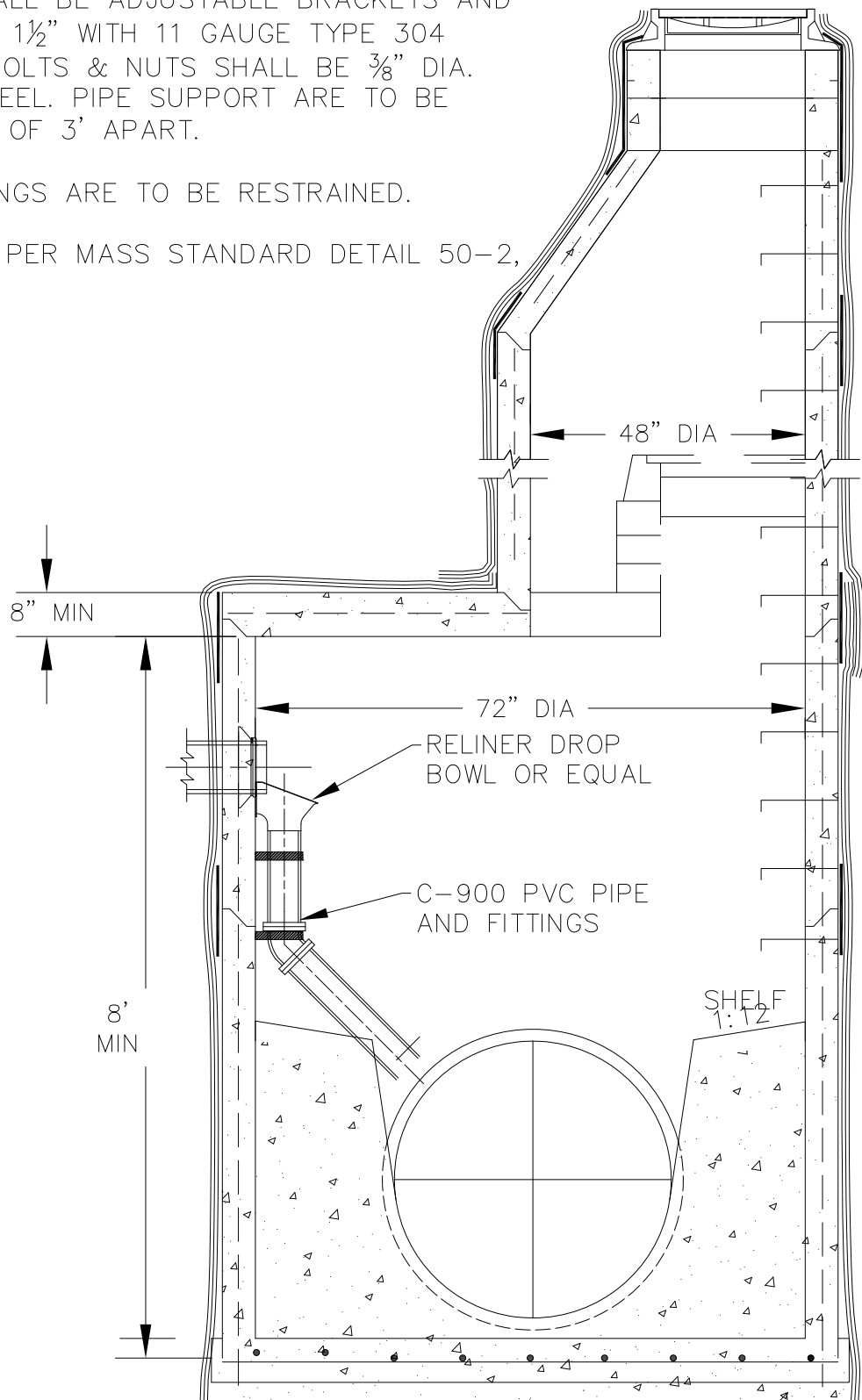
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 APPROVED:
 REVISED:
 01/2015

EXTERNAL DROP CONNECTION

SECTION #
 50.03
 DETAIL #
 50-11

NOTE:

1. PIPE SUPPORTS SHALL BE ADJUSTABLE BRACKETS AND SHALL BE MADE OF 1½" WITH 11 GAUGE TYPE 304 STAINLESS STEEL. BOLTS & NUTS SHALL BE ¾" DIA. 18-8 STAINLESS STEEL. PIPE SUPPORT ARE TO BE SPACED A MINIMUM OF 3' APART.
2. ALL PIPE AND FITTINGS ARE TO BE RESTRAINED.
3. MANHOLE IS TO BE PER MASS STANDARD DETAIL 50-2, TYPE "B".



SCALE:
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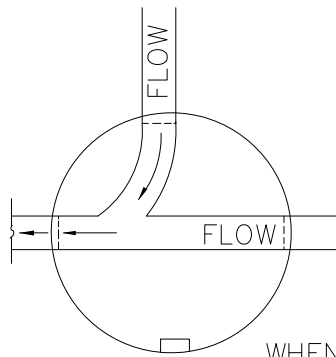
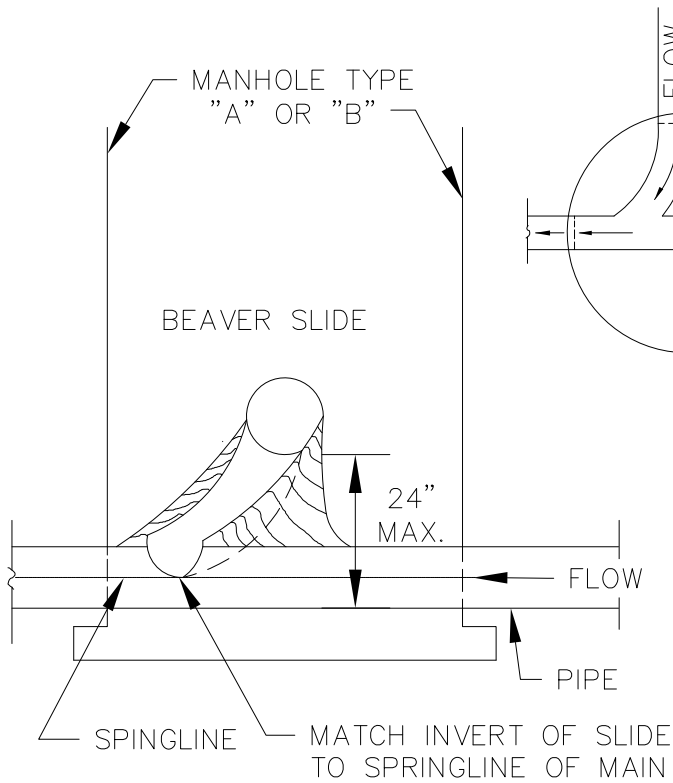
APPROVED:

REVISED:
1/2015

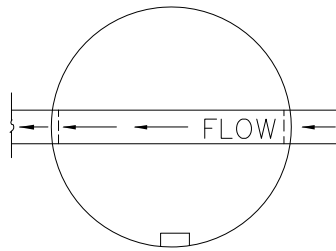
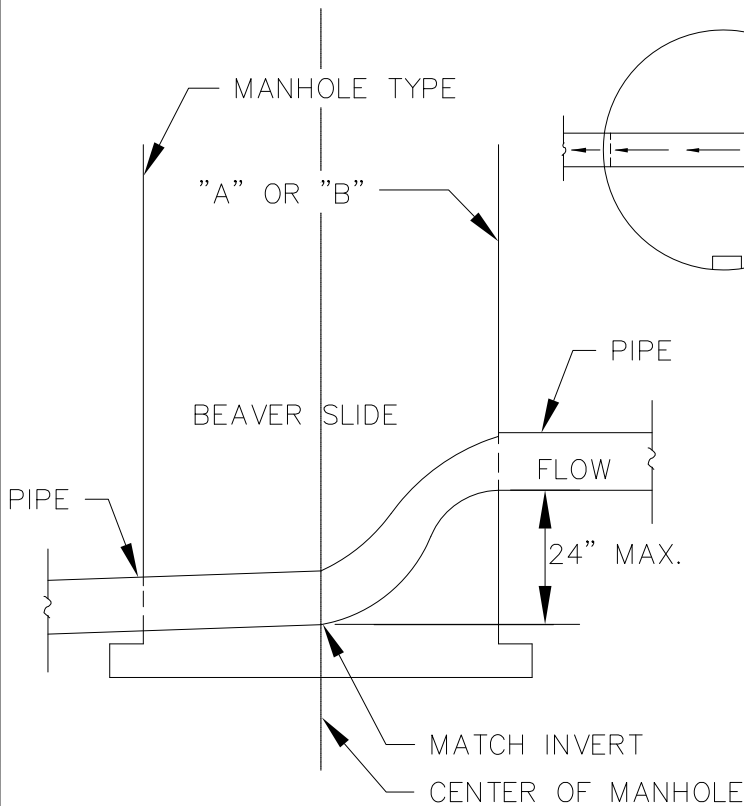
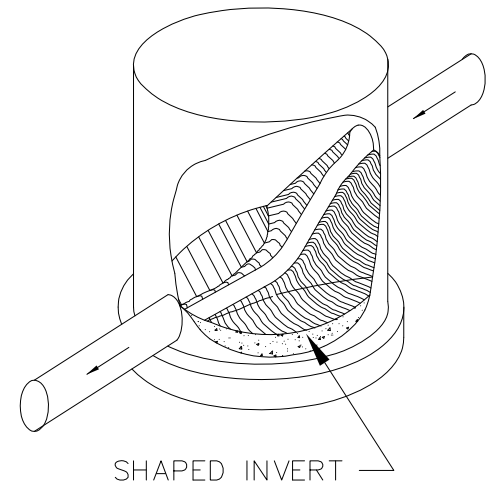
INTERNAL DROP CONNECT

SECTION #
50.03

DETAIL #
50-12

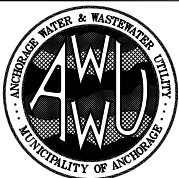


WHEN INSTALLING A BEAVER SLIDE THAT INTERCEPTS AN EXISTING SEWER AT A RIGHT ANGLE, THE CONNECTING INVERT OF THE BEAVER SLIDE IS TO INTERCEPT THE EXISTING SEWER SLIGHTLY ABOVE THE SPRINGLINE AS SHOWN. DISTANCE MEASURED FROM INVERT TO INVERT.



WHEN INSTALLING A BEAVER SLIDE WHERE THE FLOW IS STRAIGHT THROUGH THE MANHOLE, THE BEAVER SLIDE IS TO MATCH THE INVERT OF THE EXISTING LINE AND NOT TO EXTEND MORE THAN HALF-WAY THROUGH THE MANHOLE. DISTANCE MEASURED FROM INVERT TO INVERT.

PREMIX MORTAR PROHIBITED

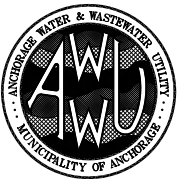
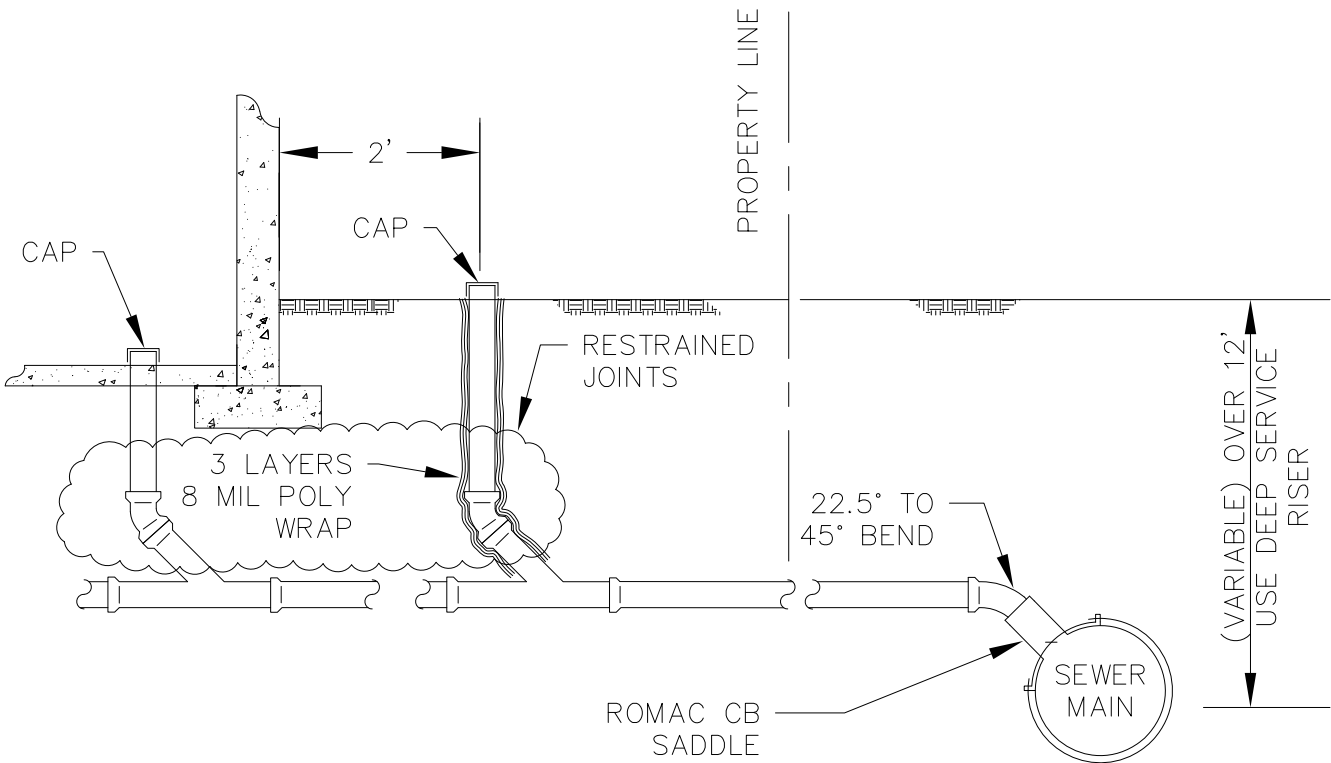
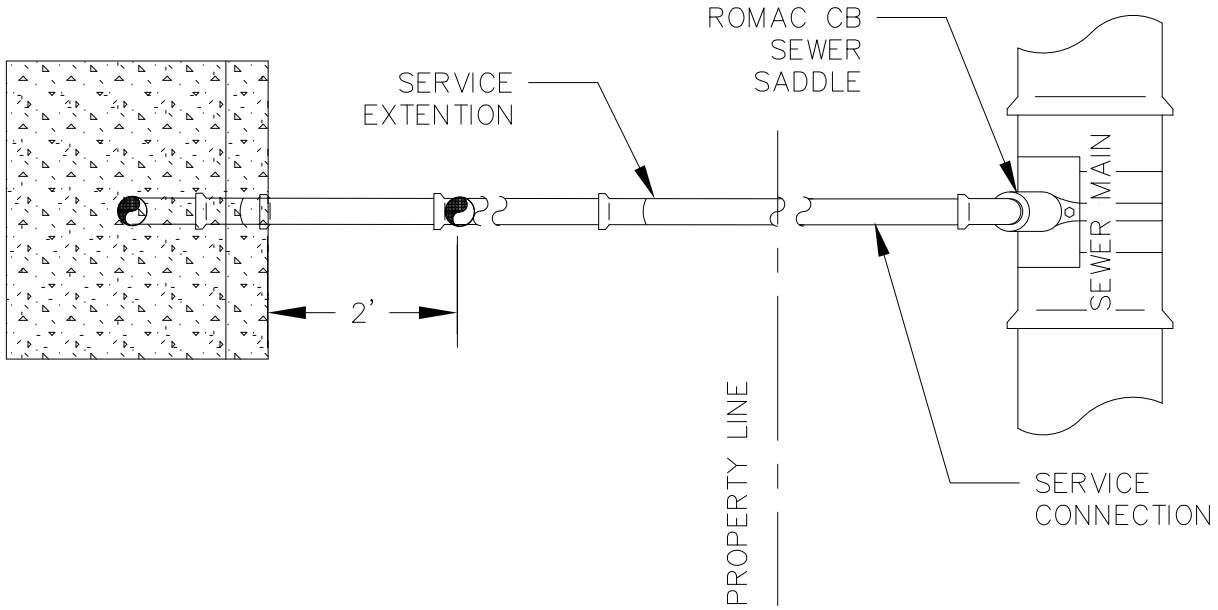


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APPROVED:
REVISED:
1/2015

TYPICAL BEAVER SLIDE MANHOLE

SECTION #
50.03

DETAIL #
50-13

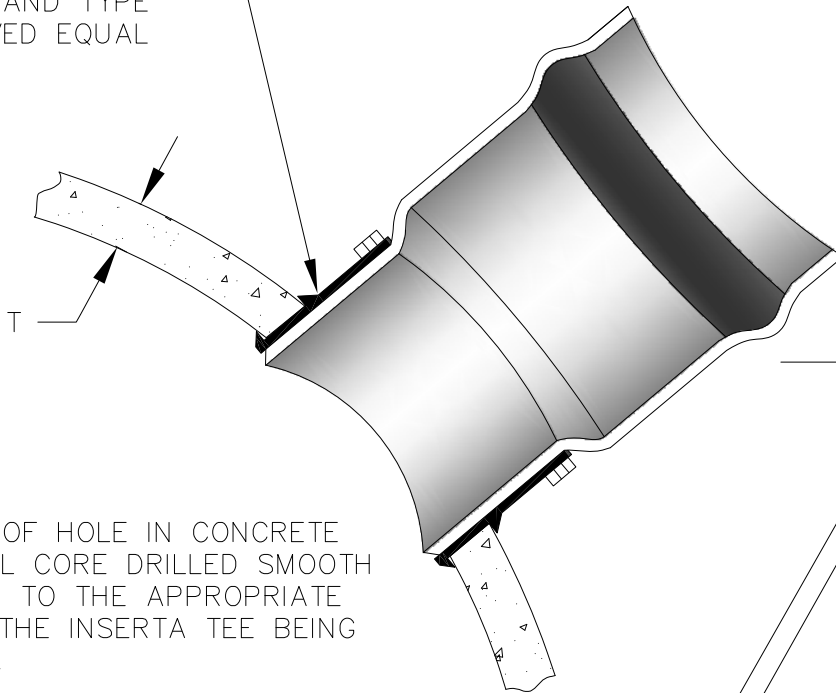


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APPROVED:
REVISED:
1/2015

SANITARY SEWER SERVICE (COMPLETE)

SECTION #
50.03
DETAIL #
50-14

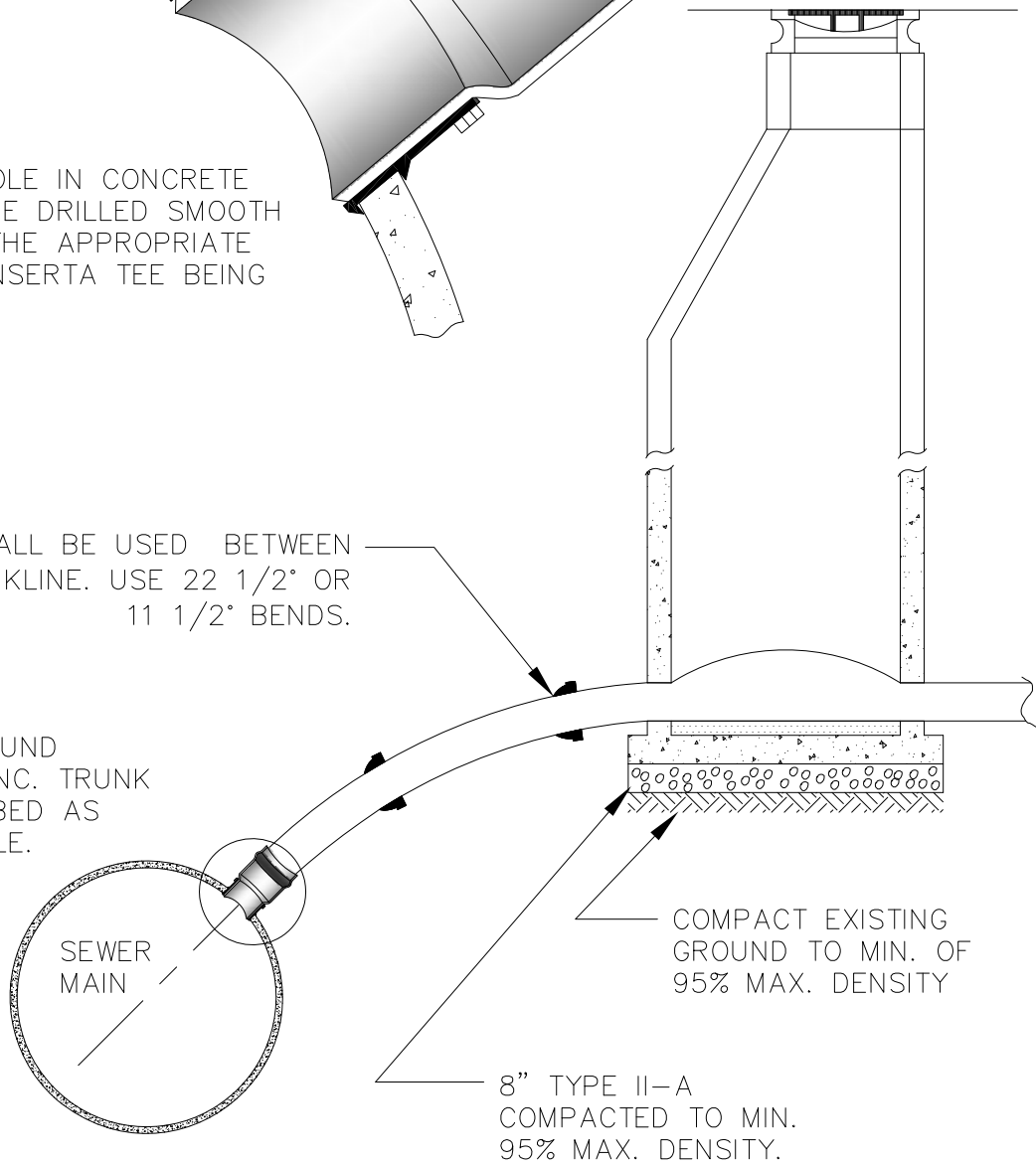
INSTALL AN INSERTA TEE OF APPROPRIATE PIPE SIZE AND TYPE OR APPROVED EQUAL



DIAMETER OF HOLE IN CONCRETE PIPE SHALL CORE DRILLED SMOOTH AND SIZED TO THE APPROPRIATE SIZE FOR THE INSERTA TEE BEING INSTALLED.

D.I.P. PIPE SHALL BE USED BETWEEN M.H. & TRUNKLINE. USE 22 1/2° OR 11 1/2° BENDS.

THE EXISTING GROUND AROUND THE CONC. TRUNK SHALL BE DISTURBED AS LITTLE AS POSSIBLE.



COMPACT EXISTING GROUND TO MIN. OF 95% MAX. DENSITY

8" TYPE II-A COMPACTED TO MIN. 95% MAX. DENSITY.

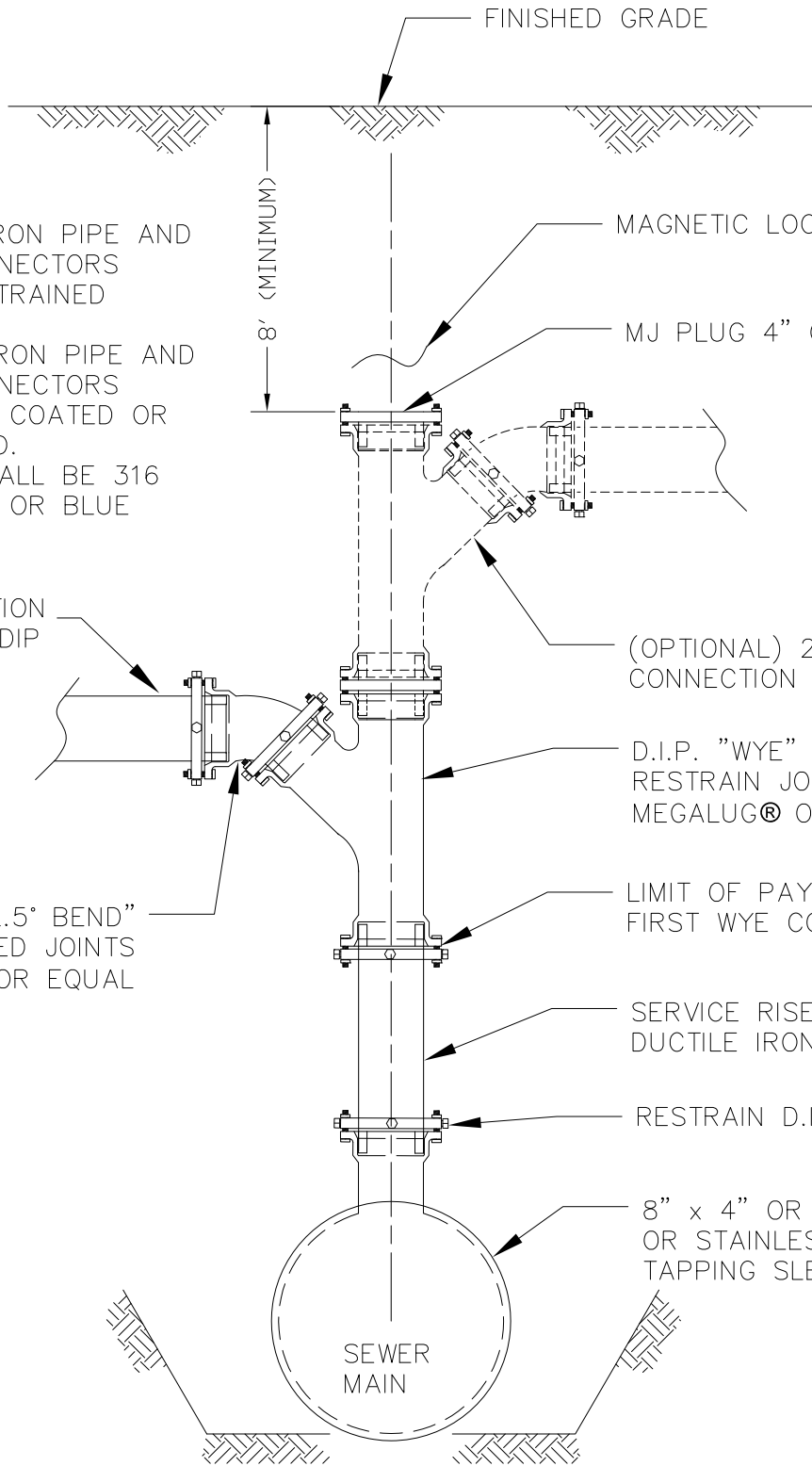


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NTS
APPROVED:
REVISED:
1/2015

LARGE DIAMETER LATERAL CONNECTION TO CONCRETE PIPE

SECTION #
50.04

DETAIL #
50-15



NOTE:

1. ALL DUCTILE IRON PIPE AND MECHANICAL CONNECTORS SHALL HAVE RESTRAINED JOINTS.
2. ALL DUCTILE IRON PIPE AND MECHANICAL CONNECTORS SHALL BE EPOXY COATED OR BE DENSYL TAPED.
3. ALL BOLTS SHALL BE 316 STAINLESS STEEL OR BLUE BOLTS

SERVICE CONNECTION
4" OR 6" DIP

D.I.P. "45° OR 22.5° BEND"
TYPICAL, RESTRAINED JOINTS
MEGALUG® OR EQUAL

MAGNETIC LOCATOR TAPE

MJ PLUG 4" OR 6"

(OPTIONAL) 2 SERVICE
CONNECTION MAXIMUM

D.I.P. "WYE" TYPICAL
RESTRAIN JOINTS
MEGALUG® OR EQUAL

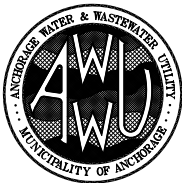
LIMIT OF PAYMENT AT
FIRST WYE CONNECTION

SERVICE RISER 4" OR 6"
DUCTILE IRON PIPE

RESTRAIN D.I.P. TO MJ TEE

8" x 4" OR 8" x 6" TEE
OR STAINLESS STEEL
TAPPING SLEEVE

SEWER
MAIN



SCALE:
NTS

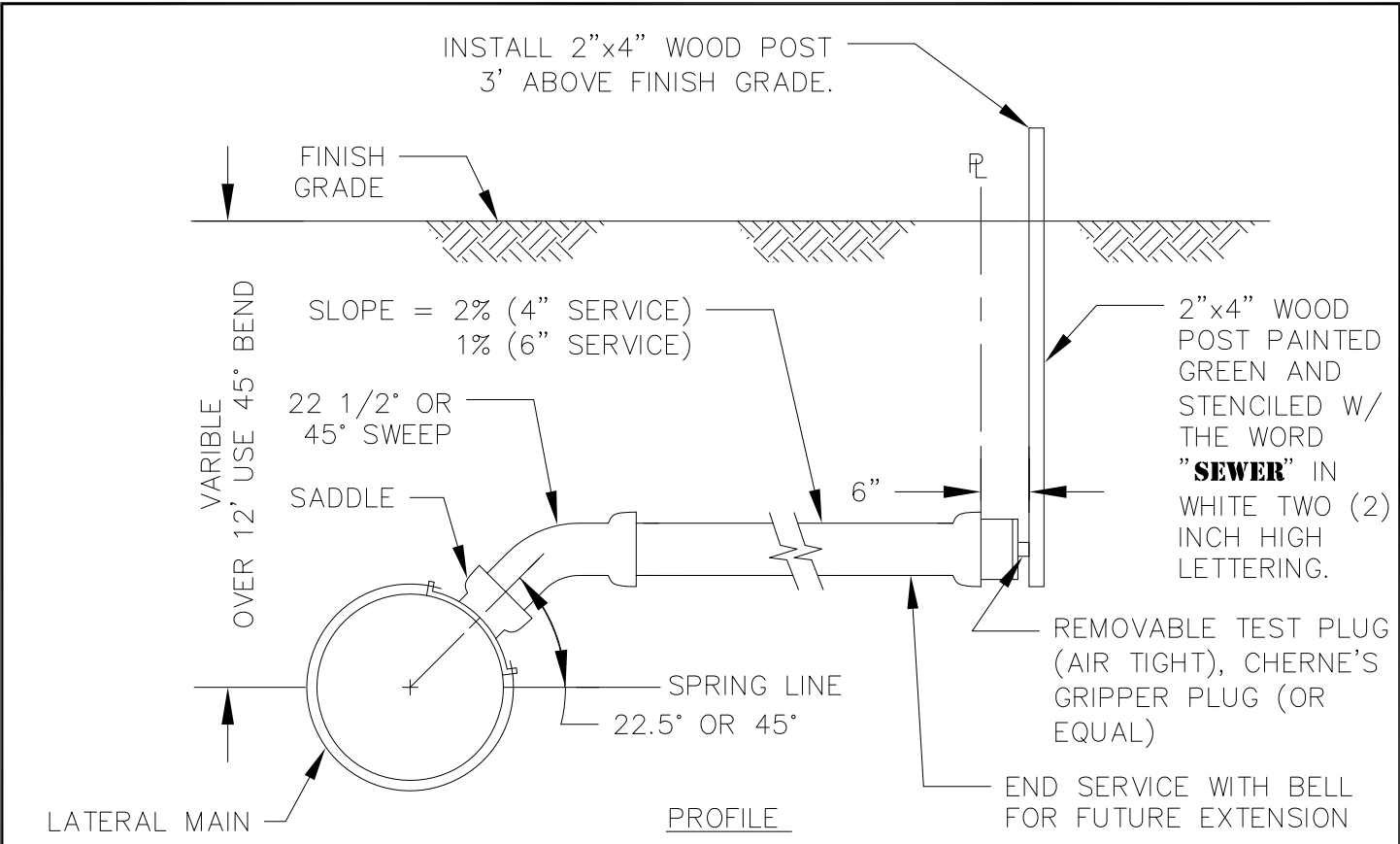
APPROVED:

REVISED:
1/2015

**NEW CONSTRUCTION OF SEWER LINES
SERVICE RISER/TOP ENTRY
FOR DEEP SEWER - DUCTILE IRON**

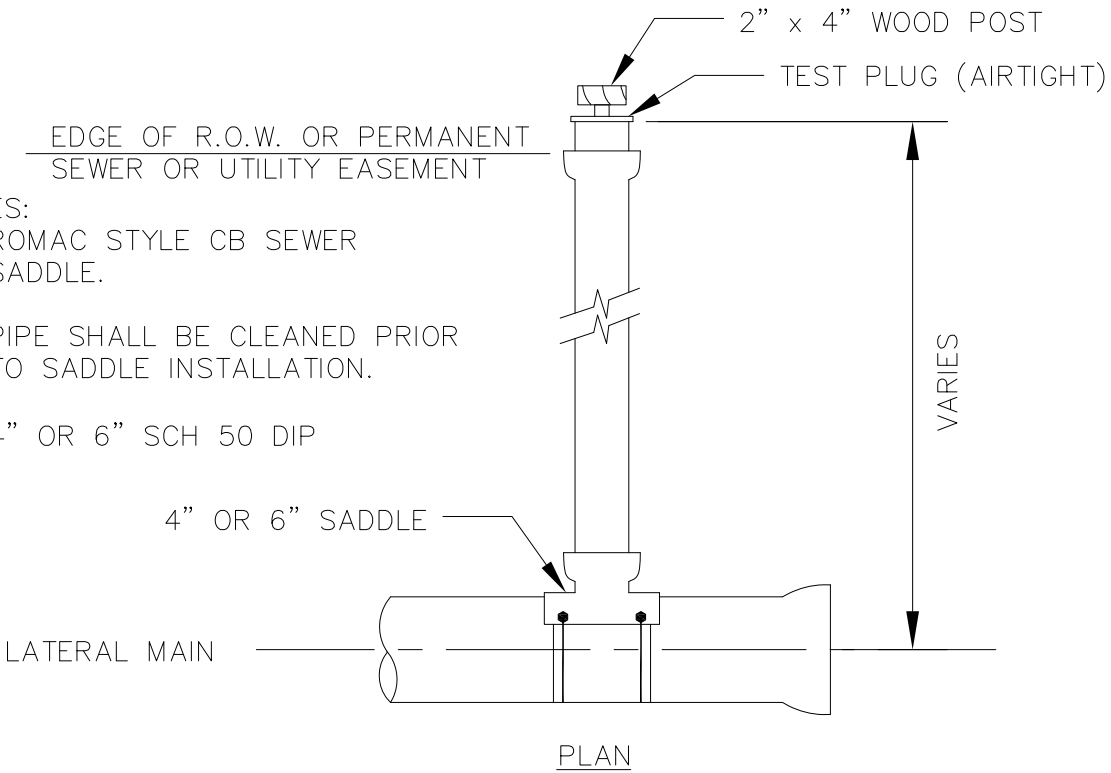
SECTION #
50.04

DETAIL #
50-16



NOTES:

1. ROMAC STYLE CB SEWER SADDLE.
2. PIPE SHALL BE CLEANED PRIOR TO SADDLE INSTALLATION.
3. 4" OR 6" SCH 50 DIP



SCALE:
NTS

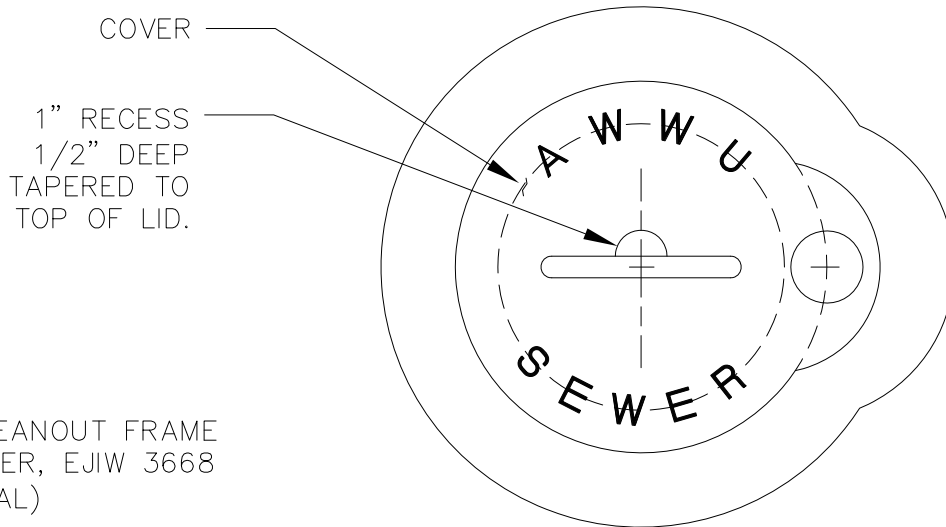
APPROVED:

REVISED:
1/2015

**SANITARY SEWER SERVICE
CONNECTION
(R.O.W. ONLY)**

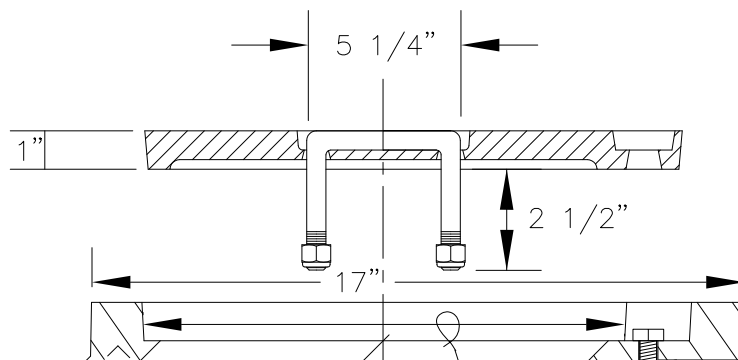
SECTION #
50.04

DETAIL #
50-17



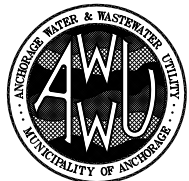
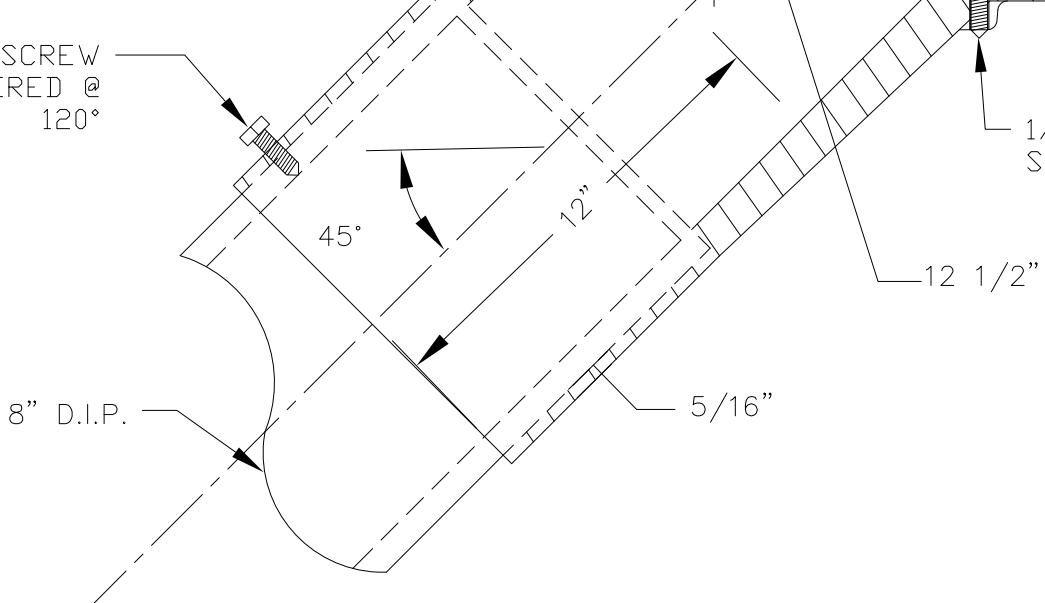
NOTES:

1. CAST CLEANOUT FRAME AND COVER, EJIW 3668 (OR EQUAL)
2. CASTING THICKNESS SUBJECT TO FOUNDRY REQUIREMENTS.
3. CASTING MUST BE SIZED TO FIT 8-INCH, D.I.P. CLASS 50 ONLY.
4. COVER SHALL BE 1/2" BELOW TOP OF PAVEMENT OR 6" BURY BELOW GRAVEL, DIRT OR R.A.P ROAD.



1/2" SET SCREW
3 REQUIRED @
120°

1/2" SET SCREW

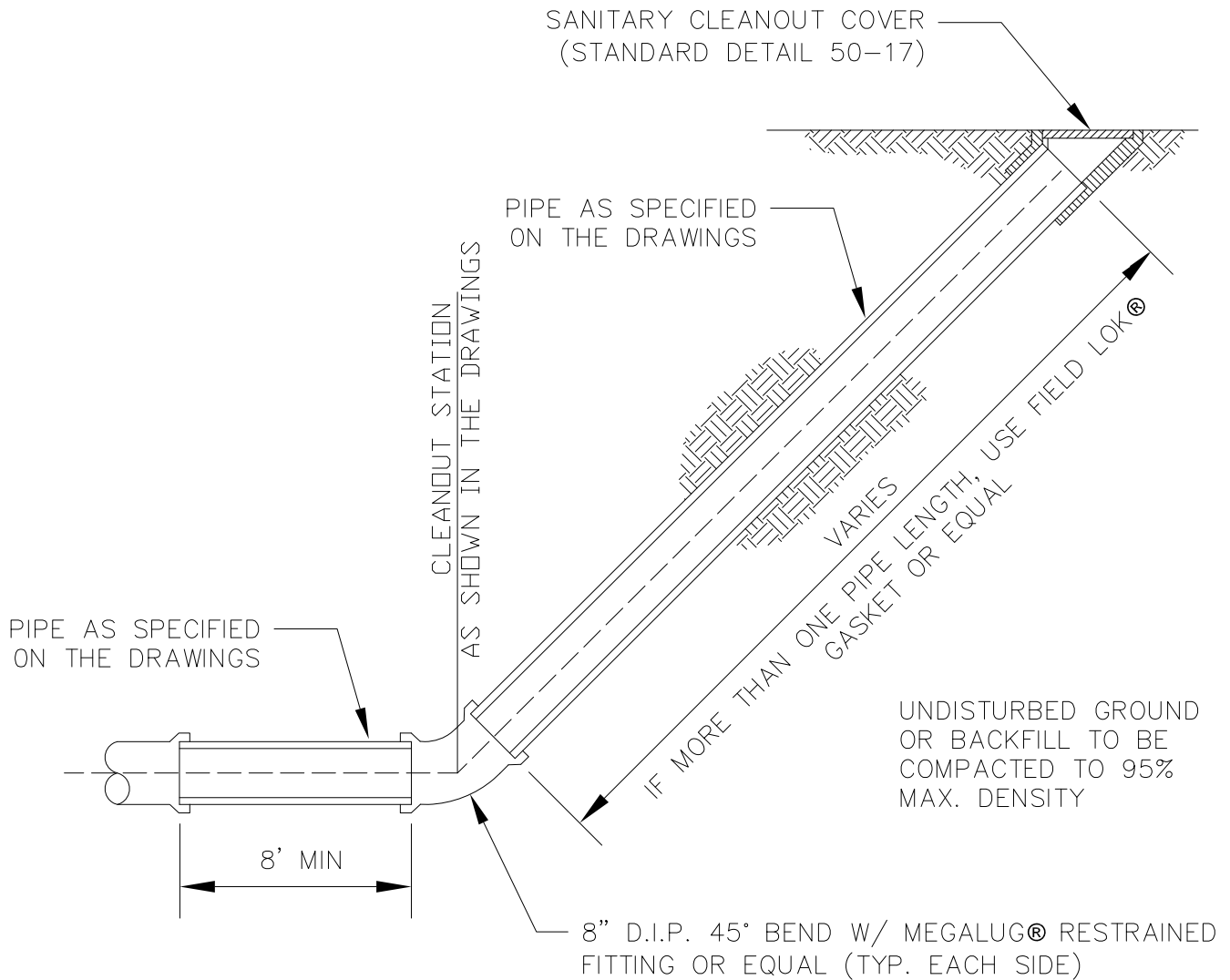


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APPROVED:
REVISED:
1/2015

SANITARY SEWER CLEANOUT COVER

SECTION #
50.04

DETAIL #
50-18



NOTES:

1. CLEANOUTS ARE NOT USED IN NEW CONSTRUCTION.
CONSULT THE ENGINEER FOR ANY NEW INSTALLATIONS.



SCALE:
NTS

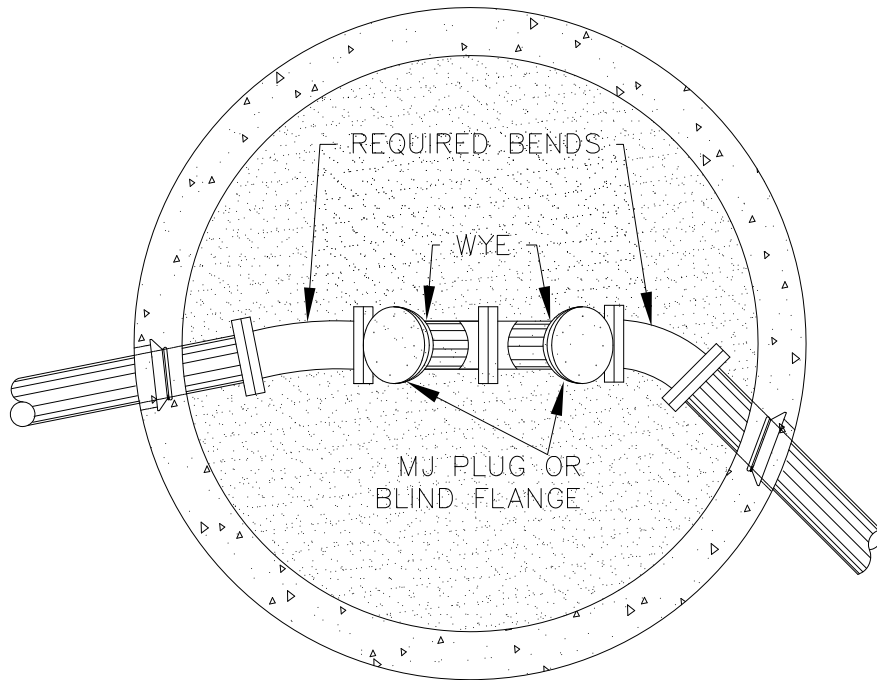
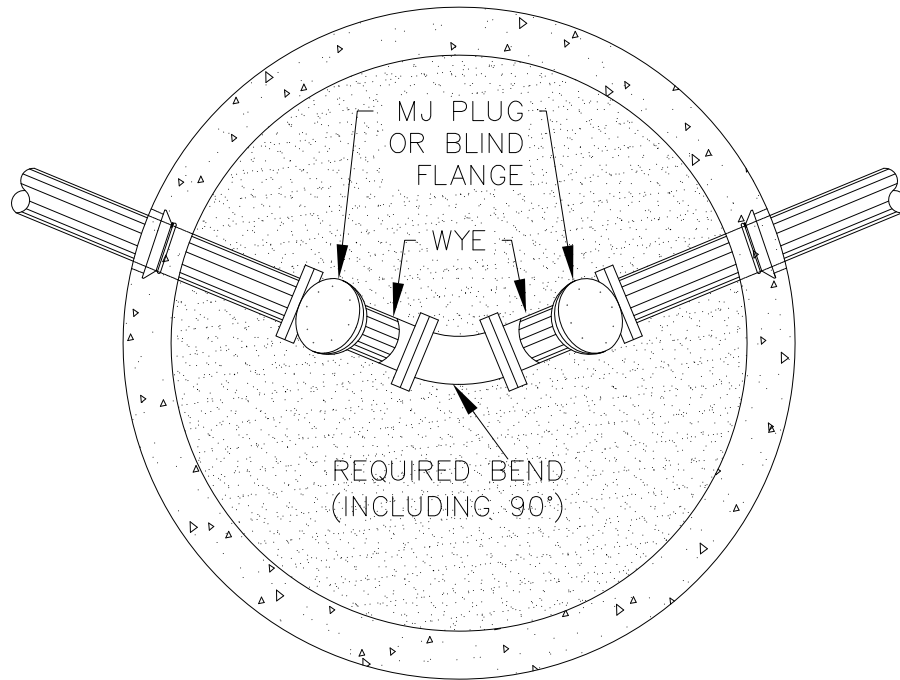
APPROVED:

REVISED:
1/2015

SANITARY CLEANOUT

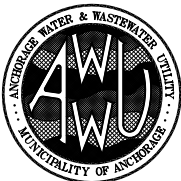
SECTION #
50.04

DETAIL #
50-19



NOTES:

1. TYPE "B" MANHOLE (MINIMUM)
2. FITTINGS SHALL BE "SHORT BODY" AND RESTRAINED W/ MEGALUG® OR EQUAL.
3. INSTALL MASON SAND TO SPRING LINE (SEE DETAIL 50-21 OR 50-22).
4. MANHOLE LID & FRAME SHALL BE WATERTIGHT IN ACCORDANCE WITH DETAIL 50-10.



SCALE:
NTS

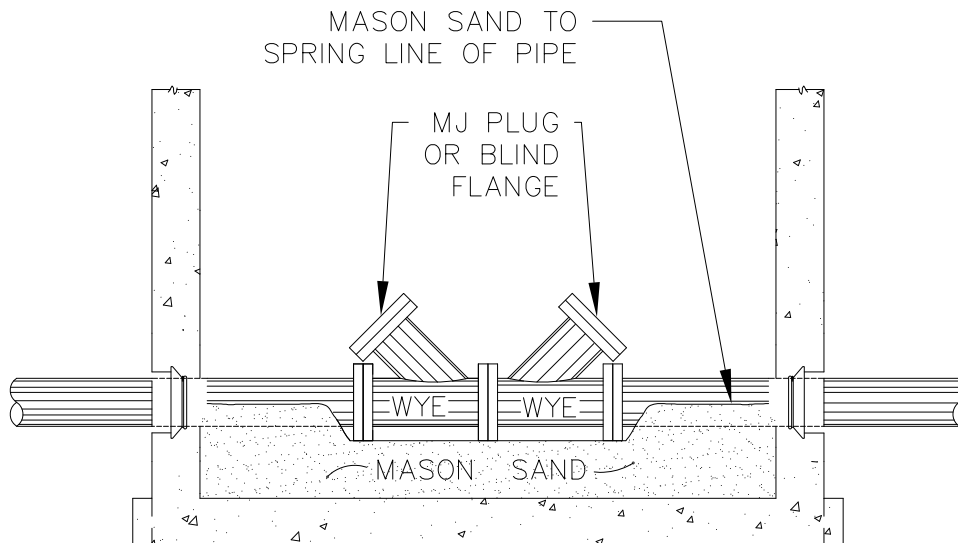
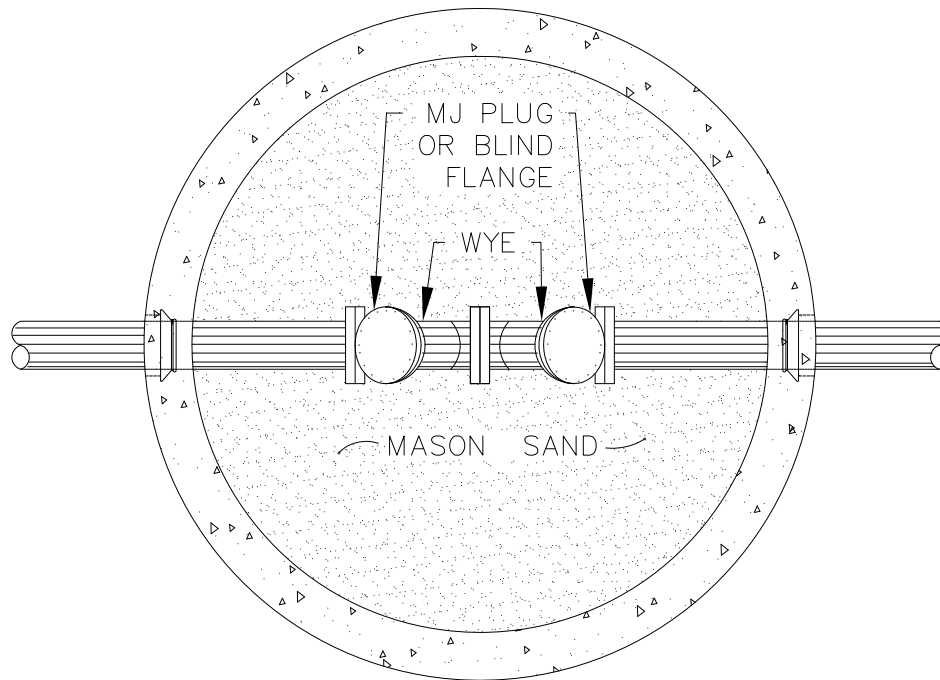
APPROVED:

REVISED:
1/2015

**SPECIAL MANHOLE AND
CLEANOUT DETAIL**
(INSIDE PROTECTIVE WELL RADIUS)

SECTION #
DIV 50.03

DETAIL #
50-20



NOTES:

1. TYPE "B" MANHOLE (MINIMUM).
2. FITTINGS SHALL BE "SHORT BODY" AND RESTRAINED W/ MEGALUG® OR EQUAL.
3. INSTALL MASON SAND TO SPRING LINE OF PIPE.
4. MANHOLE LID & FRAME SHALL BE WATERTIGHT IN ACCORDANCE WITH DETAIL 50-10.



SCALE:
NTS

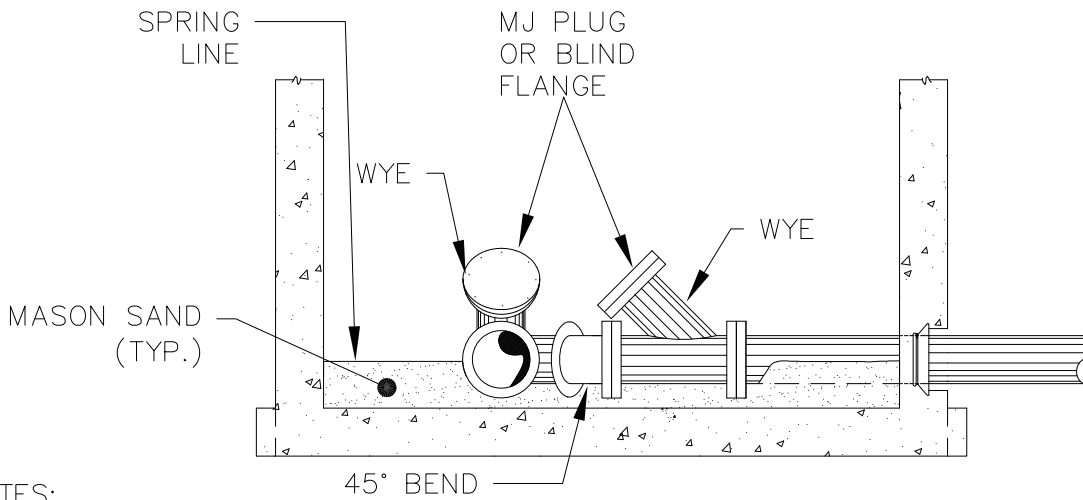
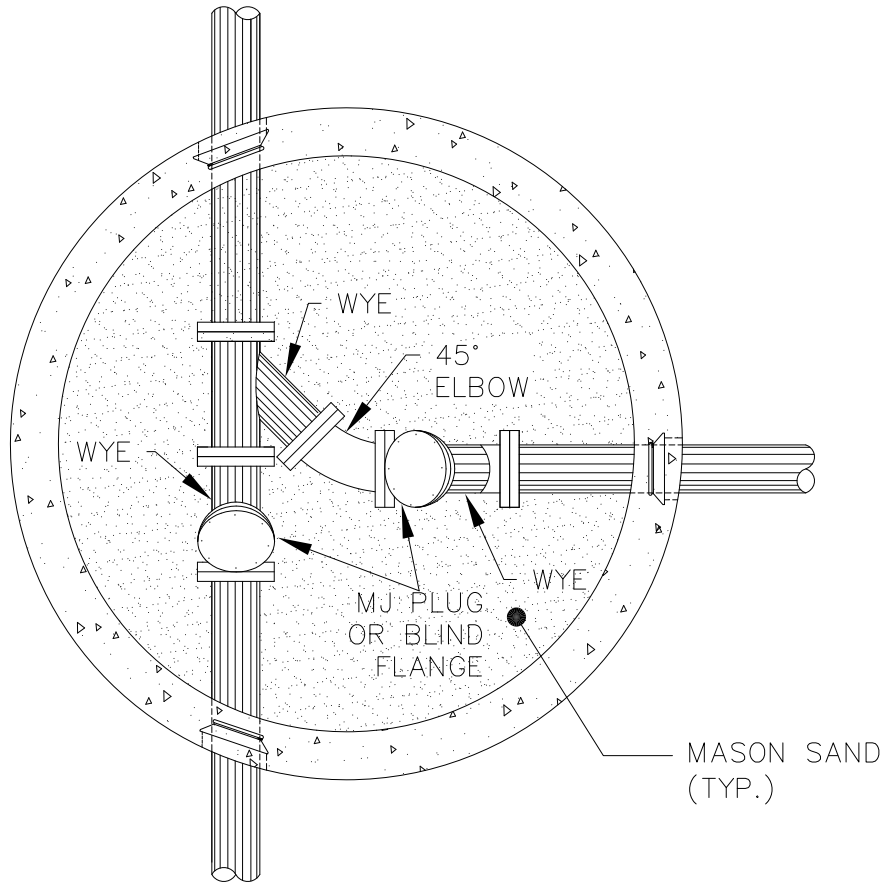
APPROVED:

REVISED:
1/2015

**SPECIAL MANHOLE AND
CLEANOUT DETAIL**
(INSIDE PROTECTIVE WELL RADIUS)

SECTION #
DIV 50.03

DETAIL #
50-21



NOTES:

1. TYPE "B" MANHOLE (MINIMUM).
2. FITTINGS SHALL BE "SHORT BODY" AND RESTRAINED W/ MEGALUG® OR EQUAL.
3. INSTALL MASON SAND TO SPRING LINE OF PIPE.
4. MANHOLE LID AND FRAME SHALL BE WATERTIGHT IN ACCORDANCE WITH DETAIL 50-10.

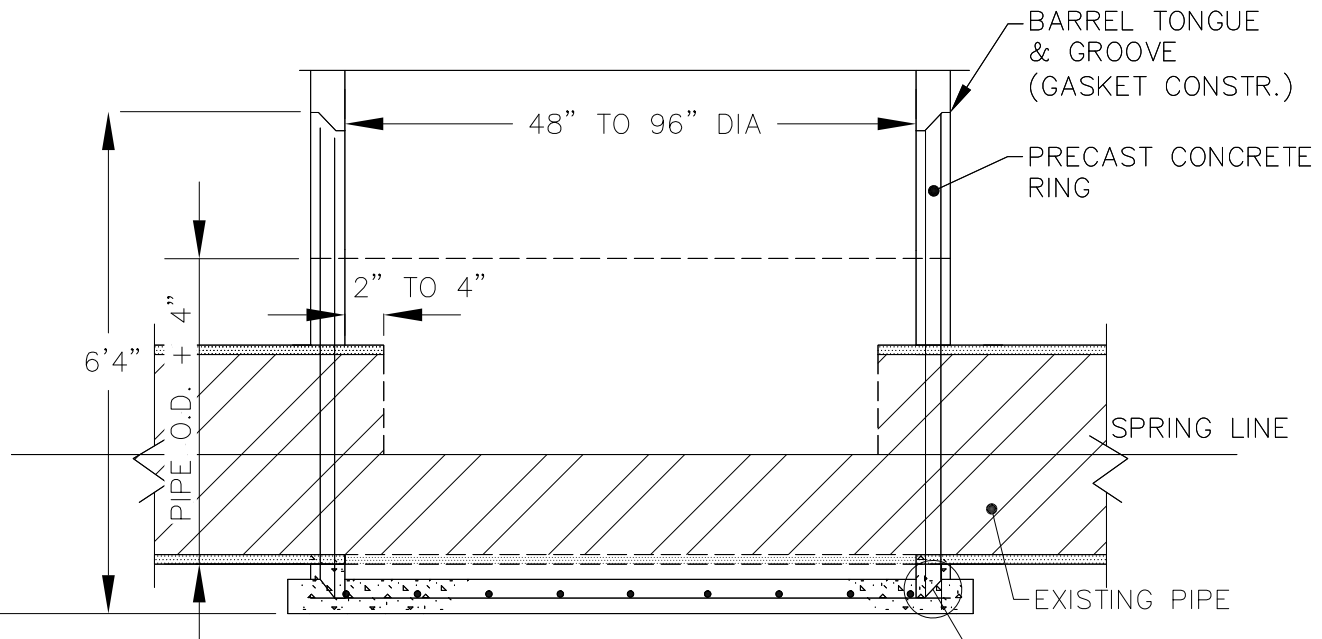
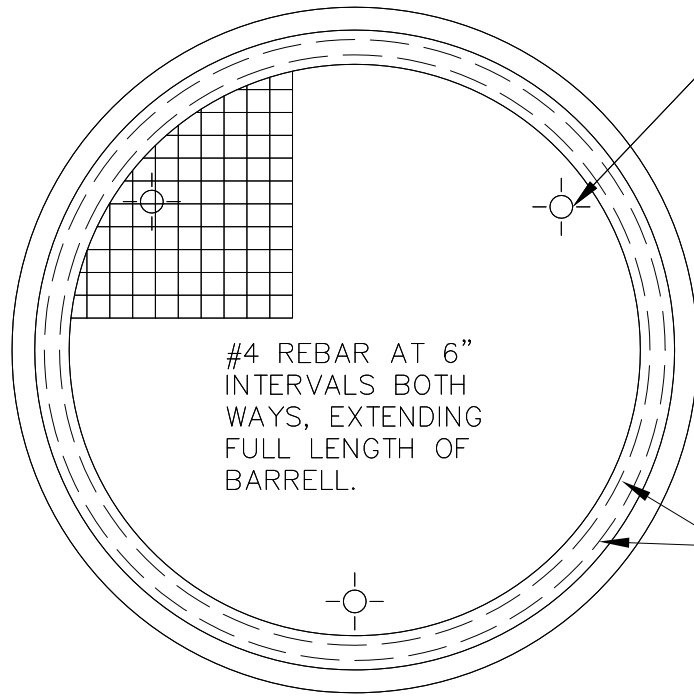


SCALE:
NTS
APPROVED:
REVISED:
1/2015

**SPECIAL MANHOLE AND
CLEANOUT DETAIL**
(INSIDE PROTECTIVE WELL RADIUS)

SECTION #
DIV 50.03

DETAIL #
50-22



NOTES:

1. NO REBAR TO EXTEND INTO PIPE OPENING.
2. MORTAR PENETRATIONS
3. REFER TO DETAIL 50-01, 50-02, & 50-03 FOR PROPER DIMENSIONS, SEALING, LADDER AND OTHER COMPONENTS



SCALE:
NTS

APPROVED:

REVISED:
1/2015

HORSE SHOE SANITARY SEWER MANHOLE DETAIL

SECTION #
50.03

DETAIL #
50-23

(DIRECTION ON STREET) S. ON ARCTIC PROJECT NAME SIZE "DI CL-50 SEWER"					
STA	+	H.I.	-	T.B.M. EL.	INV. EL.
(23+36.98)	5.64	74.70		69.06	
24+52.18	SSMH Q #4				
24+53.88	N. INV.=	65.20			65.17
24+71.99	RT (24+58.2)	4" S/S L-9, B-2	8.80 65.90		65.24
24+90.13	LT (24+84)	4" S/S L-4, B-1	8.70 66.00		65.32
25+08.19	RT (24+87)	4" S/S L-8, B-2	8.70 66.00		65.39
25+25.90	RT (25+16.2)	4" S/S L-7, B-2	8.60 66.10		65.46
25+44.00	RT (25+40.2)	4" S/S L-6, B-2	8.50 66.20		65.53
25+62.10	RT (25+66.1)	4" S/S L-5, B-2	8.40 66.30		65.60
25+70.75	S. INV.=	65.67			65.64
24+72.45	SSMH Q #5				
(23+36.98)	5.38	74.44		69.06	
24+72.45	SSMH Q #5				
25+74.15	NW. INV.=	65.77			65.74
25+92.28	RT (25+78.4)	4" S/S L-4, B-2	7.99 66.45		65.81
26+10.38	RT (26+07)	4" S/S L-3, B-2	7.89 66.55		65.89
26+28.48	LT (26+14)	4" S/S L-3, B-1	7.84 66.60		65.96
26+46.58	RT (26+43.5)	4" S/S L-2, B-2	7.74 66.70		66.03
26+64.71	LT (26+49.6)	4" S/S L-2, B-1	7.69 66.75		66.10
26+77.85	8" 45 Q C.O.	INV.= 66.18			66.16
	RT (26+71.5)	4" S/S L-1, B-2	7.64 66.80		

CONTRACTOR NAME		PAGE#		①	
LINE & GRADE NAME	PERSON	DAY	& DATE		
ROD INV.	ROD T.O.P.	FOOTAGE	TIME/SET	SLOPE/DESCR.	
(15) SSMH#3					
		0.00			
9.53	8.78	1.70		S = +0.004/FT.	
9.46	8.71	18.11 19.81	8:00	+0.07/JNT	
9.38	8.63	18.14 37.95	8:20		
9.31	8.56	18.06 56.01	8:35	SERVICE TAP STA & DIR, SIZE, LOT, BLOCK MAY GO HERE OR AT THE LEFT	
9.24	8.49	17.71 73.72	8:55		
9.17	8.42	18.10 91.82	9:10		
9.10	8.35	18.10 109.92	9:20		
9.06	8.31	8.65 118.57	9:30		
		1.70 120.27	10:00		
(15) SSMH#3					
		0.00			
8.70	7.95	1.70		S = +0.004/FT.	
8.63	7.88	18.13 19.83	10:30	0.07/JNT	
8.55	7.80	18.10 37.93	10:45		
8.48	7.73	18.10 56.03	11:00		
8.41	7.66	18.10 74.13	11:15		
8.34	7.59	18.13 92.26	11:30		
8.28	7.53	13.14 105.40	12:00		
		105.40			

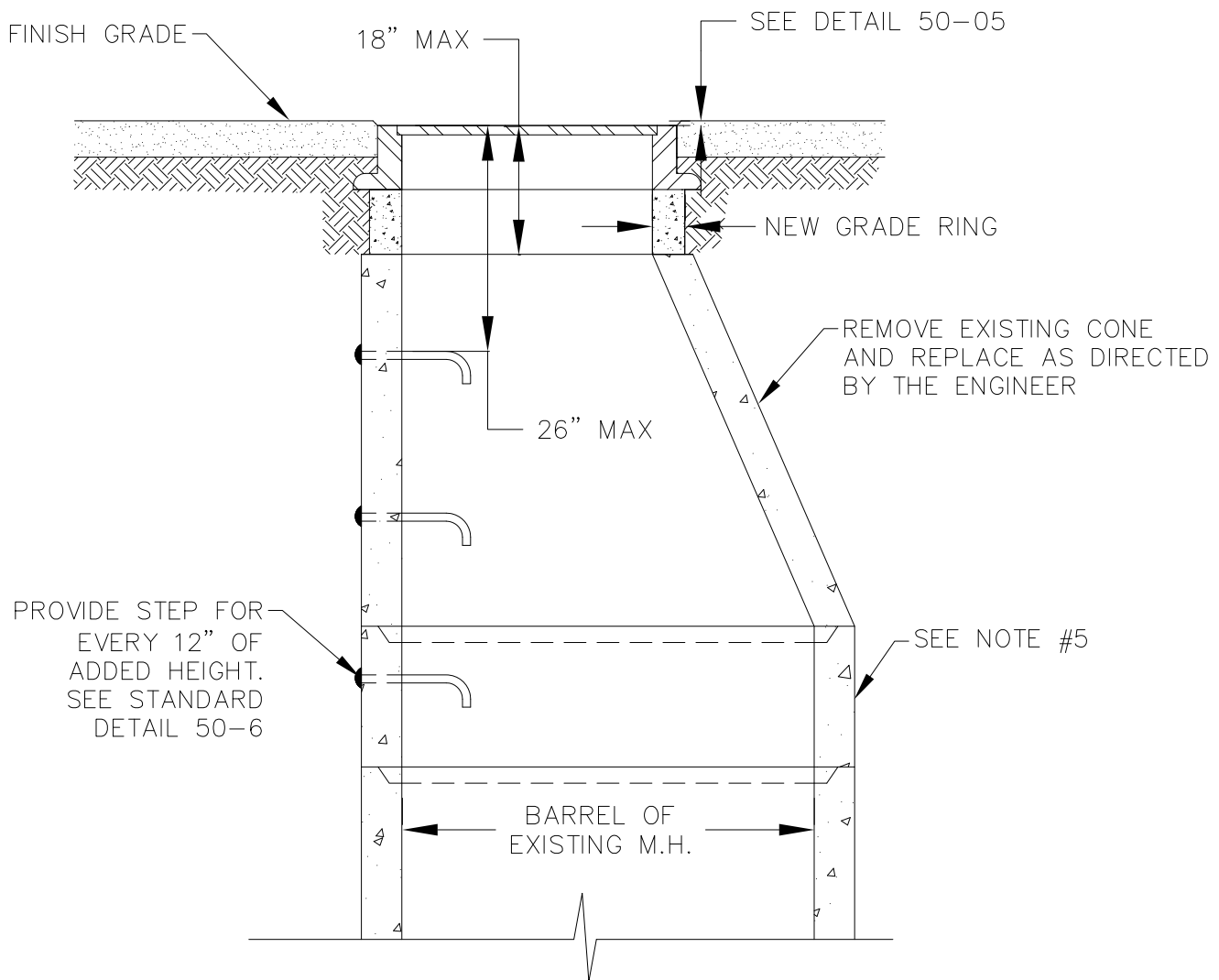
USE INVERT ELEVATIONS (INV) FOR SEWER
USE BOTTOM OF PIPE ELEVATIONS (BOP) FOR WATER



SCALE:
NTS
APPROVED:
REVISED:
1/2015

CONTRACTOR FIELD INSTALLATION NOTES SANITARY EXAMPLE

SECTION #
DIV 50
DETAIL #
50-24



NOTES:

1. RESET CONE WITH COLD JOINT GASKET AND SEAL EXTERIOR JOINT WITH COLD JOINT SEALANT.
2. ADJUST FRAME TO PROPER DEPTH BELOW SURFACE OF PAVEMENT. FEATHER EDGE OF PAVEMENT TO SMOOTH TRANSITION, PER DETAIL (50-05).
3. SEAL FRAME, AND GRADE RINGS TO CONE WITH WRAPIDSEAL® OR APPROVED EQUAL.
4. WRAP CONES & BARREL SECTIONS WITH THREE (3) LAYERS OF 8-MIL THICK POLYETHYLENE ENCASEMENT MATERIAL AFTER INSTALLING THE WRAPIDSEAL® (SEE DETAIL 50-1)
5. ADD OR REMOVE PRECAST RISER SECTIONS OR RADIAL CONCRETE MANHOLE BLOCKS AS DIRECTED BY THE ENGINEER

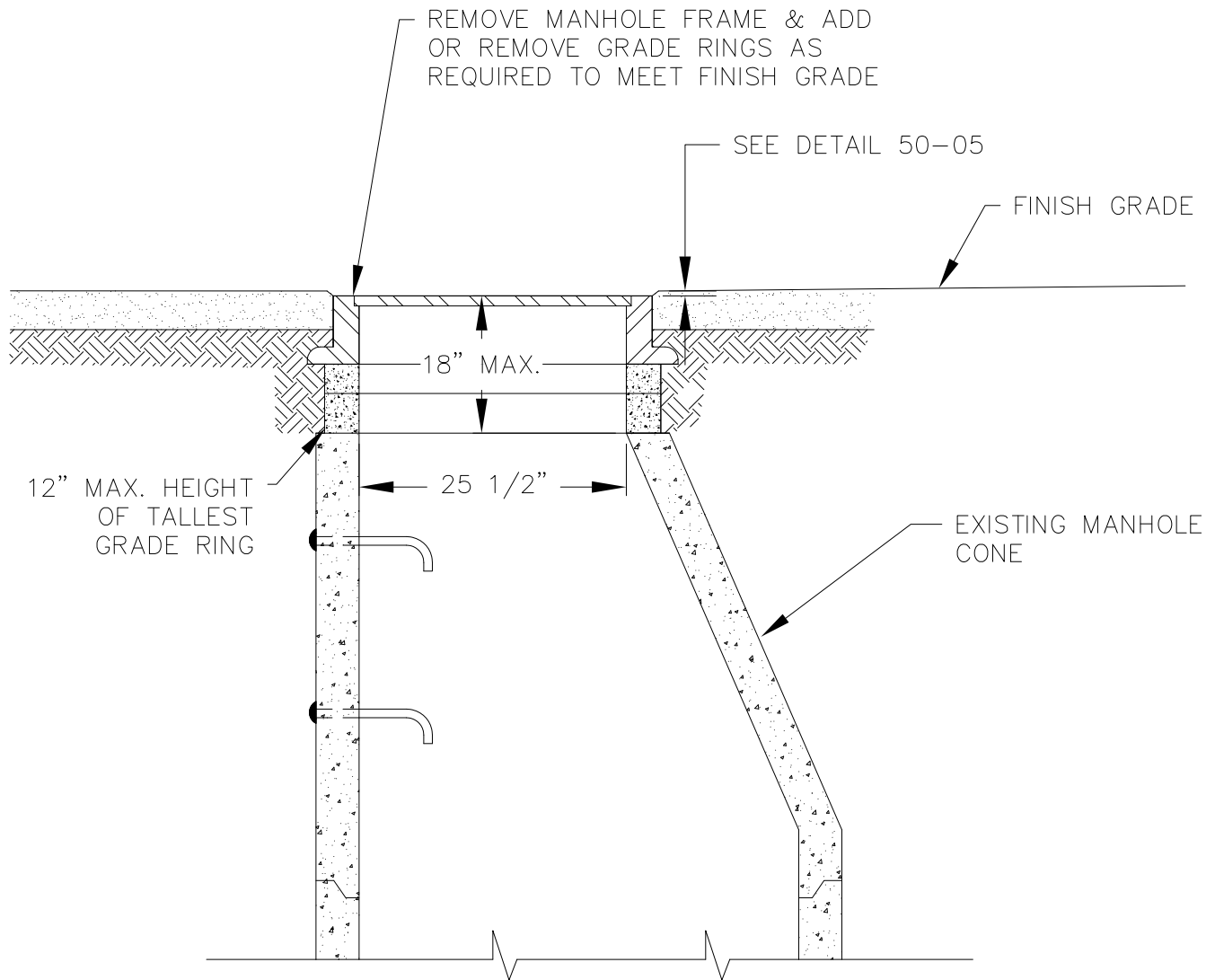


SCALE:
NTS
APPROVED:
REVISED:
1/2015

MANHOLE CONE ADJUSTMENT

SECTION #
50.03

DETAIL #
50-25



NOTES:

1. WHEN AN ADJUSTMENT OF GREATER THAN 12" IN GRADE RINGS IS REQUIRED, ADJUST CONE PER STANDARD DETAIL 50-25 RATHER THAN GRADE RINGS.
2. SEAL FRAME AND GRADE RING TO CONE WITH WRAPID SEAL® OR APPROVED EQUAL



SCALE:
NTS

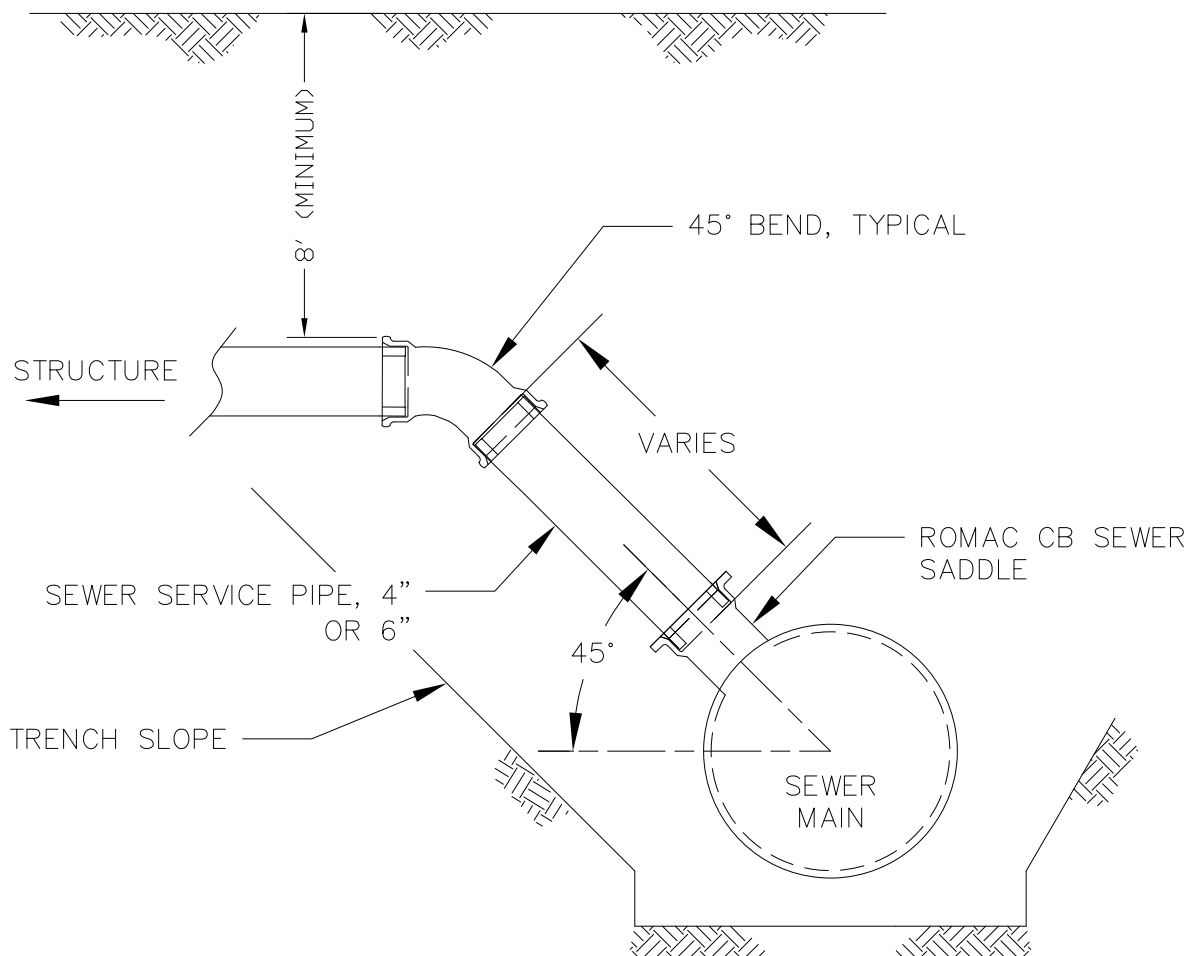
APPROVED:

REVISED:
1/2015

MANHOLE RING ADJUSTMENT

SECTION #
50.03

DETAIL #
50-26



NOTES:

1. CONNECTIONS UTILIZING A STEEP SEWER RISER MAYBE INSTALLED WHERE THE SEWER MAIN IS IN EXCESS OF 10' AND THE SERVICE CONNECTION AND EXTENSION WILL HAVE A MINIMUM OF 8' OF COVER IN THEIR ENTIRETY.
2. BACKFILL MUST BE PLACED AND COMPACTED IN UNIFORM HORIZONTAL LIFTS THE WIDTH OF THE TRENCH. COMPACTION IS CRITICAL BENEATH THE SEWER MAIN, FITTINGS, AND LATERAL TO MINIMIZE AND ELIMINATE SETTLEMENT.



SCALE:
NTS
APPROVED:
REVISED:
1/2024

STEEP SEWER RISER

SECTION #
50.04

DETAIL #
50-27