TECHNICAL SPECIFICATIONS

AND

CONSTRUCTION DETAILS

FOR

SANITARY SEWER SYSTEM IMPROVEMENTS

CHESTER COUNTY WASTEWATER RECOVERY

CHESTER, SOUTH CAROLINA

OCTOBER 2021

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SECTION 1 - ADMINISTRATIVE PROCEDURES

To expedite the approval process of new wastewater collection system extensions, we have divided the process into three sections: Preliminary Approval, Final Approval, and Project Completion and Takeover. Prior to submission for Preliminary approval, CWR recommends preparation of a sketch plan for review by CWR staff to discuss general layout and specific CWR requirements. The submittals required for each section are as follows:

1-A. PRELIMINARY APPROVAL

1. Submit two (2) paper copies and one (1) PDF copy of Plans, Specifications, and Design Checklist for preliminary approval to the CWR Office. Include copies of all design notes for system flow capacity.
2. CWR will return either a comment letter or one (1) set of Plans and Specifications reviewed indicating corrections necessary and/or approval to the Engineer at their option.
3. Plan will show all sewer related improvements both public and private which will be served by CWR.

1-B. FINAL APPROVAL

1. Submit two (2) full size paper copies and one (1) PDF copy of Plans and Specifications indicating corrections requested by CWR. These should be checked by CWR before submitting to SCDHEC.
2. Submit a copy of SCDHEC permit application and attachments.
3. Submit a copy of the proposed construction schedule.
4. Upon approval, signed copies of application will be returned for submission to SCDHEC.
5. Upon approval of the Plans and Specifications by SCDHEC, provide CWR one (1) full size paper copy of the approved Plans and Specifications, one (1) 11x17 copy of the approved Plans, and one PDF copy of the approved Plans and Specifications.
6. Engineer to notify CWR of commencement of work in writing seven (7) days prior to starting construction.
7. The Engineer should submit to the CWR a written Engineer's weekly site visit report each time he inspects the project. The format for this report may be of the Engineer's choosing.
8. The Engineer shall request in writing permission to tie into the CWR System and schedule on-site inspection by CWR personnel.
9. The Engineer shall provide CWR with two (2) copies of the final plat showing the following as required:
    a. The lift station lot, with the location of the twenty (20') wide minimum access road.
    b. The width of the easements for sewer laterals and force main lines shall be a minimum of fifteen (15') feet. Width of easements for gravity flow sewer line shall be a minimum of twenty (20') feet. All sewer lines within the easement shall be platted to provide equal distance on each side.

1-C. PROJECT COMPLETION AND TAKEOVER

1. Submit to CWR a written request for final inspection.
2. The developer shall furnish CWR with a notarized letter guaranteeing that payment for all future construction costs incurred by CWR. Lateral installations not shown on the plans will be paid by the developer within thirty (30) days after their receipt of an invoice from CWR.

3. The Engineer will provide his certification that the sewer system has been constructed in accordance with the CWR approved Plans, Specifications, and Regulations.
4. The Engineer shall provide CWR with two (2) paper copies, one (1) PDF, and one (1) .DWG file of the "As Constructed Record Drawings". These drawings should reflect all "as constructed" conditions and lateral placement in the format that follows:
   a. Station marks should be shown at all wye's, services, and terminations.
   b. Top elevation of manholes and invert elevation of manholes
   c. Benchmarks shall be referenced on drawing and shall be tied to USGS and MSL.
   d. All recorded plat information shall be included on the record drawings.

   CWR will review the "Record Drawings" for completeness prior to issuing an acceptance letter. If errors occur, then the drawings will be returned to the Engineer and the system acceptance letter will not be issued until corrections/additional information is provided.

5. The developer shall provide CWR with an instrument of conveyance, conveying the constructed system to CWR free and clear of all liens, at no cost to CWR, and the system shall thereafter be owned, operated and maintained by CWR.
6. As part of the conveyance, the Developer and/or Engineer shall furnish CWR with a copy of the plat showing the lift station lot and all easements for sewer and force main line, along with the original copy of the deed to the lift station lot and all the original copies of the legal instrument conveying the easement to CWR.
7. The Developer shall furnish irrevocable one-year maintenance bond and/or letter of credit in the amount of ten (10) percent of the total construction cost of the system as determined upon completion of construction. The starting date of the bond and the instrument of conveyance shall be the same. The Developer shall furnish certified letters indicating:
   a. The value of the sewer collection system and the value of any associated lift stations
   b. The number of manholes, the length of service line in linear feet, the length of each size of collection system lines in linear feet, the amount and size of force main pipe in linear feet, the number of service laterals, and the total number of available services.
8. The Contractor shall provide CWR a copy of the executed warranty agreement.
9. The Contractor shall provide CWR a copy of the executed final Lien Waiver.
10. When Items 1 through 9 above are completed to the CWR's satisfaction, the CWR will issue an acceptance letter to SCDHEC with copies to all involved parties. Until this letter is provided, NO tie-ins to the sewer system will be permitted.

1-D. General

1. All connections to existing CWR manholes or collection system must be approved and inspected by CWR.
2. The Contractor installing the sewer system must be approved in advance by CWR or be listed as a CWR approved utility contractors. If an unapproved contractor is used, CWR reserves the right to place a full-time inspector on site for the duration of the project and charge the developer $50/hour for each hour the inspector is on site. In addition, if significant issues are noted by CWR during construction, CWR also reserves the right to place a full-time inspector on site for the duration of the project and charge the developer $50/hour for each hour the inspector is on site. These inspection fees must be paid in full before CWR will accept the collection system
3. CWR will only consider for operation and maintenance sewer systems installed:
   a. Within the boundaries of Chester County Wastewater Recovery.
   b. Systems meeting the requirements of these guidelines and installed in a manner acceptable to CWR and SCDHEC.
4. No system shall be put into service until SCDHEC's letter of acceptance and approval to place system into operation is received.

SECTION 2 - CONSTUCTION PROCEDURES

This section of the guidelines is provided to outline most types of laying conditions, but is not intended to cover all special laying conditions or the Engineer's special requirements.

2-A. LOCATION AND GRADE

1. The alignment and grade of the sewer, and the position of manholes and other structures, will be given by the Engineer. The grade line shown and specified means the invert of the pipe. Necessary lines, levels and grades will be given by the Engineer, but the Contractor shall be responsible for accurately transferring such lines and grades to the work. This work by the Contractor shall be subject to frequent checking by the Engineer and CWR.
2. All sewers (gravity or force mains) shall be constructed such that there is a 10' minimum horizontal separation between water mains at all times, as required by Section R61 58.4D(12) of the state Primary Drinking Water Regulations.
3. Sewers crossing potable water mains shall be laid to provide a minimum vertical separation of eighteen inches (18") between the outside of the potable water main and the outside of the sewer. This shall be the case where the potable water main is either above or below the sewer. Whenever possible, the potable water main shall be located above the sewer main. Where a new sewer line crosses a new potable water main, a full length of pipe shall be used for both the sewer line and potable water main and the crossing shall be arranged so that the joints of each line shall be as far as possible from the point of crossing and each other. Where a potable water main crosses under a sewer, adequate structural support shall be provided for the sewer line to prevent damage to the potable water main while maintaining line and grade.
4. There shall be no physical connections between a public or private potable water supply system and a sewer, or appurtenance thereto which may permit the passage of any sewage or polluted water into the potable supply. No potable water pipe shall pass through or come into contact with any part of a sewer manhole.
5. All sewer lines shall be installed so that they intersect at manholes with angles of 90 degrees or greater. Any sanitary sewer with less than 3' of cover to finished grade shall be ductile iron. Additionally, any sewer laid with 14' or greater of cover shall be ductile iron. Sewer with over 18' of cover must be approved on a case-by-case basis by CWR. All pipe laid outside the road right -of-way shall be ductile iron.
6. Sewer grades shall not exceed 8%, without express written approval by CWR, so that a velocity of 10 feet per second is not exceeded. Standard manholes with a typical slide invert may be used for differences in grade of 2 feet and less. For elevation differences greater than 2 feet, a drop manhole must be used.
7. Creek crossings may require a section of long-span steel pipe. Each such crossing shall be addressed on a case by case basis. See details for additional information.

2-B. PROTECTION OF OTHER UTILITIES AND STRUCTURES

1. Before a pipeline is laid, the Contractor shall locate water, sewer, gas and other utility lines and services as necessary to avoid conflicts. The Contractor shall locate existing small lines, and other possible existing unknown utility lines, with an electronic pipe finder and shall excavate and expose all existing underground lines in advance of trenching operations. The Contractor shall be responsible for and shall repair any damage done to utility services resulting from the work of locating services or resulting from the construction operations. Damage to existing utility lines, services, poles, and structures shall be repaired or replaced by the Contractor at his own expense. The approximate positions of certain known underground lines are shown for information.

2-C. SEDIMENT AND EROSION CONTROL

1. Siltation and soil erosion shall be controlled by the Contractor, using mulches, grasses, slope drains, and other erosion control devices or machines as necessary. Erosion and pollution control may include temporary construction work outside the right of way where necessary as a result of construction operations, such a haul roads and equipment storage sites.
2. Temporary erosion control shall consist of planting temporary grass of a quick growing species such as millet, rye grass, or cereal grasses suitable to the area. Seed, fertilizer, mulch and periodic watering shall be applied in adequate quantities to assure a full, healthy ground cover over the entire disturbed area of construction operations. All materials shall be of first class quality and subject to approval by the governing erosion control authority. All disturbed areas along the pipeline shall be grassed as soon as possible after backfilling operations have been completed.
3. Unless otherwise approved by the Engineer, construction operations in streams and impoundments shall be restricted to those areas which must be entered for the construction of temporary or permanent structures. As soon as conditions permit, streams and impoundments shall be promptly cleared of all falsework, piling which are to be removed, debris and other obstructions placed therein or caused by the construction operations. Frequent fording of live streams with construction equipment will not be permitted; therefore, temporary bridges or other structures shall be used wherever an appreciable number of stream crossings area necessary. Unless otherwise approved by the Engineer, mechanized equipment shall not be operated in live streams except as may be required to construct channel changes and temporary or permanent structures, and to remove temporary structures.
4. In the case of failure on the part of the Contractor to adequately control erosion, pollution, and/or Siltation, CWR reserves the right to employ outside assistance or to use his own forces to provide the necessary corrective measures. Such incurred direct costs will be charged to the Contractor.

2-D. TRENCH EXCAVATION

1. Trench excavation shall be made in open cut and true to the lines and grades shown on the plans, unless boring is necessary or required. Banks of the trenches shall be cut in vertical, parallel planes equal-distant from the pipe center line. The horizontal distance between such planes, or the overall width of trench, shall vary with the size of the pipe to be installed. The overall width of trench shall be as recommended by manufacturer. When vertical banks for trench excavation are not practical to construct or create dangerous conditions to workmen, the banks may be sloped provided that such excavation does not damage adjacent structures. When trench banks are sloped, such banks shall be cut to vertical planes as specified above for that part of the ditch below the level of 12 inches above the top of the pipeline. The bottom of the trench shall be level in cross section and shall be cut true to the required grade of the pipe and pipe embedment materials.
2. Bell holes for bell-and-spigot pipe shall be excavated at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper installation of joints in the pipe.
3. When muck, quicksand, soft clay, swampy, or other material unsuitable for foundations or sub-grade are encountered such material shall be removed and replaced with pipe foundation material.
4. After excavation the space below the ultimate pipe grade shall be filled with pipe embedment materials as required, compacted to proper grade, and made ready for pipe laying.
5. Debris encountered in trench excavation for sewers and other pipelines shall be removed for the overall width of trench which shall be as shown on the plans. It shall be removed to a depth of six (6”) inches below the bottom of the pipe for pipes smaller than twenty-four (24”) inches in size; eight (8”) inches below the bottom of the pipe for pipes twenty-four (24”) inches to thirty-six (36”) inches in size; and twelve (12”) inches below the bottom of the pipe for pipes larger than thirty-six (36”) inches in size, if debris extends to such depth.
6. In all cases, materials deposited shall be placed so that in the event of rain, no damage will be done to the work.
7. The sides of all excavations shall be sufficiently sheeted, shored, and braced whenever necessary to prevent slides, cave-ins, settlements, or movement of the banks and to maintain the excavation clear of obstructions. Wood or steel sheet piling of ample design and type shall be used when necessary. All sheeting, shoring, and bracing shall have sufficient strength and rigidity to withstand the pressures exerted and to maintain the walls of the excavation properly in place and protect all persons and property from injury or damage. Sheeting, shoring, or bracing materials shall not be left in place unless as shown by the plans or permitted by CWR. All trench sheeting and bracing shall be left in place until the trench has been backfilled one foot above the top of the pipe.

2-E. PIPE LAYING

1. Before sewer pipe is placed in position in the trench the bottom and sides of the trench shall be carefully prepared as per manufacturer's specifications. Each pipe shall be accurately placed to the exact line and grade called for on the plans. Laser equipment shall be used in setting pipes grade in lieu of the batter board method.
2. Pipe laying shall proceed up-grade, starting at the lower end of the grade and with the bells up-grade. Pipe shall be straight when placed in the trench. Trench bottoms found to be at incorrect grade after pipe laying operations have begun shall be corrected and brought to exact line and grade. Fill required shall be pipe foundation material.
3. After each line of pipe has been laid, it shall be carefully inspected and all earth, trash, rags, and other foreign matter removed from the interior.
4. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe to avoid sudden offsets or inequalities in the flow lines.
5. All jointing of pipe and fittings shall be in accordance with the pipe manufacturer's recommendations.
6. Any leaks or defects discovered at any time after completion of the work shall be repaired immediately. All pipe in place shall be carefully protected from damage until the backfilling operations have been completed.
7. If the separation between any sewer and adjoining water line is less than the minimum SCDHEC standard, the sewer line shall be encased in concrete.

2-F. BACKFILL

1. The backfilling of pipeline trenches shall be started immediately after the pipe work has been inspected. Crushed stone bedding material shall conform to the latest revision of ASTM C 33, as amended, gradation #67 (ASTM #67), varying in sizes 1/4" through 3/4". Bedding material shall be placed in the trench and thoroughly compacted to grade by tamping. Compacted bedding material shall be carried up the sides of the pipe to the heights shown for the various classes of bedding.
2. Backfill shall be deposited in 6” layers (before compaction) and thoroughly compacted with power tools to as stated below.
3. Where trenches are not under pavement, sidewalks, or in alleys, the backfill material shall be compacted to 95% of maximum dry density, Standard Proctor ASTM-D-698. Any deficiency in the backfilling of the trenches, or depressions caused by settlement, shall be repaired.
4. Where pipe trenches are cut across or along pavement, trench backfilled shall be select fill material placed and compacted in 6” lifts to 100% of maximum dry density, Standard Proctor ASTM-D-698. Replacement of road base and asphalt shall be in accordance with SCDOT specifications.
5. Backfilling around structures shall be done in the manner specified above for pipe trenches by power tamping for the full depth of cut from the bottom of the finished grade.
6. All backfilling shall be done in such manner as will not disturb or injure the piper or structure over or against which it is being placed. Any pipe or structure injured, damaged, or moved from its proper line of grade during backfilling operations shall be opened and repaired and then re-backfilled as herein specified.
7. Bedding materials for manholes shall conform to the latest revision of ASTM C 33, as amended, gradation #57 (ASTM #57). A 12” layer of bedding material shall be placed under manholes and compacted to grade by tamping.
8. Select fill shall be sand-clay, fine sand or sand gravel mixes with a maximum of 25% passing a wash #200 sieve.
9. Re-use of existing excavated material will be allowed provided the materials are compactable and dried and/or wetted to their optimum moisture content, are free from roots, large clods of clay, and are generally non-cohesive in nature.

2-G. TESTING

1. CWR will require that all sanitary sewer systems pass the following test prior to acceptance. A representative of CWR shall be present for all tests.
   a. Low Pressure Air Test:
      Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned. Immediately after cleaning, the sewer shall be tested with low-pressure air. At the Contractor's option, sewers may be tested in lengths between manholes or in shorter sections using Air-Lock balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately 4.0 psi. After this pressure is reached and allowed to stabilize (approximately 2 to 5 minutes), the pressure may be reduced to 3.5 psi before starting the tests. If a 1.0-psi drop does not occur within the test time, then the line has passed the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test, and the Contractor will be required to locate the failure, make necessary repairs and retest the line. Minimum test time for various pipe sizes shall be in accordance with ASTM C 828, latest edition.

      Required test equipment includes Air-Lock bails, braces, air hose, air source, timer, rotometer as applicable, cut-off valves, pressure reducing valve, 0-15 psi pressure gauge, 0-5 psi pressure gauge with gradations in 0.1 psi and accuracy of ± 2%.

      The Contractor shall keep records of all tests made. Copy of such records will be given to the Engineer. The Contractor is cautioned to observe proper safety precautions in performance of the air testing. It is imperative that plugs are properly secured and that care is exercised in their removal. Every precaution shall be taken to avoid the possibility of over pressurizing the sewer line.
   b. Force Main Pressure Test:
      All air shall be released from the system prior to testing. Test pressure shall be 1.5 times the maximum working pressure in the system as measured at the lowest point of elevation of the section of line being tested. Testing time shall be a minimum two (2) hours. Leakage shall not exceed the allowable leakage shown AWWA C-600 and AWWA C-605, latest edition or calculated by the formula:

      G = (L*D*P1/2)/148,000
      Where:
      G = allowable leakage, in gallons per hour
      L = length of pipe tested, in feet
      D = nominal diameter of pipe, in inches
      P = average test pressure (psig)

      All visible leaks shall be repaired regardless of the amount of leakage.

c. In addition to pressure testing, perform the following tests in the presence of the CWR inspector prior to acceptance of the system by CWR.

i. Pipe Deflection:
After backfilling trenches all PVC sewer pipe shall be tested for initial diametric deflections by the use of a 5% mandrell which is acceptable to CWR. The initial diametric deflection shall not exceed five percent (%).

ii. Manhole Testing:
All manholes shall be watertight. Manholes shall be tested by the following procedure:

Plug pipes in manhole; remove water in manhole; observe plugs over period of not less than 2 hours to ensure there is no leakage into manhole. Determine ground water level outside manhole. Fill manhole with water to within 4 inches of top of cover frame. Prior to test, allow manhole to soak from minimum of 4 hours to maximum of 72 hours; after soak period, adjust water level inside manhole to within 4 inches of top of cover frame.

Measure water level from top of manhole frame; at end of 4 hour test period, again measure water level from top of manhole frame; compute drop in water level during test period. Manhole exfiltration test is considered satisfactory when drop in water level is less than values listed in table below:

Manhole Depth (feet)	Allowable Leakage inches for Manhole Diameter		
	4 feet	5 feet	6 feet
4	0.11	0.14	0.17
6	0.17	0.21	0.26
8	0.23	0.29	0.35
10	0.28	0.35	0.42
12	0.34	0.43	0.51
14	0.40	0.50	0.60
16	0.45	0.56	0.68
18	0.51	0.64	0.77
20	0.57	0.71	0.86
22	0.62	0.78	0.93
24	0.68	0.85	1.02
26	0.74	0.93	1.11
28	0.79	0.99	1.19
30	0.85	1.06	1.28

When unsatisfactory test results are achieved, repair manhole and retest until result meets criteria; repair visible leaks regardless of quantity of leakage.

iii. Soil Compaction Test:

All trenches suspected of not meeting the compaction requirements stated previously shall be tested for conformance by a CWR approved testing lab and at the locations and depths requested by CWR and at the expense of the contractor.

2-H. GENERAL

1. Wyes and Tees
   a. Wye and tee branches shall be installed in sanitary sewer lines as required. If such branches are not to be used immediately, they shall be closed with plastic stoppers as specified by manufacturer for the sewer pipe.
   b. If the work consists of the construction of a sewer that is to replace an existing sewer, all of the existing service lines shall be connected to the new line by a method approved by CWR prior to construction.
   c. Wyes and tees shall be installed in sanitary sewers to properly serve each existing house and each vacant lot facing or abutting on the street or alley in which the sewer is being laid, and at such other locations as may be designated by CWR. The exact location of each connection shall be determined by the Engineer before backfilling.
   d. Wyes and tees shall be of the same material and strength as the sewers on which they are installed.
2. Service Laterals
   a. Service laterals shall be installed where required to provide a connection from the sanitary sewer to the abutting lots. In general, house sewers shall be constructed from the lateral sewer to a point located at property line.
   b. Service laterals shall consist of either DIP or SCH 40 PVC and conform to the requirements of these guidelines. Service wye shall be installed at the end of each service lateral and plugged in a manner to allow for air testing. Depth shall be a minimum of 36" below finished grade.
   c. Service laterals shall be connected to manholes when available and installed so the crown of main sewer and service lateral are the same elevation.
   d. Service laterals longer than 20' will be 6" house sewers and will not be any longer than 50'. House sewers less than 20' can be 4" on single dwelling or where approved by CWR.
3. Marking Wyes, Tees, and Service Laterals:
   a. The location of all wyes, tees, and service laterals installed in the work shall be marked.
4. Connections to Existing Sewers:
   a. Connections to existing manholes shall be made in the presence of the CWR Inspector. Contractor shall notify CWR 48 hours before starting on connection.
5. Pipe Protection:
   a. Sewer pipe which, when completed, will have less than three feet of cover shall be constructed of ductile iron pipe.
   b. Where foundation conditions are not satisfactory as determined by the soil conditions, sewer pipe shall be either laid on a 3,000 psi un-reinforced concrete cradle, pipe foundation material, or constructed of ductile iron pipe, as approved by CWR.
6. All excavated areas, backfills, embankments, trenches and access roads, and grading and ditches shall be maintained by the Contractor in good condition at all times until final acceptance by CWR. Trenches shall be re-backfilled where trench backfill has settled.
7. Manhole tops must be above minimum 100 year flood elevation or shall have water tight manhole covers.
8. Manholes on right-of-way across open fields shall be 1' (foot) above ground grade.
9. Sewer line right-of-ways must be leveled out smooth and left clear of any rocks or other debris to facilitate safe and easy access for maintenance. They must also be seeded and grassed to CWR's approval before final acceptance.

10. Lead–free pipes, plumbing fittings/fixtures, and solder/flux shall contain less than 0.25 percent lead in accordance with the Reduction of Lead in Drinking Water Act (P.L. 111– 380).
11. Pre–treatment devices, such as grease traps/grease interceptors may be required as determined by the Building Code Official and/or CWR. Such devices shall meet the current Building Code as adopted by Chester County, be sized accordingly, and must have the written approval of the Building Official and CWR. Grease traps/interceptors are required at establishments such as food service establishments (FSE) and convenience stores involved in food preparation activities. Grease traps/grease interceptors are not serviced or maintained by Chester County or CWR.

2-I. GRASSING

1. All seeding is to be performed in compliance with the SCDOT Supplemental Technical Specification for Seeding and the SCDOT Standard Specifications.
2. Description
   a. This work consists of permanent cover, permanent grassing, temporary cover, liming and fertilizing (when specified), and mulching all areas shown on the Plans or where directed by CWR in accordance with these Specifications. The Contractor shall coordinate seeding with the construction of fill and cut slopes. In order to limit the area of erodible material, CWR may require that partially completed slopes be brought to the required slope and the Contractor perform permanent or temporary cover operations at that time.
3. Seed
   a. Use seed that conforms to all state laws and all requirements and regulations of the South Carolina Department of Agriculture (SCDA). Seeds containing species designated by the State Crop Pest Commission as a plant pest (i.e., noxious weeds) are not permitted. Use seed that is individually packaged or bagged and tagged. Each tag must clearly state: Net weight, Botanical name, Common name, Variety, Grower name, Grower lot number, Percent purity, Percent germination, Percent other crop seed, Percent inert matter, Percent weed seed (if weed seed is present, provide a list of species by botanical name), and Origin.
   b. When mixtures of different types of seed are called for in the seeding schedule the Contractor may use pre-blended mixtures that are individually packaged or bagged and tagged with the tag specifying the botanical and common name of each species contained in the blend, and the percentages of each species.
   c. When pre-blended seed mixtures are not used, each species shall be weighed and mixed in the proper proportions on-site in the presence of a member of CWR's staff.
   d. CWR reserves the right to test, reject, or approve all seed before seeding.
4. Seeding Schedule

Seeding Schedule for Permanent Vegetation			
Schedule No.	Common Name of Seed	Planting Rate (lbs/acre)	Planting Dates
1	Common Bermuda (hulled)	25	March 15 to August 14
	Sericea Lespedeza (scarified)	50	
	Kentucky 31 Fescue	50	
	Weeping Lovegrass	10	
2	Kentucky 31 Fescue	50	August 15 to March 14
	Sericea Lespedeza (unhulled, unscarified)	80	
	Common Bermuda (unhulled)	30	
	Weeping Lovegrass	10	
	Annual Rye Grass	15	
	Rye Grain	20	

5. Agricultural Granular Lime
    a. Use solid agricultural granular lime for all permanent cover applications that is agricultural grade, standard ground limestone conforming to the current Rules, Regulations, and Standards of the Fertilizer Board of Control. These rules, regulations, and standards are promulgated and issued by the Fertilizer Board of Control at Clemson University in accordance with Section 16 of the South Carolina Liming Materials Act. Ensure that each bag has affixed in a conspicuous manner a tag or label, or in the case of bulk sales, a delivery slip showing brand or trade name, calcium carbonate equivalent, percent by weight passing prescribed U.S. Standard Sieves, and other pertinent information to identify lime as being agricultural grade, standard ground limestone.
6. Fast Acting Lime
    a. Use fast acting liquid forms and/or dry forms of lime for all temporary cover by seeding and permanent cover applications that meet all of the requirements of agricultural grade granular lime specified herein, except percent by weight passing U.S. Standard Sieves.
7. Granular Fertilizer
    a. Use granular fertilizer for all permanent cover applications that complies with state fertilizer laws. In a mixed fertilizer such as 10-10-10, the first number represents the percent of nitrogen, the second number represents the percent of available phosphoric acid, and the third number represents the percent of water soluble potash in the fertilizer. Use fertilizer that incorporates a minimum of 50% water insoluble (slow release) nitrogen. Use fertilizer that has a package slip clearly stating the percentage of nitrogen, water insoluble nitrogen, percentage of phosphoric acid, and percentage of potash along with the weight (pounds) of nitrogen, weight (pounds) of phosphoric acid, and weight (pounds) of potash. Animal by-product or municipal waste fertilizers are not acceptable under this Specification.
8. Mowing
    a. Mowing consists of mowing areas seeded or sodded under the Contract or other areas as necessary to provide adequate sight areas and to maintain the project in a satisfactory manner. Mowing will be performed by the Contractor where directed by CWR and such mowing will commence within three (3) business days following verbal notification by CWR. Failure of the Contractor to comply with the above may be grounds for stopping work on the project or withholding payment of the monthly construction estimate.
    b. Mow shoulders and medians when vegetation reaches a height of approximately eighteen (18) to twenty four (24) inches. Use mowing equipment equipped with safety devices designed to prevent injury or property damage caused by flying debris propelled from under the mowing equipment. Keep all mowing equipment in good operating condition and keep the equipment maintained to provide a clean, sharp cut of vegetation at all times. If CWR determines the equipment is defective to the point that the quality of work or safety is affected, immediately repair or replace the equipment.
    c. Ensure that mowing results in a uniform vegetation height of four (4) to six (6) inches, unless otherwise directed by CWR. Mow as closely as possible to all fixed objects exercising care not to damage trees, plants, shrubs, signs, delineators, or other appurtenances which are a part of the facility. Hand trimming around such objects may be required of the Contractor.
    d. Remove litter and debris prior to beginning mowing operations. Immediately remove and properly dispose of all litter and debris resulting from mowing operations. Mowed grass is not normally removed unless it becomes a hazard as determined by CWR.

e. Do not perform mowing when, in the opinion of CWR, soil and weather conditions are such that rutting or other damage to the project may occur. The three-business-day period may be extended by CWR until the soil and weather conditions become suitable for mowing on the project.

9. Inspection and Maintenance
   a. Perform all maintenance necessary to keep permanent cover, permanent grassing, temporary cover by seeding, and temporary cover by mulch areas in a satisfactory condition until the work is finally accepted. This includes mowing, repairing areas of erosion and washes, and applying additional seed, fertilizer, and mulch to areas where a satisfactory stand of grass has not been achieved. Water seeded areas as directed, as needed, and/or as directed by CWR.

SECTION 3 - MATERIAL

3-A. PIPE

1. Pipe Size and Type Selections
    a. On depths of 1 to 3 feet use DIP.
    b. On depths of 3 to 14 feet use PVC SDR 35.
    c. On depths over 14 feet and deeper DIP.
    d. Pipe enclosed in casings shall be restrained joint D.I.P. only.
2. General Pipe Requirements
    a. Weights and Marking: Weights of D.I. pipe and fittings shall conform to the requirements of AWWA Specifications. The class designations for the various classes of D.I. pipe and fittings shall be cast on fittings in raised numerals, and cast or stamped on the outside of individual joints of pipe. Weights shall be plainly painted in white on the outside of each joint of pipe after the exterior coating has hardened. PVC pipe shall be marked at intervals of 5 feet or less with information regarding the Manufacturer's Name or Trade Mark, Plant Code, Date of manufacture, Nominal Pipe Size, PVC Cell Classification, the legend “Type PSM SDR35 PVC Sewer Pipe”, and ASTM designation D3034. Fittings shall be marked with the following information regarding the manufacturer’s name or trademark, nominal size, designations PVC and PSM and ASTM designation D3034. All markings shall remain legible during normal handling, storage and installation.
    b. Certification: The manufacturers of pipe and fittings shall be prepared to furnish both CWR and the Contractor with certified reports stating that inspection and specified tests have been made and that the results thereof comply with the applicable ANSI Specifications.
    c. Quality and Inspection: Latitudes in workmanship and finish allowed by ASTM notwithstanding, all pipe shall have smooth exterior and interior surfaces, be first quality, be free from cracks, blisters, and other imperfections, and be true to theoretical shapes and forms throughout each length. Pipe that does not conform will be so marked by the Engineer, and shall not be used in the work. On-the-job repairing of rejected pipe will not be permitted.
    d. Unloading: Equipment and facilities for unloading, hauling, distributing, and storing materials shall be furnished by the Contractor and shall at all times be available for use in unloading materials.
    e. Handling: Proper and suitable tools and equipment shall be used for the safe and convenient handling and laying of pipe. Pipe, fittings, and other materials shall be carefully handled to prevent breakage and to prevent damage to the lining in pipe and fittings. Pipe shall not be unloaded by rolling or dropping off of trucks or cars, but shall be handled by carefully lifting and lowering into position, using approved slings or clamps which shall be provided. Ductile iron pipe and fittings shall be carefully examined for cracks, broken lining or other defects. No pipe or fitting which is known to be defective shall be laid. If any pipe or fitting is discovered to be cracked, broken, or defective, after being laid, it shall be removed and replaced with sound material at the expense of the Contractor. All pipe and fittings shall be thoroughly cleaned before being laid and shall be kept clean until accepted in the completed work.

f. Distributing: Materials shall be distributed and placed to not interfere with traffic. No street or roadway may be closed without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which material is distributed. No distributed materials shall be placed in drainage ditches.
g. Cutting Pipe: Whenever ductile iron pipe or special castings are required to be cut, the cutting shall be done by skilled workmen, using an abrasive wheel cutter. Use of oxyacetylene torch will not be permitted. The plain end shall be beveled and any sharp edges that might damage the gasket shall be removed by means of a file or power grinder. Pipe that is cut in the field must be ground and beveled before assembly.
h. Storage: All pipe, fittings, and other materials that cannot be distributed along the route of the work shall be stored for subsequent use when needed. The Contractor shall make his own arrangements for the use of storage areas. PVC pipe shall not be exposed to direct sunlight for inordinate periods of time.
i. Tracer Wire: UL-approved 14-gauge copper tracer wire shall be installed directly above plastic force mains and be detectable within three feet (3') of finished grade. It shall run along the centerline of the pipe and be secured to the pipe. The wire shall be brought up into the valve boxes and bare wire connected to a valve bolt.
j. Cleaning: All dirt and foreign material must be cleaned from each joint of pipe or fitting while it is suspended before it is lowered into the trench. The Contractor shall thoroughly clean all lines before the system is accepted.

3. General Gravity Sewer Pipe Requirements
   a. PVC Gravity Pipe: Installation shall meet ASTM D2321.
   b. Ductile Iron Pipe: Installation shall meet AWWA C600.
4. General Force Main Pipe Requirements
   a. PVC Force Main: Installation shall meet ASTM D2774.
   b. Ductile Iron Pipe: Installation shall meet AWWA C600.
5. Ductile Iron Pipe and Fittings
   a. Pipe: Ductile-iron pipe shall be centrifugally cast and shall be domestically manufactured in the United States and shall conform to the requirements of AWWA C150 (ANSI A21.50) and AWWA C151 (ANSI A21.51) for gravity applications and ASTM A377 and AWWA C600 for pressure applications, latest edition. Pipe shall have mechanical or push-on joints as outlined in ANSI A21.11 with laying lengths of at least 18 feet. Pipe is to be Pressure Class 350 and have a minimum internal pressure rating of 350 psi. For pipes with flanged joints, provide ductile iron cast pipe conforming with AWWA C115 (ANSI A21.15) for thickness class 53 for a minimum working pressure of 250 PSIG. All crossings with other utilities shall be made with ductile iron pipe. Crossings with gas mains will need to be coordinated with CWR.
   b. Joints: For pipe, fittings and valves, use the following joint types indicated for the specified locations, unless otherwise specified or shown.
      i. Flanged Joint (FJ): AWWA C115 (ANSI A21.15) flanged joint complying with ANSI B16.1 for class 125 pound drilling, unless class 250 pound drilling is indicated on Drawings or is required for connecting valves. Bolts and nuts for flanges shall be in accordance with ANSIƒAWWA Standards for uncoated, high strength, low alloy steel (304 SS) meeting ASTM A242.and rubber gaskets complying with Appendix A of AWWA C115 (ANSIA21.15). Provide flanged joints for normally visible piping, unless noted otherwise.

ii. Mechanical Joint (MJ): Mechanical joint complying with AWWA C111 (ANSI A21.11). Bolts and nuts for mechanical joint fittings shall be uncoated, high strength, low alloy steel (304 SS) meeting ASTM A242. Provide mechanical joints for direct burial piping or concealed piping within structures or at Contractors option, for direct burial piping outside structures.

iii. Restrained Joint (RJ): Restrained joint complying with AWWA C111 (ANSI A21.11). Provide restrained joints for piping installed in tunnel liner, or, at Contractor option, for direct burial piping outside structures.

iv. Push-On Joint (POJ): Push-on type joint complying with AWWA C111 (ANSI A21.11). Provide push-on joints for direct burial piping outside structures.

v. Joints: For pipe, fittings and valves, use the following joint types indicated for the specified locations, unless otherwise specified or shown.

c. Fittings: Fittings shall be cast from ductile iron and shall conform to AWWA C110 (ANSI A21.10) and/or AWWA C153, latest edition. All fittings shall have standard mechanical joints or as shown. Mechanical joint fitting shall meet AWWA C111 (ANSI A21.11). At CWR's discretion, ductile iron compact fittings complying with ANSI/AWWA C153/A21.53 for a minimum 350 psi working pressure rating, lined and coated same as connecting pipe may be used for pipe with push-on joints or mechanical joints.

d. Lining and Coating: Pipe and fittings shall be lined with Induron Protective Coatings Protecto 401, 40 mils minimum uniform thickness. The pipe and fittings exterior shall have a bituminous coating with a minimum thickness of two mils complying with AWWA C104.

6. Polyvinyl Chloride Gravity Sewer Pipe and Fittings
   a. PVC Gravity Sewer Pipe: Polyvinyl Chloride (PVC) gravity sewer pipe shall be bell and spigot pipe, shall not exceed 20' laying lengths, and shall have minimum wall thickness conforming to ASTM D3034 for piping under 15" in diameter and ASTM F679 over 18" in diameter under the classification for SDR35 pipe, latest edition.
   b. Joints: All pipes shall have elastomeric joints with an integral belled, bell and spigot rubber gasketed joint. Each integral bell joint shall consist of a formed bell complete with a single rubber gasket. Gaskets shall conform to ASTM F477, latest edition. Joints shall meet the requirements specified in ASTM D3212, latest edition.
   c. Fittings: PVC sewer pipe fittings for gravity systems shall be bell and spigot or bell and plain end and shall conform to the same cell classification requirements as defined above. Fittings shall be in accordance with ASTM F794, D3212, and D3034, as applicable with stiffness and wall thickness equal to, or greater than the pipe. Adapters shall be provided to join different materials.
7. Polyvinyl Chloride Pressure Sewer Pipe and Fittings
   a. PVC Pressure Sewer Pipe: Polyvinyl Chloride (PVC) water pipe shall be bell and spigot pipe, shall not exceed twenty feet (20') laying length, and shall have minimum wall thickness conforming to SDR21 Class 200 dimensions. All water mains shall be provided with a minimum of 3 feet of cover, unless pipe material is steel, concrete, DIP, or other approved material, and if exposed should be insulated to prevent freezing. All plastic pressure pipes (sizes 4"- 12") shall meet all requirements of AWWA Standard C-905. Alternative plastic pipe (sizes 4"-12"), other than C-905, shall meet all requirements of ASTM D 1785 or ASTM D2241 (SDR21 Class 200), but its use shall be subject to the approval of the CWR. All plastic pipes (sizes 14"- 48") shall also meet all requirements of AWWA Standard C-905, but its use shall be subject to the approval of CWR. No new main shall be smaller than 4" diameter.

b. Joints: PVC pipe Joints: Joints for PVC pipe shall be elastomeric–gasket type with a pressure rating not less than the pipe pressure rating meeting performance requirements of ASTM D3139. All PVC pipes shall have elastomeric joints with an integral belled, bell and spigot rubber gasketed joint. Each integral bell joint shall consist of a formed bell complete with a single rubber gasket. Gaskets shall conform to ASTM F477. Joints shall meet the requirements specified in ASTM D3212.
c. Fittings: Fittings shall be in accordance with ASTM F794, D3212, and/or D3034, as applicable with stiffness and wall thickness equal to or greater than the pipe. Adapters shall be provided to join different materials.

8. Steel Pipe for Aerial Crossings
   a. Pipe: High Strength steel pipe shall be welded or seamless, manufactured in accordance with ASTM A53 for Welded Steel and Seamless Steel Pipe (1/8–inch to 26–inch inclusive) and/or ASTM A139 for Welded Straight–Seam Steel Pipe (4–inch to 92 inch inclusive).
      i. All steel shall be Grade "B" only, with minimum yield strength of 35,000 psi. Thickness shall be 0.250–inch unless otherwise specified or shown on the Construction Drawings.
      ii. The pipe shall be produced in a single continuous length. Welding of two or more individual pieces together end to end shall not be permitted. Spiral–seam pipe shall not be permitted.
      iii. Pipe ends shall have tolerances within the limits required for approved couplings. Pipe shall also be furnished with plain right–angle ends with all burrs removed from the ends.
   b. Linings: All steel pipe shall receive one (1) of the following shop applied linings on the inside of the pipe barrel:
      i. Coal tar lining 3/32–inch minimum dry film thickness in accordance with AWWA 203.
      ii. Coal tar epoxy lining 24 mils minimum dry film thickness and shall be Carboline Koppers No. 300M, Amercoat No. 78, Carboline Carbomastic No. 14, or approved equal.
   c. Coatings: The outside of steel pipe and complete couplings shall receive one coat of
      i. Carboline Koppers 300M coal tar epoxy, 16 mils minimum dry film thickness or approved equal. The coal tar epoxy coat shall be shop applied to the pipe, and field applied to the couplings. Damage to exterior shop applied coatings shall be repaired with the same coating used by the manufacturer and applied as recommended by the manufacturer.

3-B. VALVES AND ACCESSORIES

1. Plug Valve

    a. Eccentric resilient faced plug, cast iron body type valve rated for a minimum working pressure of 125 psig; suitable for full flow, positive shut-off and throttling service, and further suitable for both frequent operation and for applications where valve operation occurs after long periods of inactivity. Provide valve whose minimum port area is at least 92 percent of full pipe area. Use plug facing suitable for the specific service application indicated, together with seat materials or coatings, bearings, packing and other components which as a unit assure long life, maintenance-free valve performance. Valve shall be installed to rotate to the top when opened. Provide non-lubricated plug valve with the following features depending upon valve installed location:
        i. Manual hand lever type operator with valve position indicator and adjustable position locking device.
2. Check Valve

    a. Iron body, 150 psig working pressure, bronze mounted, rubber faced disc, full opening, outside spring and lever operator, swing check valve with flanged ends and stainless steel hinge pin incorporating applicable features of AWWA C508 specifications. Provide 125/150 pound flanges unless another pattern is required for connecting work.
3. Air Release Valve

    b. Cast iron body, stainless steel float, 150 psig working pressure, one or two inch NPT inlet as indicated on Drawings, direct acting, and capable of venting at least 10 SCFM at 25 psi differential. Provide valve allowing air to vent from a closed system, then automatically closing to prevent water from escaping until more air accumulates in it to automatically initiate another venting cycle.
4. Combination Air Release Valve

    c. Provide combination high capacity air and vacuum valve and slow venting release valve designed for handling sewage in a single housing. Furnish stainless steel floats guided with a stainless shaft, Buna-N seat having positive drip-tight closure, cast iron elongated body, and cast iron cover with threaded ends and rated to 150 psig. Furnish valve designed to automatically release entrapped gas under pressure, automatically exhaust large quantities of air during pipeline filling without permitting liquid to escape and to permit reentry of air during pipeline draining or when negative pressure occurs. Equip unit with 2 inch NPT inlet; bronze body inlet, blow-off, and back-flush gate valves; and back flush pipe and hose with quick-disconnect connections.
5. Flexible Couplings

    a. Flexible Coupling: Resilient chemical-resistant elastomeric polyvinyl chloride (PVC) coupling, two stainless steel clamps and stainless steel screws and housings for piping 12” and smaller. Couplings for larger pipe diameters shall be submitted to CWR for approval.

3-C. MANHOLE CONSTRUCTION

1. Manholes shall be precast reinforced concrete manhole sections consisting of a base section, riser sections, and top section with tongue and groove joints. Manholes shall conform to the requirements of ASTM Specification C478 latest edition and these specifications. Concrete used in their manufacture shall have a 28-day compressive strength of not less than 4,000 pounds per square inch when tested in accordance with ASTM C478 latest edition and the absorption shall not exceed six (6) percent.
2. Manhole sizes: Manholes will be furnished with the following clear inside diameters according to the sewer main diameter, unless amended by the depth of invert, Construction Drawings or other project documents.

Pipe Diameter	Manhole Diameter
6” to 18” pipe	4’
21” to 36” pipe	5’
42” to 54” pipe	6’
54” and larger	8’ or as necessary to accommodate pipe

Manhole Diameter	Invert Depth
4’ manhole minimum	Less than or equal to 20’
5’ manhole minimum	Greater than 20’

3. The minimum wall thickness of the manhole riser sections shall be:

4’ Diameter Manhole	5” Minimum Wall Thickness
5’ Diameter Manhole	5” Minimum Wall Thickness
6’ Diameter Manhole	6” Minimum Wall Thickness

   Cone sections shall have a minimum wall thickness of 8” at their top.

4. Base riser sections shall be made with bottoms cast monolithically. Bottoms cast into already made pipe sections are acceptable. Base sections shall be furnished with inside diameters as required to accommodate the connecting piping. Base sections shall be furnished with a minimum height of 24 inches for pipes having a diameter of 12 inches or less, and a minimum height of 36 inches for pipes having a diameter greater than 12 inches. Minimum height for 5– or 6–foot diameter base sections shall be 48 inches regardless of pipe size. Base sections with 5– or 6–foot inside diameters shall be reduced to 4 foot inside diameter by means of an adapter ring or transition top. Base sections are to be design to resist buoyant forces to prevent the manhole from floating.
5. Riser sections shall be furnished in a minimum of six inch (6") increments and shall be four feet (4') in diameter. The gasket joint shall be thoroughly cleaned of all loose materials and brushed with an approved Epoxy to give a smooth surface free of any honeycomb.

6. Cone sections section for manholes shall be eccentric type with the vertical face installed over the manhole's effluent pipe. Cone sections can be eliminated and replaced with a flat top slab meeting SCDOT traffic ratings where elevations preclude the laying height of the cone section. Eccentric cones with bolt–down frame and cover shall have a minimum vertical height, as measured from the top of the cone to the bottom of the bell, of 32 inches. Eccentric cones without bolt–down frame and cover to be installed flush to finished grade may have a minimum vertical height of 24– inches. Transition cone sections may be provided for eccentric transition from a 60–inch riser to a 48– inch cone section to be placed directly beneath the 48–inch cone. The minimum access diameter of a manhole shall be 22–inches.
7. Suitable openings for inlet and outlet sewer pipe shall be cast or cored into the base sections and into riser sections for drop connections. These openings shall be circular, accurately made, and located as required for each manhole. Base riser sections shall be set on compacted pipe embedment materials twelve (12) inches in thickness.
8. Flexible manhole sleeves or flexible manhole entrance joints shall be installed on all pipe entering and leaving manholes. Flexible manhole sleeves shall be installed on all pipe 16 inches in size and smaller. Flexible manhole sleeves shall be of high quality synthetic rubber terminating in a substantial serrated flange of the same material. The flange shall be secured to the wall of the manhole base to form a tight water-stop. Minimum thickness of the sleeve material shall be 3/8 inch. Sleeve material shall comply with the requirements of ASTM Specification C-923. Sleeves shall be secured to the sewer pipe to make a watertight union with stainless steel strap clamps, draw bolts, and nuts.
9. Manhole steps shall be constructed of steel covered with polypropylene. The minimum tread width shall be 12 inches. The steps shall incorporate two non-skid grooves and shall be of the drop-front design. Polypropylene covered steel steps shall consist of a ½ inch diameter Grade 60 steel reinforcing rod covered by corrosion resistant polypropylene plastic. The steps shall incorporate traction cleats and foot guide lugs. Steps shall be spaced 12 inches apart.
10. The manhole sections may be joined with either O-ring seals or butyl rubber type sealer. If O-rings are used, they shall conform to ASTM C443 and shall be set in a rectangular groove cast into the tongue section of each manhole. O-rings shall be installed as recommended by the manhole manufacturer. If butyl sealer is used it shall be "Ram-Nek" joint sealer or equal. "Ram-Nek" shall be set on only clean and dry surfaces and placed as recommended by the manufacturer.
11. Manhole inverts shall be constructed of cement grout, Class "B" and shall have the same cross-section as the invert of the sewers which they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction to flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit. Concrete brick will be used only to form the invert channel walls only. All other annular space shall be filled with concrete grout only. Inverts shall be "U" design with the top of the "U" even with the crown of the pipe (see details). Invert piping shall not extend inside manhole any further than 2 inches. Slope of inside of invert benches shall be a minimum of 2" higher than the crown of the pipe. When dissimilar pipe sizes occur, the elevation of the crown of the pipes must be same.
12. Manholes will be scored or stamped with date of casting.
13. Manhole sections shall be free from large honeycomb, cracks, spalds, large chips, exposed reinforcing, and broken bells or spigots. Allowable deviation in form joint shall be ¼". Edges of bells and spigots shall be even and straight.

14. Manholes shall be lined in accordance with the following.
    a. Conditions: Manholes meeting any of the following conditions, unless otherwise approved by CWR, shall be lined:
        i. Manholes receiving discharge from force main piping
        ii. Manholes located within FEMA 100–year flood plain
        iii. Manholes located within flood–prone areas
        iv. Areas indicated by the design engineer
    b. Installation: Installation of the linings shall be one of the following applications on clean surfaces in accordance to the manufacturer's instructions. For new manholes, lining shall be applied after all repairs have been made and manhole has been successfully vacuum tested.
        i. Manholes shall be lined with Spraywall urethane liner by Sprayroq Inc. or approved equal at a minimum dry–film thickness of 125 mils for the first 9 vertical feet of manhole depth and at 250 mils for manhole depths greater than 9 vertical feet.
        ii. Manholes shall be lined with Ultra–High Build Epoxy Coating System Raven 405 by Raven Lining Systems at a minimum dry–film thickness of 125 mils.
15. Manhole Frames and Covers
    a. Manhole frames and covers shall be made of cast iron conforming to ASTM Specifications A-48 Class 35. All castings shall be made accurately to the required dimensions and pattern. The castings shall be sound, smooth, clean, and free from blisters and other defects. Castings which have been plugged or otherwise repaired shall be unacceptable for use. The contact surface between the cover and supporting ring shall be machined to make contact on the complete perimeter. There shall be no holes or perforations in the cover.
    b. Leveling and final grading of manhole frames and covers shall be accomplished by using a maximum of two concrete grade rings. Grade rings shall not exceed 4" in thickness. Grade rings shall be laid in a full bed of non-shrink grout and covered after laying with a smooth coating of non-shrink grout or hydraulic cement a minimum of ½ inch thick.
    c. After the manhole has been set in its final position, the cast iron frame for the cover shall be carefully set above finished grade and properly bolted to the masonry. Where manholes are constructed in paved areas, sidewalks, etc., the top surface of the frame and cover shall be tilted to conform to the exact slope crown and grade of the existing pavement adjacent thereto.
    d. Bolt–down watertight lids are to be used where it is anticipated that storm water runoff depth will exceed the rim elevation or on outfall lines located outside the road right–of–way. Manhole rim elevations shall be installed at an elevation two (2) foot above the anticipated 100–year flood water surface elevation, unless watertight covers are provided with approval of CWR.
16. General
    a. All manholes over 12' deep shall be reviewed during design with CWR.
    b. Drop manholes are required where the invert differential is twenty– four inches (24") or more. Where drop connections are required, drop pipe shall not be smaller than 8–inches. Generally, drop pipe shall be one size smaller than the sewer that they serve. Openings in walls of precast concrete manholes for drop connections shall not be made at joints. Drop connection fittings and riser pipe shall be located on the outside of the manhole and encased in brick and mortar or formed Class "C" concrete. Drop connections for precast concrete manholes shall conform to CWR's Standard Details. Slide inverts shall be installed on drop connections with drops less than two (2) feet. Drop connections shall be carefully backfilled to prevent dangerous side pressures. Interior drops shall only be installed where approved by CWR.

c. Where the work requires special stream or railroad crossings or other extraordinary conditions, or where alternate types of construction are those that are not covered by these specifications, the materials and construction methods shall be submitted for approval to CWR.
d. In the event that a manhole has to be altered after delivery to job site, the Contractor may, with permission of CWR, connect the pipe to the manhole with a Kor–n–seal slotted band style connector manufactured by Trelleborg Pipe Seals Milford, Inc., Kwik Seal Manhole Connector manufactured by the Press–Seal Gasket Corporation, or equal. Any remaining gaps between the pipe and manhole shall be filled with a non–shrink grout installed from the inside of the manhole.
e. All final grade adjustment of manhole covers and frame assemblies shall be completed utilizing brick or concrete adjustment rings. The maximum height for field adjustment is 18”–24”.
f. Repaired and patched sections will not be acceptable unless each individual section to be repaired or patched shall have first been inspected and approved by the Engineer. Repairs to and patching of "O"–ring grooves and shoulders will not be permitted.

3-D. CONCRETE WORK

1. Concrete of the respective classes for manhole bottoms, bedding, blocking, headwalls, piers and other miscellaneous structures shall be as called for in the work to which they pertain.
2. Cement shall satisfy the requirements of ASTM C150, Type I or Type II.
3. Aggregate shall satisfy the requirements of ASTM C33.
   a. Course Aggregate: Course aggregate shall be uniformly and evenly graded for each application in accordance with ACI Standard 318. Unless otherwise approved, aggregates shall be sound, crushed, angular granitic stone. Smooth or rounded stone (river rock) shall not be acceptable.
   b. Fine Aggregate: Fine aggregate shall consist of natural sand, manufactured sand or a combination thereof and shall be graded to meet the requirements of SCDOT size number FA–10 and 67, as appropriate.
4. Water shall be fresh, clean and free from injurious amounts of oil, acid, alkali, and organic materials.
5. Mixing shall be accomplished at a central mix plant unless prior approval is given by the Engineer for mixing on the job site.
6. Concrete supplied from a central mix plant shall have 28–day compressive strengths not less than those listed below.
   a. Class "A" 3,000 psi
   b. Class "B" 2,200 psi
   c. Class "C" 1,500 psi
7. Concrete mixed on the job site shall have 28–day compressive strengths as above and shall contain not less than the following quantities of cement per cubic yard.
   a. Class "A" 564 lbs. (6 bags)
   b. Class "B" 470 lbs. (5 bags)
   c. Class "C" 376 lbs. (4 bags)
8. All grouts shall be of a non–shrink nature (as may be achieved through additives or proportioning) and depending upon application, range from plastic to flowable cement water paste. Testing as specified above for concrete may be required for acceptance of grouts to include frequent checks for consistency by a time–of–flow measurement.
   a. Expansion grouts shall be either Gilco premixed or Supreme non–metallic grout as manufactured by Gifford–Hill and Company, Inc., Embeco 636 grout as manufactured by Master Builders, or approved equal.
   b. Grouts shall be mixed (if applicable) and placed in accordance with the manufacturer's recommendations, for each specific application.
9. Mortar used in sanitary sewer manholes shall be hydraulic cement mortar in accordance with ASTM C398.
10. Flowable fill shall be controlled, self–leveling, non–shrink, low–strength material consisting of a fluid mixture of cement, aggregate, water and with admixtures as necessary to provide workable properties. Placement of flowable fill may be by grouting techniques in pipelines or other restricted areas, or as mass placement by chutes or tremie methods in unrestricted locations with open access. Long–term hardened strength shall be between 75 psi and 150 psi at 56 days as determined based on an average of three tests for the same placement.
    a. Fly ash shall not be used in flowable fill adjacent to ductile iron pipe and fittings. Protect pipe and fittings by covering with polyethylene.

11. Concrete cylinders for testing purposes shall be made in accordance with the procedure described in ASTM C31. Compression tests shall be made at the age of 7 days and 28 days by the testing laboratory as per ASTM C39. Testing shall be done by a laboratory approved by the Engineer. Each test shall consist of at least four (4) specimens; two (2) for field control and two (2) for laboratory control. One (1) initial test will be required and then one (1) test for each one hundred (100) yards thereafter.

3-E. MISCELANEOUS STEEL

1. Steel piles, cross braces, cradles, etc., shall consist of structural steel shapes of the section required in the Construction Drawings. The steel shall conform to specifications for ASTM A36 – Carbon Structural Steel.
   a. All bolts and nuts shall conform to ASTM A325 for 7/8–inch and ASTM A490 for 1– inch and larger.
   b. The Contractor shall handle and store steel members above ground on platforms, skids or other supports. Members shall be free of dirt, grease, and other foreign material and protected against corrosion.
   c. Coal tar epoxy coating Carboline Koppers No. 300M, Amercoat No. 78, Carboline Carbomastic No. 14, or approved equal shall be applied to all specified surfaces of the steel pier.
   d. Welding Electrodes shall conform to the following:
      (1) Shielded Metal–arc: AWS A5.1 or AWS 5.5, E70XX
      (2) Submerged–arc: AWS A5.17, F70X–EXXX
      (3) Gas Metal–arc: AWS A5.18, E70S–X or E70U–1
      (4) Flux Cored–arc: AWS A5.20, E70T–X (except 2 and 3)
2. Steel encasement pipe shall be welded or seamless, smooth wall or spiral weld, consisting of Grade "B" steel as specified in ASTM A139. Encasement pipe must be approved by the appropriate controlling agency (i.e. SCDOT, railway corporation, etc.) and CWR prior to ordering.
   a. Minimum yield strength shall be 35,000 psi; and pipe thickness shall be as specified for each individual job.
   b. All pipe shall be furnished with beveled ends prepared for field welding of circumferential joints. All burrs at pipe ends shall be removed.
3. Structural Steel Tunnel Liner Plates shall be either the four flanged type (as approved for use within SCDOT rights–of–way) or the lap seam type (as approved for use within railroad rights–of–way) fabricated to permit assembly of a continuous steel support system as the tunnel is excavated. Tunnel liner plates shall be fabricated from hot rolled, carbon steel sheets or plates conforming to the specifications of ASTM A569 and must be approved by the appropriate controlling agency (i.e. SCDOT, railway corporation, etc.) and the City Engineer prior to ordering.
   a. The tunnel liner shall be designed in accordance with the requirements of Division I, Section 15 and constructed to conform to Division II, Section 25 of the AASHTO Standard Specifications for Highways and Bridges.
   b. Liner plates shall be galvanized in accordance with AASHTO M167 and fully bituminously coated in accordance with AASHTO M190. All hardware necessary to the tunneling operation shall be hot–dip galvanized in accordance with ASTM A153 prior to the bituminous coating application. Hardware shall conform to ASTM A307, Grade A.
   c. The mechanical properties of the flat steel plate before cold forming used for the design of the tunnel liner shall be:
      (1) Minimum tensile strength: 42,000 psi
      (2) Minimum yield strength: 28,000 psi
      (3) Elongation, 2–inches: 30 percent
   d. The moment of inertia shall be 0.042 inches to the 4th power per inch of width for four flange 12 gauge liner plate.

4. Steel For Reinforcing For Concrete

    a. All reinforcement bars shall conform to ASTM A615. All bars shall be deformed and of structural grade 60. All splices shall be lapped 24 diameters unless otherwise noted.
    b. All reinforcement wire fabric shall conform to ASTM A185.
5. Unless otherwise specified, steel vent pipes shall be Schedule 40 five (5) inch diameter steel pipe, consisting of Grade "B" steel as specified in ASTM A139, with a minimum yield strength of 35,000 psi.
    a. The steel pipe shall have an inside coal tar lining 3ƒ32 inch minimum thickness in accordance with AWWA C203 or a coal tar epoxy lining conforming to that required for steel (aerial creek crossing) pipe.
    b. Outside surface of pipe shall be sand or grit blasted to commercial standard and have one (1) coat of zinc chromate primer applied in accordance with Federal Specification TT–86A.
    c. Pipe shall be furnished with two (2) evenly applied coats of rust inhibiting enamel paint, either Koppers Glamortex No. 501 Enamel (olive Green), Southern Coatings and Chemical Company Rustaloy No. 0537 Enamel (Garden Green), or approved equal.
6. Where stainless steel is identified in the Standard Details, pipes, bolts/anchors and/or straps shall conform to the requirements of ASTM A276. All other steel pipe and/or pier straps shall conform to the requirements of ASTM A36, with minimum yield strength of 36,000 psi.
    a. Finished straps and anchors of carbon steel shall be galvanized in accordance with ASTM A153. The entire strap and all exposed surfaces of anchors and/or bolts (and nuts) shall be fully bituminously coated in accordance with AASHTO M190. Anchor bolts (non– head) shall conform to ASTM A36 with tension test to be made (as required on the bolt body or on the bar stock used for making the anchor bolts. Unless otherwise specified all other fasteners shall conform to ASTM A307 for carbon steel externally and internally threaded standard fasteners Grade A or B.

3-F. STONE AND BRICK

1. All brick used to construct manhole inverts or adjust frames shall be made from concrete, shall be solid only and shall be of standard building size. All brick shall meet or exceed the compressive strength and water absorption properties as specified in ASTM C139. All manholes placed within the limits of roadway pavement and sidewalk shall use the minimum course of adjusting brick as indicated in the Standard Details.
2. All granular bedding material shall be angular, clean washed crushed stone graded in accordance with Size #57 or #67 in ASTM D448 for "Standard Sizes of Course Aggregate", or SCDOT Standard Size #57 or #67. Bedding material will be used only as instructed in the specifications and as specifically directed by the Engineer and be spaded around the pipe on both sides.
3. All rip rap shall consist of clean, field stone or rough unhewn quarry stone, resistant to the action of air and water, varying in weight from 25 to 250 pounds with 60% weighing a minimum of 100 pounds each and no more than 5% weighing less than 50 pounds each (SCDOT Class 2 Rip Rap). Rip rap will be placed form a minimum of 4.0 feet below the toe of the bank to top of the bank in areas determined by field conditions. Rip rap thickness shall be 1–1/2 times the diameter of the largest stones used, or as directed by the Construction Drawings.
4. Silt Check Dam Material shall be course angular, clean washed, crushed stone, gravel or rock, well–graded, and ranging in size from 2–inches to 6–inches, or SCDOT stone for erosion control, Class A.
5. Stone Stabilization Material shall be angular, clean washed crushed stone graded in accordance with standard sizes #467 in ASTM D448 or SCDOT Standard Size #467. Stabilization material will be used only as instructed in the specifications and/or as specifically directed by the Engineer.

3-G. FERROUS CASTINGS

1. All special cast iron pipe fittings and special castings shall be furnished in weight, classes, and/or special thickness as specified elsewhere. The castings shall conform to ASTM A126 and shall be manufactured in domestic foundries. Coatings and linings, if applicable, shall be the same as specified for Ductile Iron Pipe.
2. All manhole frames and covers shall conform to ASTM A48, Class 30 and shall conform to the Standard Details. Manufactured by domestic foundries preferred, but not required.

    a. Manhole frames and covers shall be furnished with the common contract surfaces between frame and cover machines.
    b. Where watertight frames and covers are specified, the water tight seal between frame and cover shall be accomplished by means of rubber gasket.

3-H. SEWER LATERALS

1. Sewer service piping shall be constructed of Schedule 40 PVC pipe in accordance with ASTM D2665 and ASTM D1785. Service piping shall be sized to accept flows from the structure being served, but in no case shall the size of the service be less than the following:
   a. Residential service piping: Minimum 4–inch diameter piping
   b. Commercial Service piping: Minimum 6–inch diameter piping
2. FITTINGS: Service branch connection for PVC pipe shall consist of molded or fabricated tee or wye branch fitting with gasketed connections and shall be in accordance with ASTM D2466. Joining shall be through solvent cement in accordance with ASTM D2564. Sewer service lateral piping shall be installed perpendicular to the mainline when possible.

SECTION 4 - LIFT STATION CONSTRUCTION

This section of Guidelines is provided for the purpose of outlining items required in a majority of lift stations but is not intended to cover all special conditions or the Engineer's special requirements.

4-A. SITE CONSTRUCTION

1. Fencing of Lift Station Site
   a. Area to be fenced shall be a minimum of 50 feet by 50 feet.
   b. Fence Material (All materials Class I Galvanized Coated).
      1. Fabric shall be 6 feet high, ends barbed, commercial grade 9 gauge. Two (2) inch mesh with galvanized coating.
      2. End, corner and pull posts to be 2-7/8" O.D. galvanized coated.
      3. Top and line posts to be 1-7/8" O.D. galvanized coated.
      4. Bottom tension wire shall be 7 gauge spring coil wire with galvanized coating.
      5. Barb wire shall be 14 gauge galvanized barbs; four point pattern on 5 inch centers. Three (3) rows of outward facing barbed wire shall be used.
      6. Gate posts shall be 3" O.D. galvanized coated.
      7. Gate shall be a pair of 4-1/2; lone 7' high sections constructed of 2 inch O.D. pipe. Gate shall be equipped with a prop post center latch and hasp assembly. A ground anchor cast in concrete shall be provided. Gates shall be factory fabricated and equipped with gate holders.
2. The entire site shall be covered with 8 mil black polyethylene covered with 2" of clean gravel. This covering should extend 1' outside the fence line.
3. Power pole should be located within the fenced area and should be located in such a manner so the electric meter can be easily read from outside the fenced area.
4. All power lines within the site shall be underground. No overhead power line will be allowed to cross the site.
5. Site shall be serviced by an all weather road with top of road above the twenty-five (25) year flood elevation. Road and site drainage shall be included and approved by appropriate agency.

4-B. DESIGN CONSIDERATIONS

1. The Engineer should submit the following design calculations:
   a. Station service area ultimate loading
   b. Flotation calculation (weight of station without pumps vs. uplift).
   c. Cycle time calculation maximum twelve (12) cycles/hour.
   d. Provide certification that motor and control circuit will provide 12 cycle/hour.

4-C. WET WELL

1. Minimum allowable wet well diameter shall be 6' – 0".
2. The bottom slab of the wet well shall be set on a 6" or thicker working slab made out of 3,000 psi unreinforced concrete. All over-excavated areas below the wet well bottom shall be filled with 3,000 psi unreinforced concrete as well. No stone shall be used for bedding or fill.
3. Top of slab shall be one (1') foot above the 100 year flood elevation.
4. Steps shall NOT be used in wet wells.
5. Influent line shall terminate a minimum of ½" inside the wet well and should be equipped with an acceptable influent strainer basket. Strainer shall be 315 Stainless Steel with two side guide rails. Access hatch and hook for hoisting cable shall be cast into the top of wet well.
6. All hatches shall be aluminum with hasp and hinge.
7. Vent pipe shall contain 1/8" 316 S.S. bug screen.
8. All bots, nuts, and washers in wet well shall be 316 stainless steel.

4-D. PUMPS AND MOTORS (Submersible Stations)

1. Acceptable pump manufacturers for submersible pumps are:
   a. Flygt
   b. ABS
   c. Gorman Rupp
   d. Ebara
2. Pumps shall be designed to handle peak flow with largest pump out of service.
3. Motors shall be non-overloading over entire pumping range.
4. Motors shall have Class F (155°C) insulation and withstand Class B (180°C) temperature rise with a service factor of 1.0 at the efficient point of the curve.
5. Motor shall not exceed 1800 rpm's. Wire to water efficiency curves shall be submitted for approval.
6. Three (3) phase power shall be required on all motors 4.7 HP and above. No "add-a-phase" systems shall be allowed.
7. Unbalanced voltage on motors under load shall not exceed 1.0% when measured at the motor terminals. Voltage shall be read with an accurate digital volt meter, and recorded as part of the final inspection. Calculation shall be per NEMA Standard MG1, latest edition.
8. Power factor correction shall be required to 85%, if power company will charge for power factor.
9. Lightning arrestors are required for all services.
10. Pump and motor shall have a minimum of 400 series S.S. shaft on motors under 10 HP. Over 10 HP motors can have a chrome plated steel shaft.
11. Impeller shall be keyed to shaft and be single vane.
12. Pump volute shall have replaceable wear rings.
13. Seals shall be tungsten carbide to tungsten carbide.
14. AFBMA B-10 bearing life shall be a minimum of 100,000 hours.
15. Pump and motors shall have adequately sized galvanized lifting chain; length shall reach top of station plus an additional six (6') feet. Chain shall be 1" welded hot-dipped galvanized link chain. Adequately designed lift chain hooks (2) shall be imbedded into top slab and situated to facilitate easy removal of units.
16. Depth of wet well shall be set to accommodate the following parameters:
    a. Float Control System
       1. Off: Set 3 (3") inches above top of pump.
       2. Lead-lag differential of a minimum of one (1') foot.
       3. Alarm setting one (1') foot above the lag setting
       4. Influent pipe a minimum of six (6") inches above the alarm setting.
17. Motor shall be equipped with moisture detection probe and have moisture detection indication lamp mounted on control panel. Moisture detection shall cause motor shutdown .
18. Motor shall be equipped with overheat sensor and shall shut down the motor. Control panel shall have separate indicator lamp for overheat shutdown.
19. Motor shall be wired for lead-lag operation and shall be equipped for alternate cycle operation.
20. Each motor shall have a separate run time totalizer and HOA switch

4-E. VALVE BOX

1. Lift station must be equipped with a valve box similar to the one shown in the Construction Details.
2. Each pump discharge line shall have a weighted arm check valve, a plug valve, and a M.J. or Victaulic fitting that is placed in a manner that facilitates removal of fittings.
3. The force main shall have a check valve to prevent force main backflow.
4. A tee shall be located between the pump discharge gate valve and the force main gate with the tee turned up and closed with a blind flange. Bolts on blind flange to be 316 S.S.
5. All bolts, nuts and washers shall be hot-dipped galvanized rust-resistant steel within the valve box.
6. Access cover shall be aluminum equipped with hasp and hinge and large enough to provide clear access to all fittings.
7. 4" Drain from valve box to wet well shall have flap valve.

4-F. ELECTRICAL

1. Pump and motor shall be shipped with non-wicking electrical power cable, over-heat cable and seal failure cable, factory installed and tested. Cut ends are to be sealed and tagged at the factory for shipping.
2. All electrical cables from the motor and wet well level sensors shall be terminated in a PVC weather tight box mounted flush in the wet well top slab and located on the handle side for easy access for cable removal.
3. Conduit shall be P.V.C. Conduit leaving the electrical terminal box and shall have a gas tight seal.
4. Wet well level sensor float hangers shall be located at the edge of the hatch.
5. Electrical control panel shall be NEMA 4X stainless steel. Panel shall be large enough to house all control equipment, shall have S.S. hasp and hinge with 3/8" diameter hole, shall have a separate lockable W.P. main disconnect adjacent to the control panel, and shall be large enough to provide additional space to house an automatic dialer assembly by GE, Model NX4 to be provided by the contractor.
6. If the proposed lift station is to discharge directly into the wet well of another existing CWR operated lift station, a GE NX4 Automatic Dialer will have to be retrofitted into the existing CWR lift station as part of the proposed sewer system work and at no cost to the CWR.
7. Electrical control panel bracket shall be made entirely of stainless steel above ground and adequately grounded.
8. Concrete pad shall be provided for by the electrical control panel and extend a minimum of three (3') feet – measured from the face of the panel.

4-G. CONTROL PANEL

1. Enclosure shall be NEMA 4X stainless steel with latches (easy opening without tools) and padlocking provisions.
   a. Provide sunshield on exterior of enclosure.
2. A minimum of the following components shall be installed at a separate hinged inner door:
   a. Padlockable door interlocking rotary handles from pump motor protective breakers
   b. Hand-off automatic selector switches
   c. Lead 1, Lead 2 Automatic-Selector switch
   d. 6 digit, none reset, elapsed time meters
   e. Voltmeter with Off-L1-L2-L3 selector switch
   f. Ammeter with Off-L1-L2-L2 selector switch
   g. Indicating lights for:
      - G1 pump running
      - G2 seal alarm
      - G3 motor failure (overtemperature pump breaker-overload tripped)
      - G4 high level alarm
      - G5 phase failure
   h. Push buttons for:
      - H1 test float level switches
      - H2 alarm horn silence
      - H3 reset-motor overtemperature
      - H4 test seal alarm
      - H5 reset seal alarm
   i. GFi Duplex Receptacle 15A.
3. A minimum of following components shall be mounted at the mounting backplate:
   a. Fuseless combination starters with instantaneous short circuit protection, heavy duty industrial contactors (D.P. contactors are not acceptable) 3 phase adjustable bimetallic overload protection.
   b. Control circuit transformer 115V with primary circuit breaker and secondary circuit breakers for
      - B1 control
      - B2 duplex receptacle
   c. Automatic electrical alternation
   d. Control replays
   e. Automatic shut-off timer for alarm horn (0-20 min. adjustable)
   f. Lightning arrestor
   g. Power terminals, control terminals
   h. Condensation protective space heater with thermostat
   i. Phase failure relay with (a 2-sec.) delay trip and a 60 sec. delay on time which will monitor:
      - J1 Phase Failure
      - J2 Phase Reversal
      - J3 Low Voltage (Brown Out)
   j. Set temperature control to 140°F or maximum temperature of panel components.

4. A minimum of the following alarm components:
   a. An alarm horn and a flashing alarm light with a minimum of 40W light bulb shall be installed at panel. Alarm light shall be approved for vaportight side installation.
   b. Alarm light and horn shall be on at:
      B1 High Level
      B2 Seal Alarm
      B3 Pump Breaker Tripped
      B4 Overload
      B5 Motor Over Temperature
5. Control sequence shall be designed so that panel is functioning automatically again after a power failure and manual reset is not necessary.
6. Seal failure relays shall be the electronic type with a maximum of: 24V, 0.5mA, 5VA Signal Power.
7. Control wire to be MTW 90°C #14 AWG.

   All wiring should be neatly grouped in plastic wire troughs except wiring from the backplate to the door shall be done in separate bundled harnesses for control, voltmeter and ammeter circuits.

   All wires shall have a wrap-around wire identification number as shown in the wiring diagram at both ends.

   All components shall be identified with the same number as shown in the wiring diagram.

   All door mounts components shall have in addition engraved name-plates.

8. All conduits into the control panel must be sealed.
9. All electrical work shall be performed by licensed personnel
10. Electrical permit shall be applied for at CWR and taken to Duke Power for hook-up.
11. All installations shall be in accordance with National electrical Code.
12. Electrical supply, control, and alarm circuits shall be designed to provide strain relief and to allow disconnection from outside the wet well. Terminals and connectors shall be protected from corrosion by location outside the wet well or through use of watertight seals. If located outside, weatherproof equipment shall be used.
13. The motor control center shall be located outside the wet well and be protected by a conduit seal or other appropriate measures meeting the requirements of the National Electrical Code, to prevent the atmosphere of the wet well from gaining access to the control center. The seal shall be so located that the motor may be removed and electrically disconnected without disturbing the seal.
14. Pump motor power cords shall be designed for flexibility and serviceability under conditions of extra hard usage and shall meet the requirements of the Mine Safety and Health Administration for trailing cables. Ground fault interruption protection shall be used to de-energize the circuit in the event of any failure in the electrical integrity of the cable. Power cord terminal fittings shall be corrosion-resistant, constructed in a manner to prevent the entry of moisture into the cable, and shall be provided with strain relief appurtenances, and shall be designed to facilitate field connecting.

4-H. SPARE PARTS FOR SUBMERSIBLE PUMP STATION

1. Contractor shall furnish on or before final inspection each of the following:
   a. One (1) Seal assembly
   b. Bearings; one (1) complete set of bearings for one pump
   c. Two (2) complete sets of record drawings for wet well, electrical, electronic schematics (and O&M Manuals, with factory pump curves for pumps installed), copies of all certified test and inspection data.

4-I. GRINDER STATIONS

Under conditions that arise from time to time, where normal installations cannot be implemented, we will review submittals on a grinder station installation. When it has been approved, the following criteria will be used.

1. Duplex station only – with guide rails
2. No motors larger than 3 HP
3. Fiberglass basins, include method to prevent flotation
4. Separate valve box (locking type) including gate valves and check valves
5. Water supply with backflow preventer installed in valve box terminated with ¾" hose bib and watts 8A vacuum breaker
6. All fees and permits paid by developer
7. Control panel will be as follows:
   a. The electrical controls for single phase pumps shall be mounted in Nema4X enclosure. Single phase power shall be 115/230V, 60 H2, 3 wire neutral ground system. All conduits to and from the pump shall be sealed and protected against water penetration.
   b. The control panel must be weatherproof, type Nema 4X construction, stainless steel or fiberglass. The outer door shall be completely gasketed hinged and equipped with a padlockable latch. A separate hinged inner door shall be provided for mounting the padlockable door inter-locking handle of the main disconnect switch, green running lights, H.O.A. switches, red seal alarm lights, 6 digit totalizers and 120 VAC GFI receptacle.
   c. A 20 amp two-pole main disconnect switch shall be provided to de-energize the control panel. From the load side of this switch a two-pole 20 A circuit breaker for each motor short circuit protection.
   d. The control circuits from the 115V line and neutral shall be protected by a max 6 amp 1-pole circuit breaker connected to the load side of the main disconnect switch. There must be a separate max 6 amp 1-pole circuit breaker for each high level alarm circuit only and be connected parallel to the control circuit breaker to insure high-level alarm function after tripping of control breaker and motor branch circuit breaker.
   e. Each motor will be protected by an adjustable, 2-pole bimetallic overload relay, meeting NEMA Class 10 tripping characteristics and shall be temperature compensated. The U.L. listed overload relay must be approved to be used in control panels. The control auxiliary contact of the overload relay must be connected in series with the motor contactor coil to switch off the contactor in the event of overload.
   f. The U.L. listed NEMA sized motor contactor must have a guaranteed component life span without maintenance or contact replacement of 1 million operations. (Definite purpose contactors will not be allowed.)

g. The inherent motor over-temperature contacts shall be connected in series with the motor contactor.
h. There will be an electronic seal alarm monitoring relay installed with voltage at the sensor shall not exceed 24V with a signal current not to exceed 0.5ma.
i. All pilot devices mounted at the inner door shall have phenolic or metallic engraved name plates. The control panel shall be fitted with an integral red (min 40 watt) bulb flashing, tamper proof alarm light.
j. All starting capacitors, run capacitor and voltage sensing start relays shall be of heavy duty quality.
k. The level shall be controlled by three floats. The operational sequence shall be:
    1. Pump off
    2. Pump on
    3. High level alarm
l. There will also be installed in the control panel a device for automatic electrical alternation of pumps.
m. Provided to cWR (2) additional pumps for inventory.

8. All electrical work shall be performed by licensed personnel
9. Electrical permit shall be applied for at CWR and taken to Duke Power for hook-up.
10. All installations shall be in accordance with National Electrical Code.
11. All wires shall have a wrap-around wire identification number as shown in the wiring diagram at both ends.
12. All components shall be identified with the same number as shown in the wiring diagram.
13. Five year warranty on pump. One year maintenance bond on complete installation.

SECTION 5 - MISCELLANEOUS INFORMATION

5-A. CWR INSPECTOR

1. The CWR Inspector will reserve the right to request changes in work if the work is not in accordance with these guidelines or if work is being performed in an improper manner and may result in incorrect installation of the wastewater collection system.
2. All work rejected by the CWR Inspector shall be removed and redone to the satisfaction of the CWR Inspector.
3. The CWR Inspector will reserve the right to request any work be uncovered if the work was covered contrary to the Inspector's request, if defective work is suspected or to correct defects discovered during CWR requested or to correct defects discovered during CWR requested testing.

5-B. ENGINEER'S RESPONSIBILITY

1. The Engineer will review all phases of the work in progress and will be responsible for ascertaining whether or not the work performed is in accordance with the Engineer's plans and specifications and CWR requirements.
2. The Engineer shall promptly furnish CWR with pertinent information concerning changes made during the progress of the work. No major changes shall be performed without prior approval of CWR.

PROJECT CHECKLIST - NEW SANITARY SEWER SYSTEMS

PROJECT NAME: _____

CWR JOB NO: _____ CWR EXTENSION NO: _____

ENGINEER: _____ DEVELOPER: _____

ENGINEER: _____ DEVELOPER: _____

ENGINEER: _____ DEVELOPER: _____

CONTACT: _____ PHONE: _____

CONTACT: _____ PHONE: _____

PRELIMINARY APPROVAL:		BY	DATE
A.	2 Sets of Plans and Specs and 1 Copy Design Notes to CWR to the Attention of Mr. Greg Loving, Maintenance Supt.	_____	_____
B.	Plans and Specs Received and Approved _____ or Disapproved _____ Resubmit _____	_____	_____

FINAL APPROVAL:			
A.	DHEC Approved Plans and Specs Submitted to CWR.	_____	_____
B.	DHEC Permits Submitted to CWR.	_____	_____
C.	Construction Schedule Submitted to CWR.	_____	_____
D.	Contractor/Engineer Notify CWR in Writing Date Construction is to Commence. Work Commenced: _____	_____ _____	_____ _____
E.	Engineer's Written Request to Tie Into CWR System.	_____	_____
F.	Permission for On-Site Inspection to CWR.	_____	_____
G.	Copies of Engineer's Weekly Progress Reports Submitted to CWR.	_____	_____

_____ _____ _____

_____ _____ _____

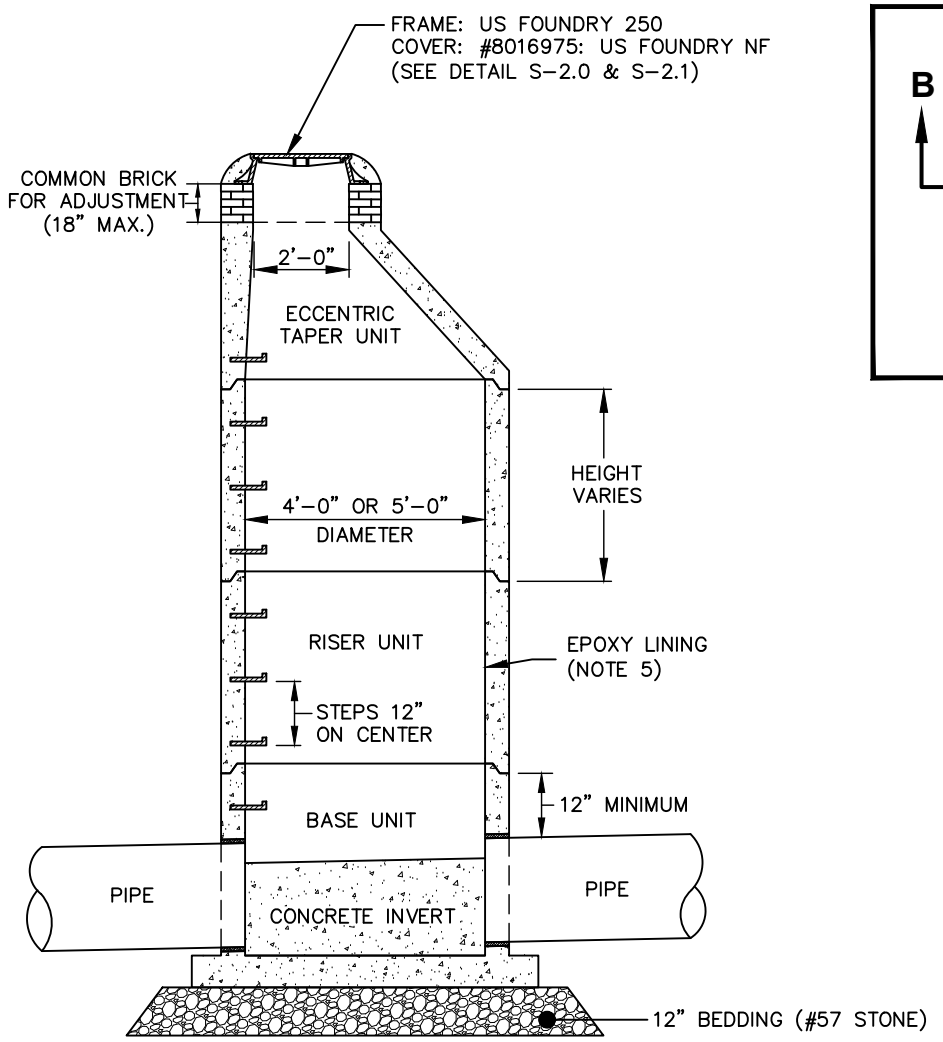
PROJECT CHECKLIST - NEW SANITARY SEWER SYSTEMS

PROJECT COMPLETION AND TAKE-OVER:		BY	DATE
A.	Written Request to CWR/DHEC for Final Inspection. Final Inspection Date: _____	_____	_____
B.	Engineer's Certification of Completion and Acceptance to CWR.	_____	_____
C.	"As-Constructed" Drawings Furnished CWR.	_____	_____
D.	Instrument of conveyance Furnished CWR.	_____	_____
E.	One-Year Maintenance Bond Furnished CWR.	_____	_____
F.	Letter of Value Furnished CWR and Letter of Quantity and Cost.	_____	_____
G.	CWR Acceptance Letter Sent to DHEC – Copy to Engineer.	_____	_____
H.	DHEC Approval Letter.	_____	_____
I.	Release of Liens.	_____	_____
PROJECT CLOSED OUT:		_____	_____

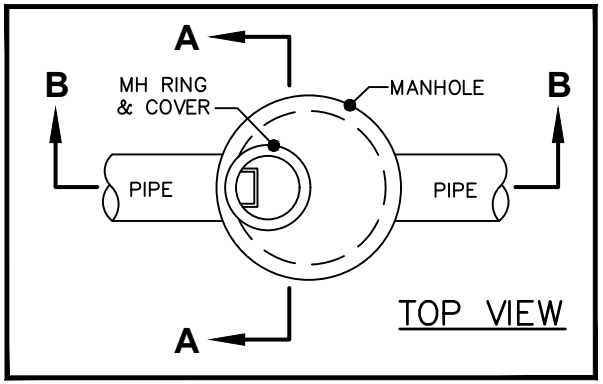
REMARKS:

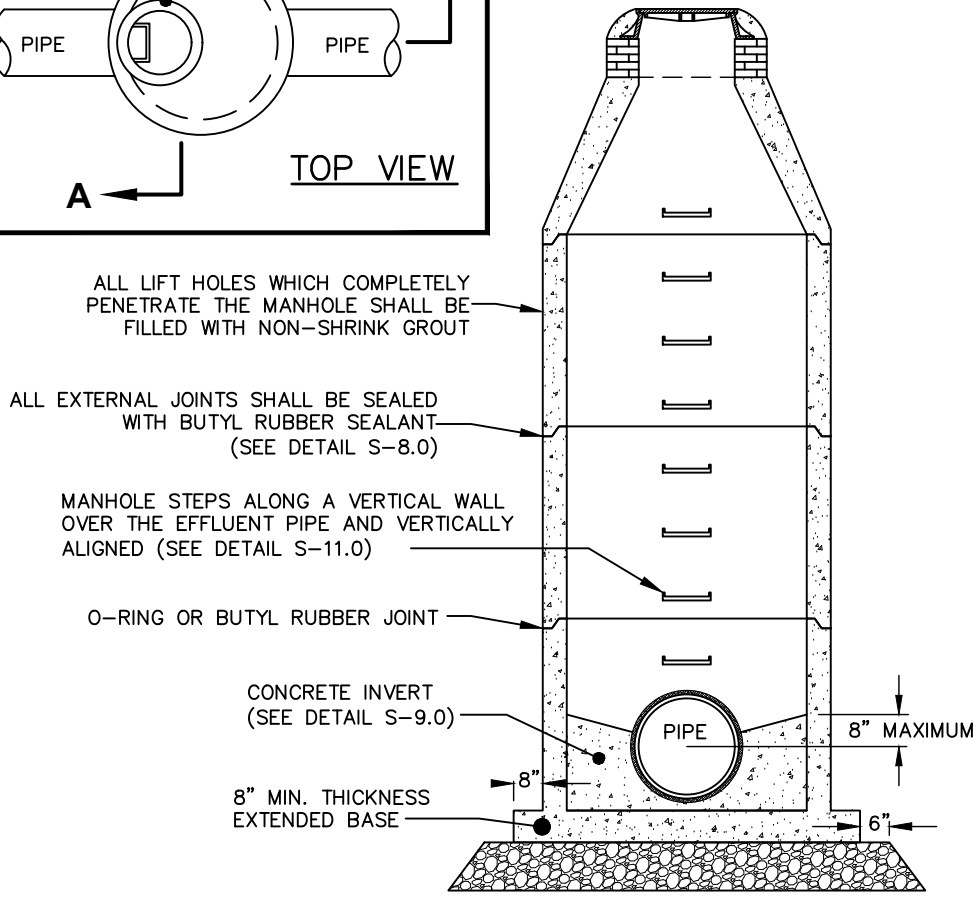
SECTION 6 - CONSTRUCTION DETAILS
FOR
SANITARY SEWER
SYSTEM IMPROVEMENTS

CHESTER COUNTY WASTEWATER RECOVERY
CHESTER, SOUTH CAROLINA
OCTOBER 2021



SECTION B-B





SECTION A-A

NOTES:
1. ALL MANHOLE CONNECTIONS SHALL BE PREFABRICATED OR CORED WITH A CONCRETE CORING MACHINE.
2. EXTENDED BASE REQUIRED FOR ALL MANHOLES WITH MORE THAN 12-FT DEPTH OF BURY.
3. PROVIDE A MINIMUM 0.2 FOOT IN-OUT DROP.
4. SEE SPECIFICATIONS FOR MINIMUM WALL THICKNESS.
5. PROVIDE EPOXY LINING IN MANHOLE RECEIVING FLOW FROM FORCEMAINS AND GRAVITY FLOW OVER 5 FEET PER SECOND.

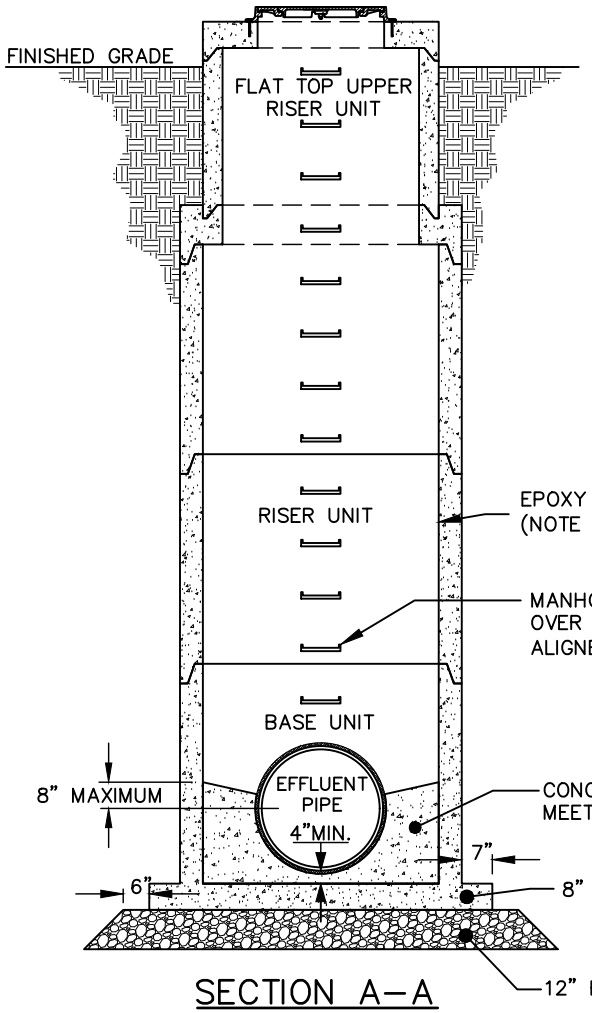
DETAIL No.
S-1.0

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

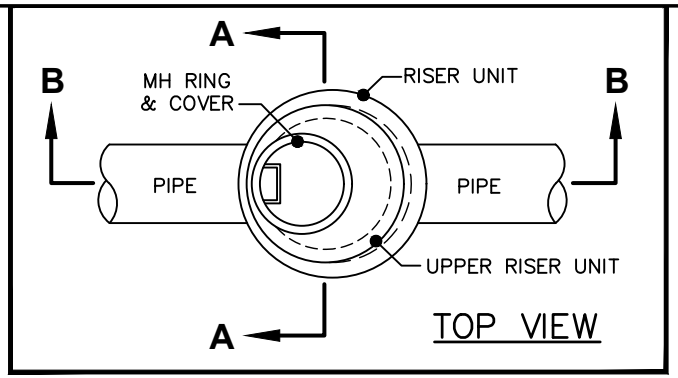
STANDARD PRECAST CONCRETE MANHOLE

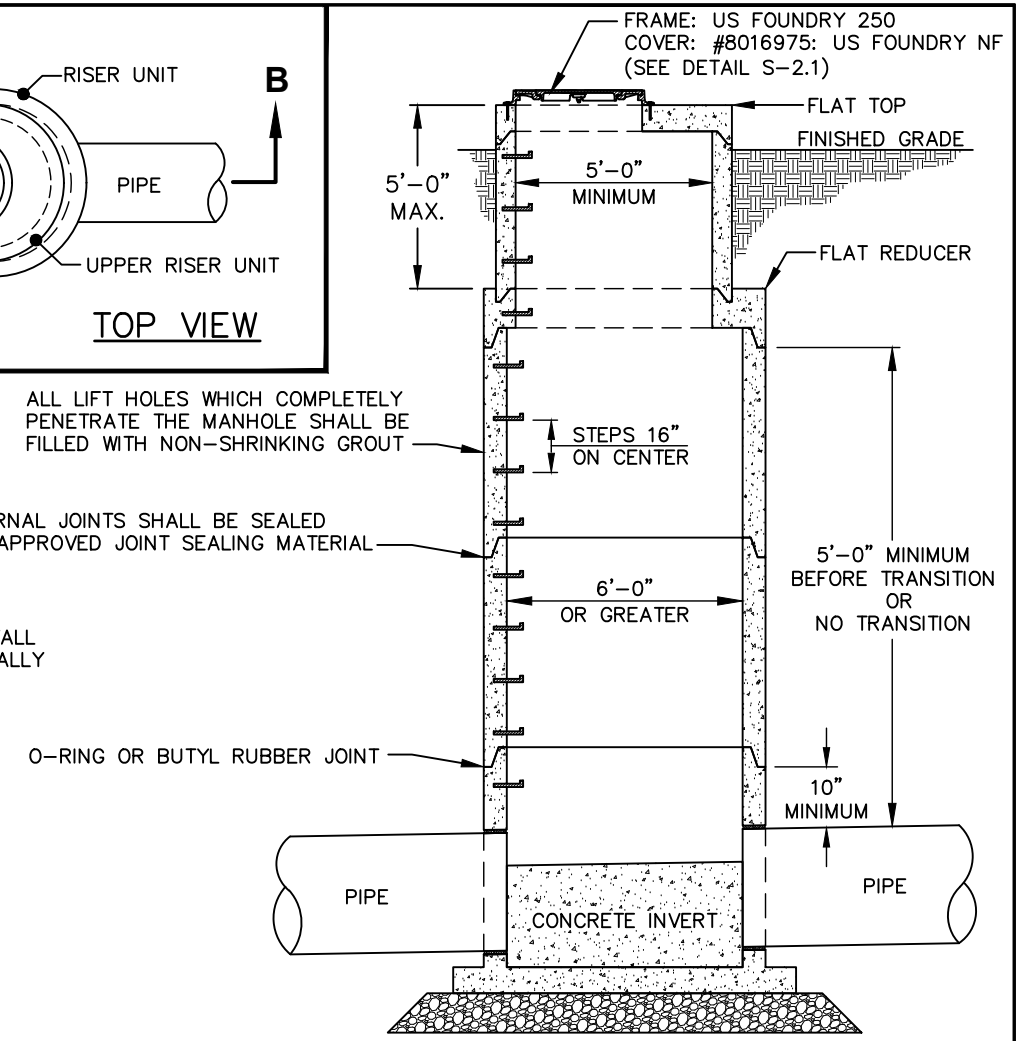
SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



SECTION A-A





SECTION B-B

NOTES:

1. ALL MANHOLE CONNECTIONS SHALL BE PREFABRICATED OR CORED WITH A CONCRETE CORING MACHINE.
2. EXTENDED BASE REQUIRED FOR ALL MANHOLES WITH MORE THAN 12-FT DEPTH OF BURY.
3. PROVIDE A MINIMUM 0.2 FOOT IN-OUT DROP.
4. SEE SPECIFICATIONS FOR MINIMUM WALL THICKNESS.
5. PROVIDE EPOXY LINING IN MANHOLE RECEIVING FLOW FROM FORCEMAINS AND GRAVITY FLOW OVER 5 FEET PER SECOND.

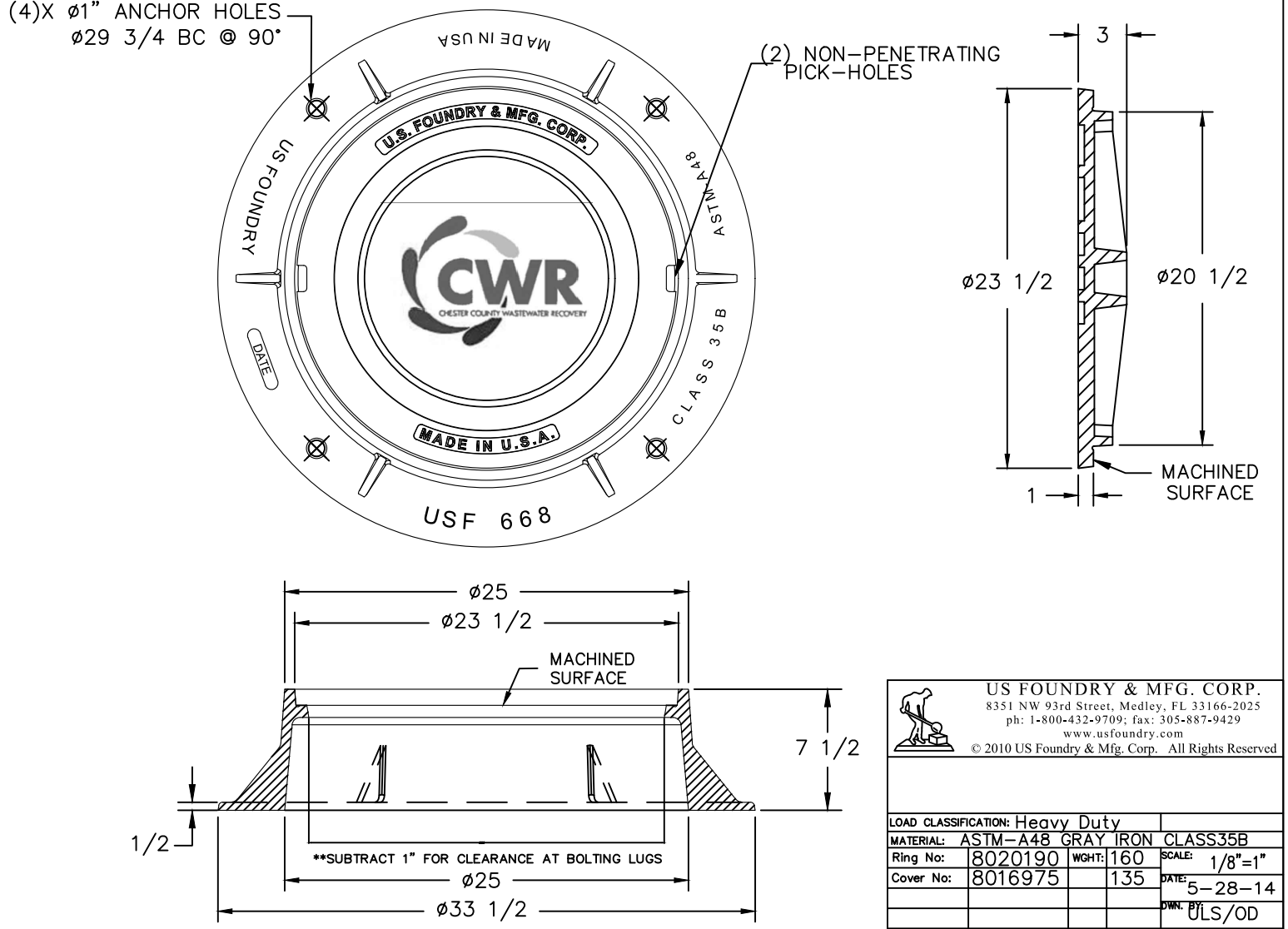
DETAIL No.
S-1.1

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

STANDARD PRECAST CONCRETE MANHOLE
6-FT DIAMETER OR LARGER FOR NON-PAVED AREAS

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



US FOUNDRY & MFG. CORP.
8351 NW 93rd Street, Medley, FL 33166-2025
ph: 1-800-432-9709; fax: 305-887-9429
www.usfoundry.com
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LOAD CLASSIFICATION: Heavy Duty				
MATERIAL: ASTM-A48 GRAY IRON CLASS35B				
Ring No:	8020190	WGHT:	160	SCALE: 1/8"=1"
Cover No:	8016975		135	DATE: 5-28-14
				DWN. BY: ULS/OD
UNLESS OTHERWISE NOTED WEIGHT IS IN POUNDS AND APPROXIMATED				
REV: 0	DATE:	REV BY:		QUOTE# 3455

DETAIL No.
S-2.0

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

STANDARD MANHOLE RING AND COVER (PAVED AREAS)

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020

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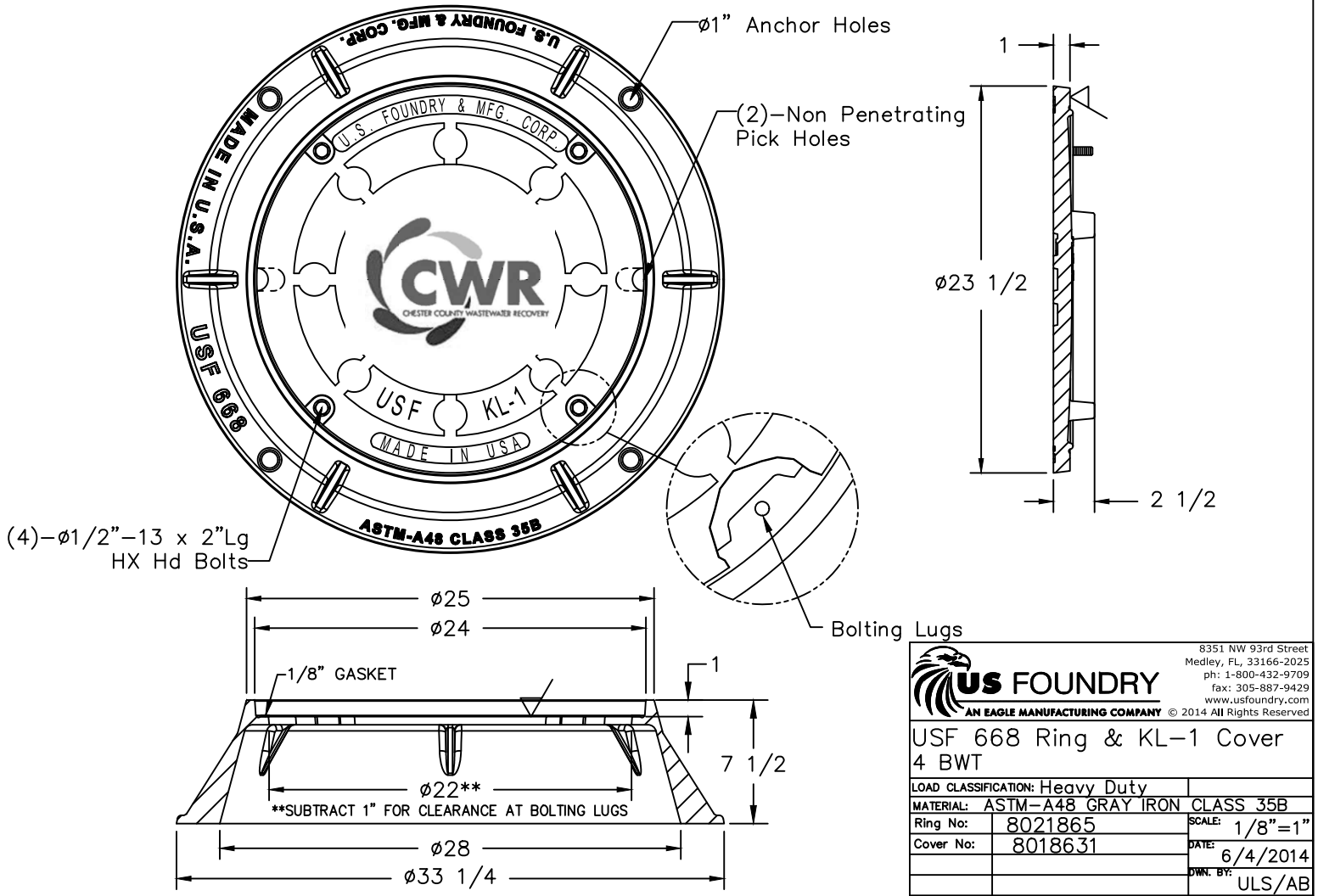

US FOUNDRY
AN EAGLE MANUFACTURING COMPANY
8351 NW 93rd Street
Medley, FL, 33166-2025
ph: 1-800-432-9709
fax: 305-887-9429
www.usfoundry.com
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USF 668 Ring & KL–1 Cover
4 BWT

LOAD CLASSIFICATION: Heavy Duty		
MATERIAL: ASTM–A48 GRAY IRON CLASS 35B		
Ring No:	8021865	SCALE: 1/8"=1"
Cover No:	8018631	DATE: 6/4/2014
		DWN. BY: ULS/AB
REV: 0	DATE:	REV BY: QUOTE#

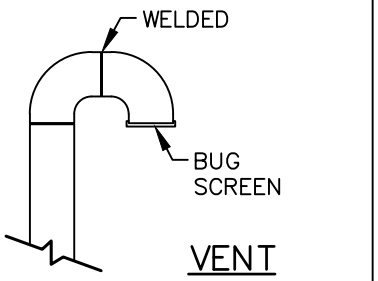
DETAIL No.
S–2.1

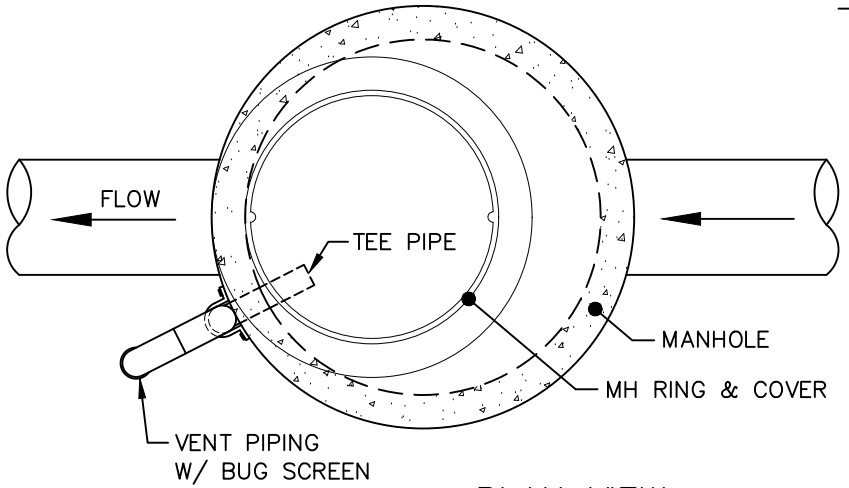
CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

STANDARD MANHOLE RING AND COVER
(FOR OUTFALLS OR UNPAVED AREAS - WATERTIGHT APPLICATIONS)

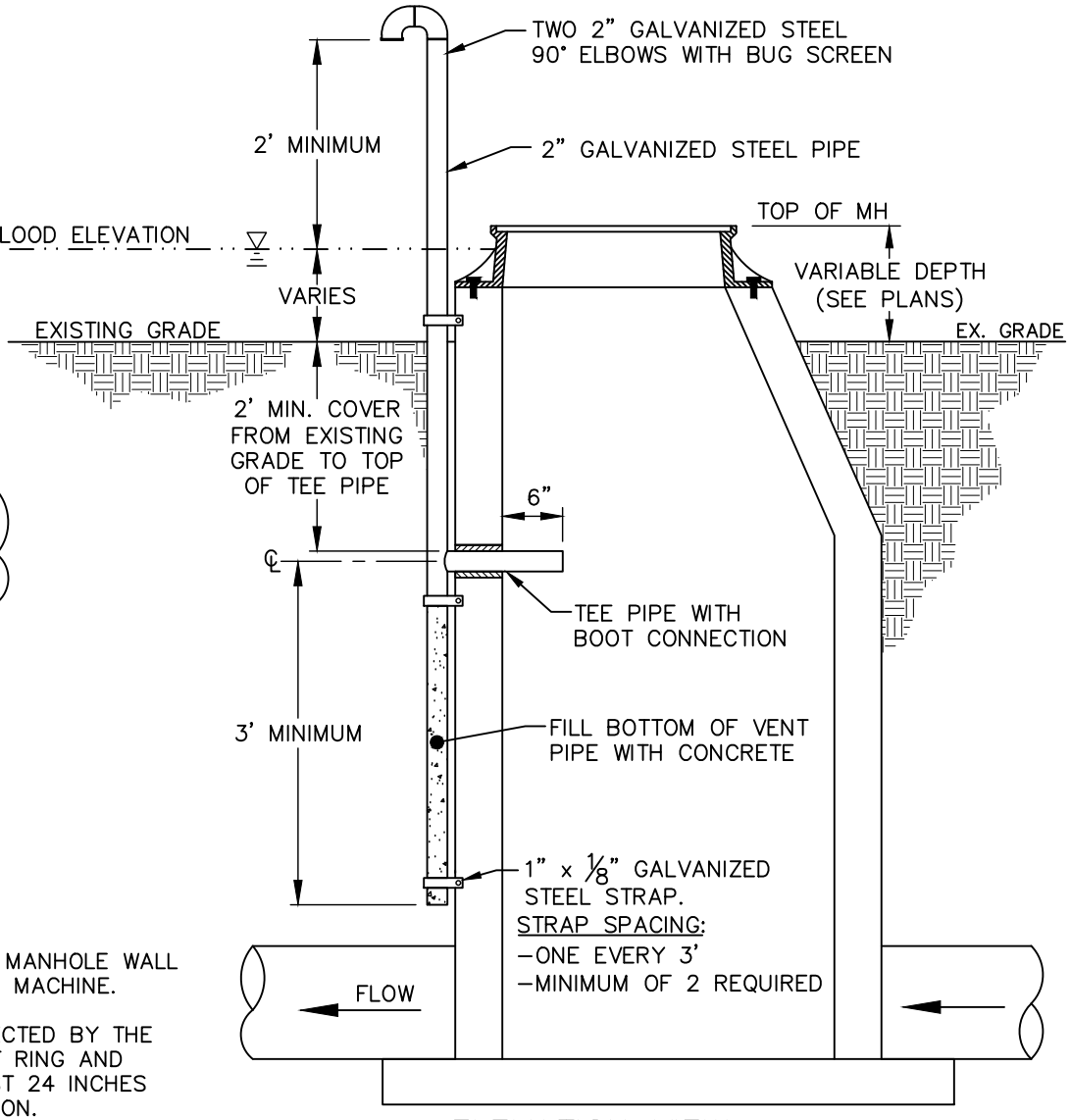
SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020





PLAN VIEW



ELEVATION VIEW

NOTES:

1. VENT PIPE OPENING IN PRECAST CONCRETE MANHOLE WALL SHALL BE CORED WITH A CONCRETE CORING MACHINE.
2. LOCATION OF VENT PIPE SHALL BE AS DIRECTED BY THE CONSTRUCTION INSPECTOR WITH WATERTIGHT RING AND COVER VENT TOP TO BE ELEVATED AT LEAST 24 INCHES ABOVE THE 100 YEAR FLOOD PLAIN ELEVATION.

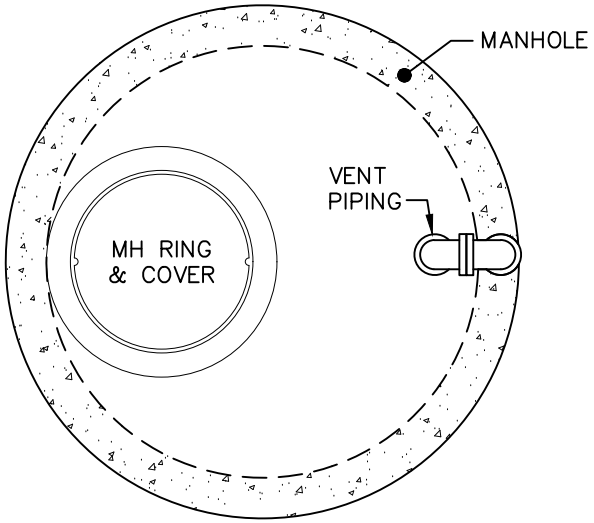
DETAIL No.
S-3.0

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

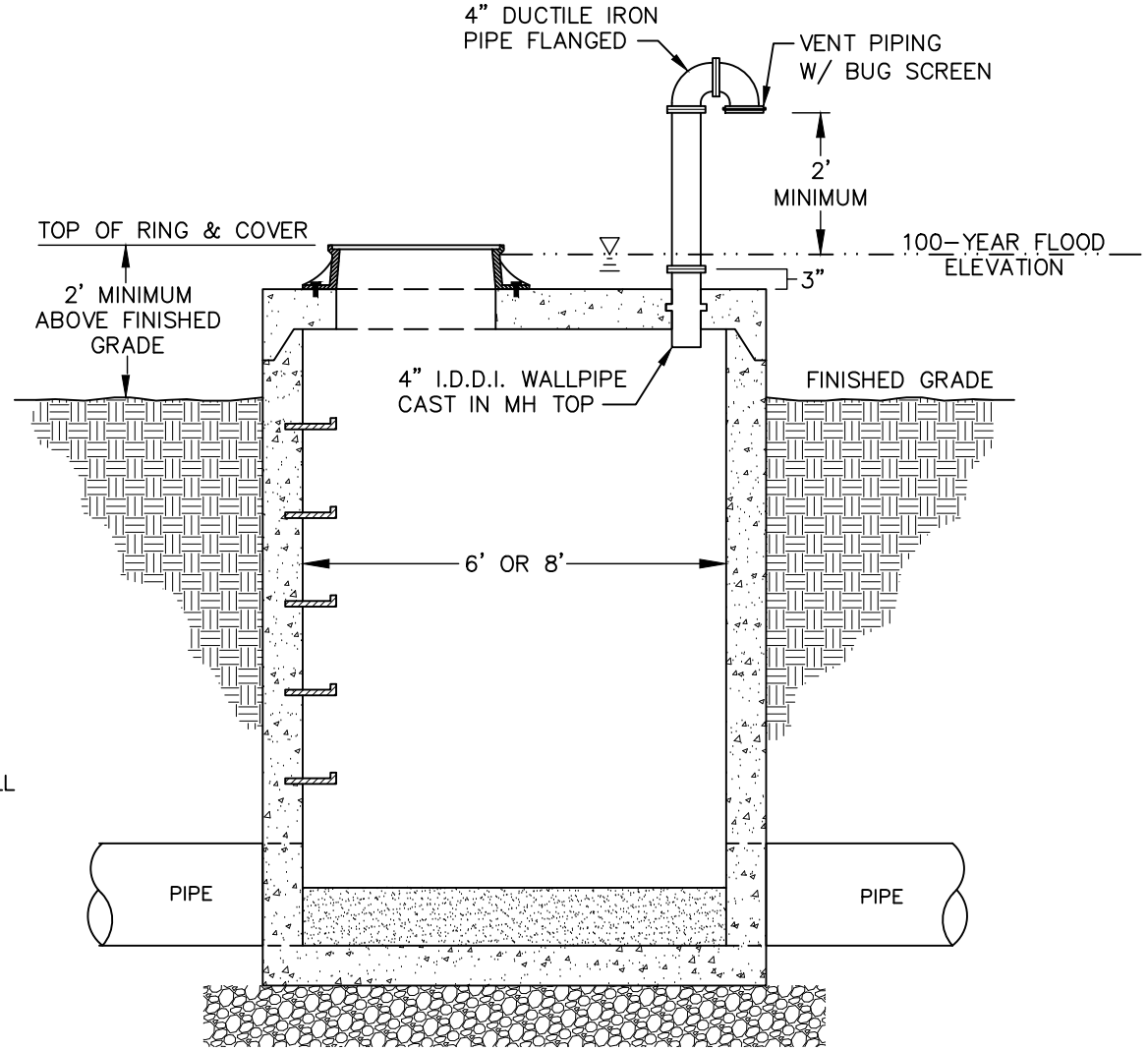
STANDARD MANHOLE VENT

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



PLAN VIEW



ELEVATION VIEW

NOTES:

1. VENT PIPE OPENING IN PRECAST CONCRETE MANHOLE WALL SHALL BE CORED WITH A CONCRETE CORING MACHINE.
2. LOCATION OF VENT PIPE SHALL BE AS DIRECTED BY THE CONSTRUCTION INSPECTOR WITH WATERTIGHT RING AND COVER VENT TOP TO BE ELEVATED AT LEAST 24 INCHES ABOVE THE 100 YEAR FLOOD PLAIN ELEVATION.

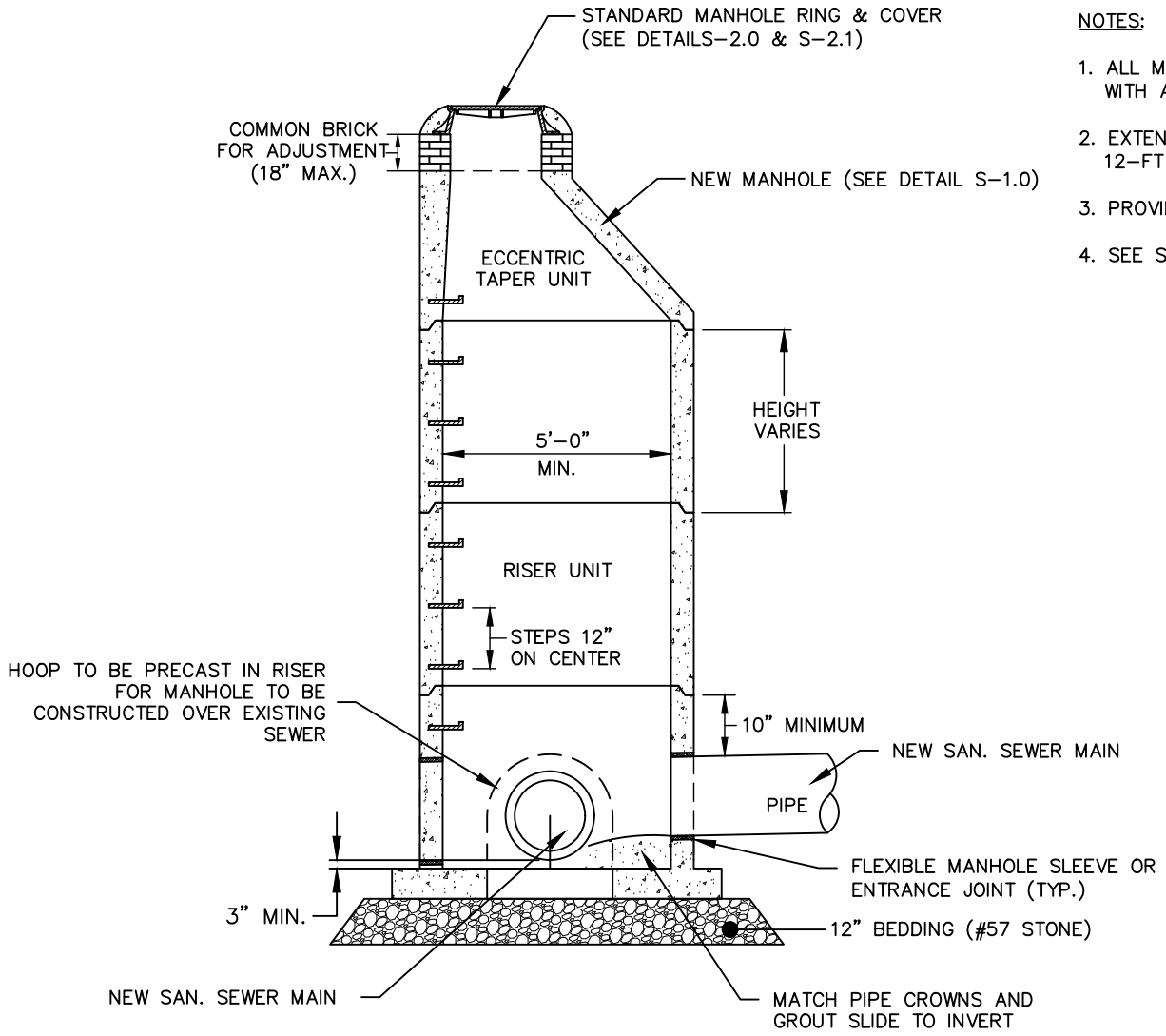
DETAIL No.
S-3.1

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

STANDARD MANHOLE VENT WITH FLAT TOP MANHOLE

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



NOTES:

1. ALL MANHOLE CONNECTIONS SHALL BE PREFABRICATED OR CORED WITH A CONCRETE CORING MACHINE.
2. EXTENDED BASE REQUIRED FOR ALL MANHOLES WITH MORE THAN 12–FT DEPTH OF BURY.
3. PROVIDE A MINIMUM 0.2 FOOT IN–OUT DROP.
4. SEE SPECIFICATIONS FOR MINIMUM WALL THICKNESS.

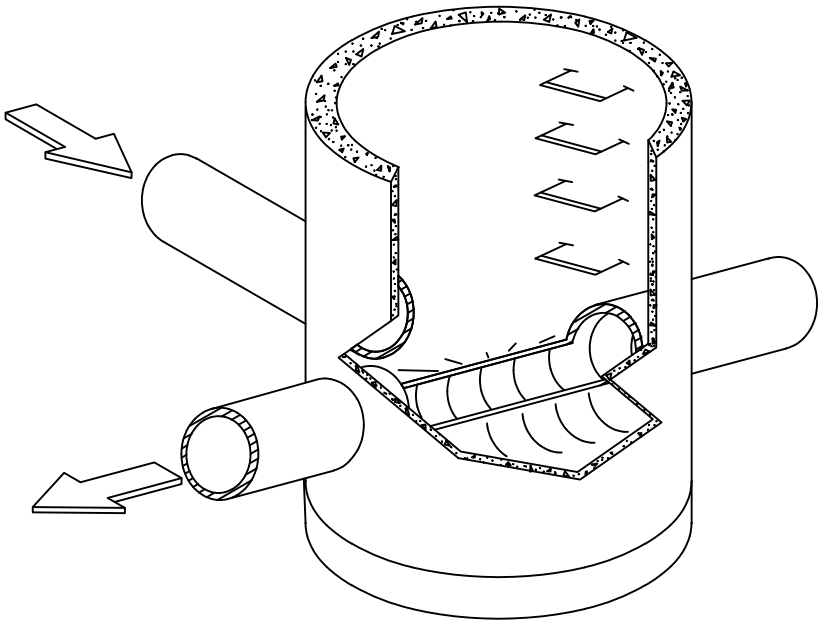
CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

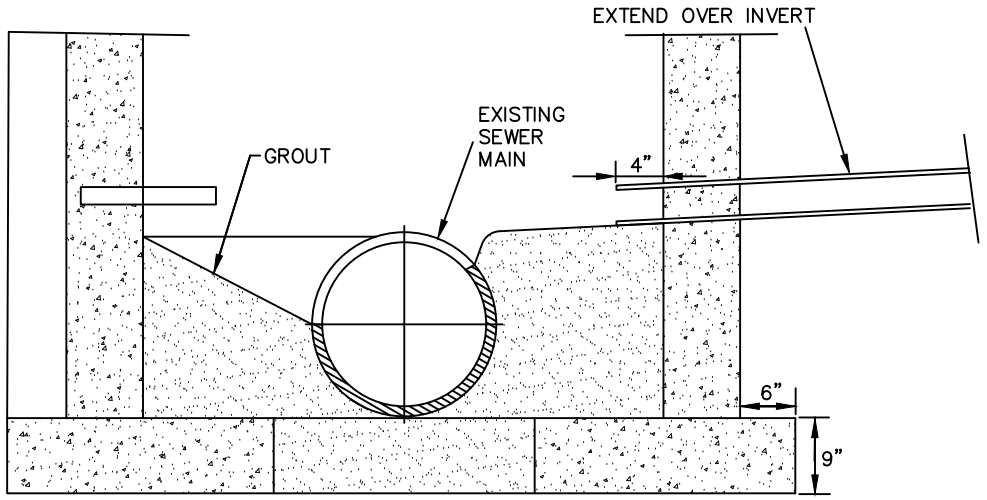
MANHOLE OVER EXISTING LINE

SCALE: N.T.S.

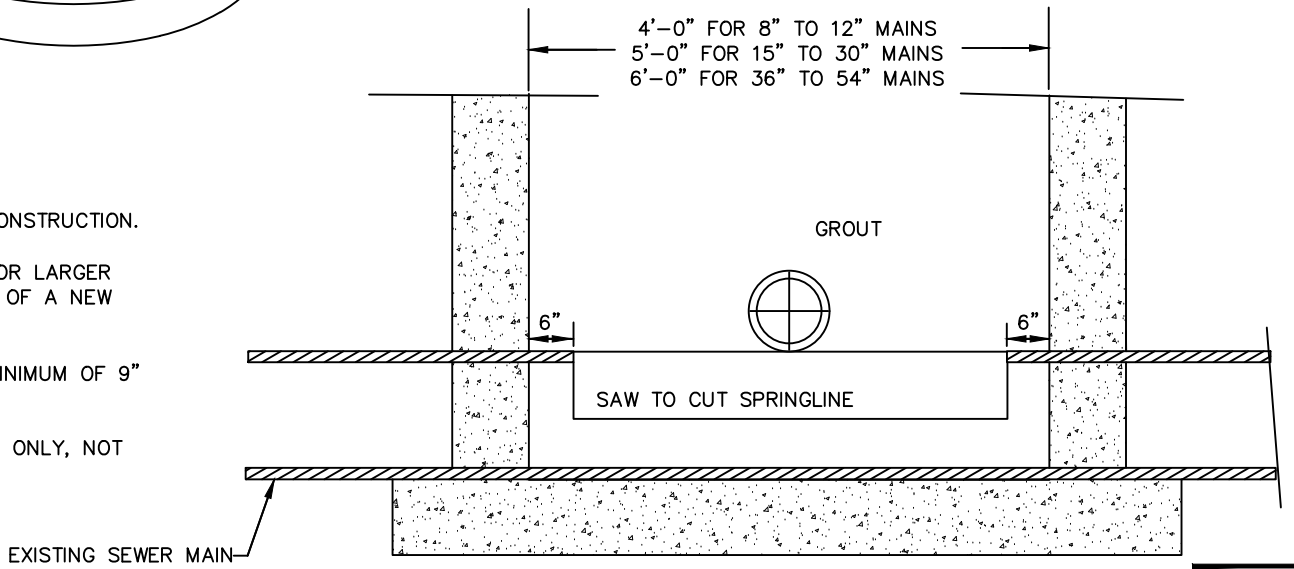
DETAIL No.
S–4.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020





SECTION AT RIGHT ANGLE TO EXISTING MAIN



SECTION ALONG CENTERLINE OF EXISTING MAIN

NOTES:

1. FLOW SHALL BE MAINTAINED DURING CONSTRUCTION.
2. THIS DETAIL TO BE USED WHEN A 6" OR LARGER LATERAL NECESSITATES CONSTRUCTION OF A NEW MANHOLE.
3. THE CONTRACTOR SHALL PROVIDE A MINIMUM OF 9" COMPACTED OF #67 STONE BASE.
4. FOR USE ON DIP, CONCRETE, AND PVC ONLY, NOT ALLOWED ON VCP.

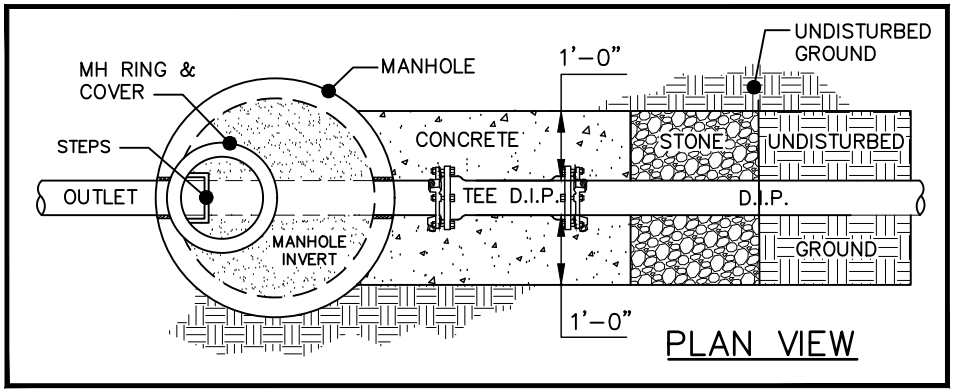
DETAIL No.
S–4.1

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

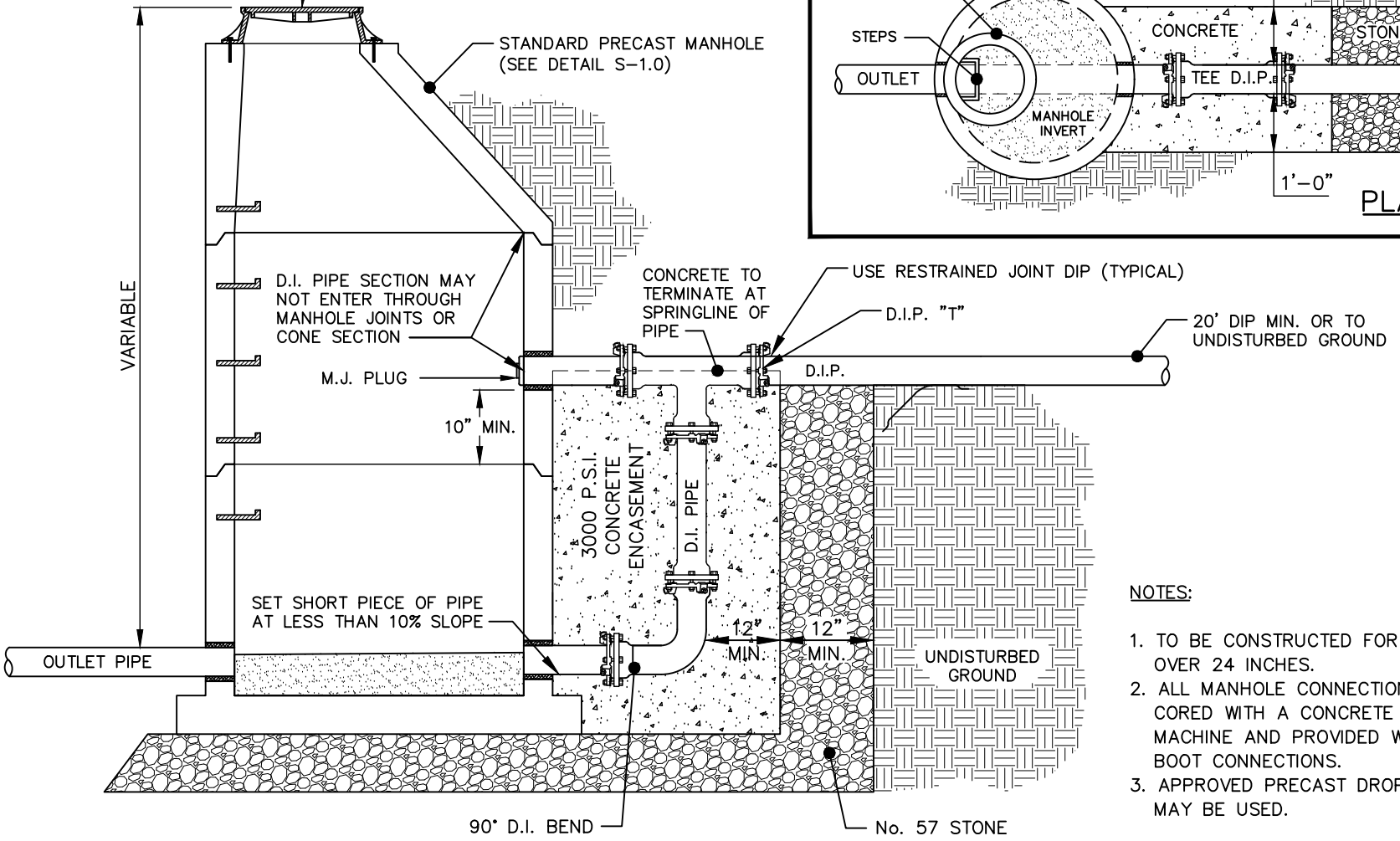
STANDARD MANHOLE INSTALLATION OVER EXISTING SEWER MAIN

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



PLAN VIEW



SECTION VIEW

NOTES:

1. TO BE CONSTRUCTED FOR ALL DROPS OVER 24 INCHES.
2. ALL MANHOLE CONNECTIONS SHALL BE CORED WITH A CONCRETE CORING MACHINE AND PROVIDED WITH WATERTIGHT BOOT CONNECTIONS.
3. APPROVED PRECAST DROP MANHOLES MAY BE USED.

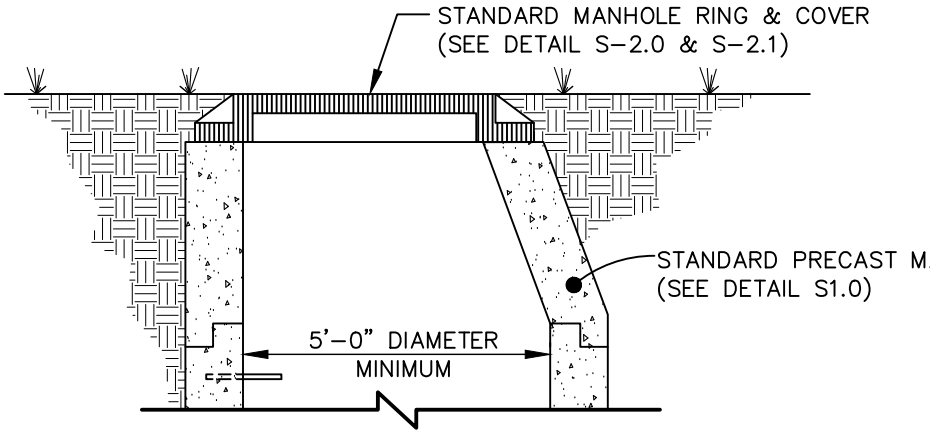
DETAIL No.
S-5.0

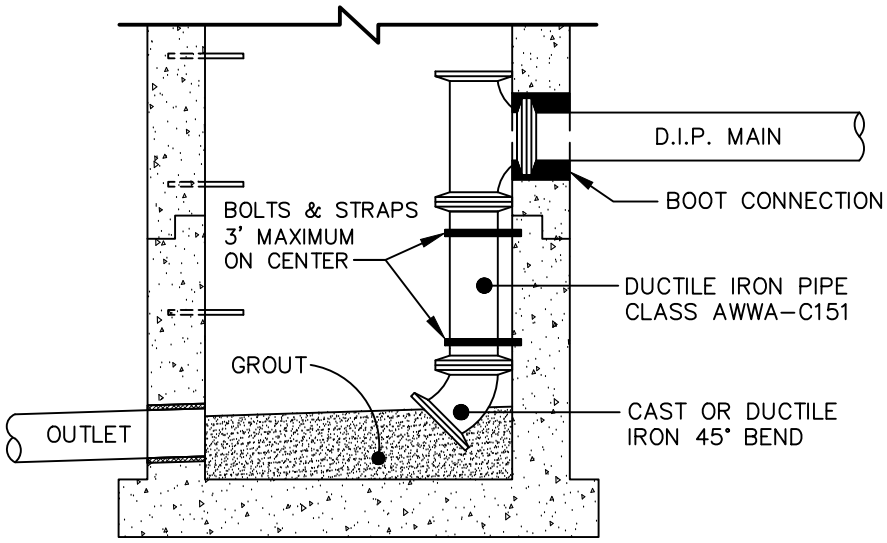
CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

STANDARD OUTSIDE DROP MANHOLE

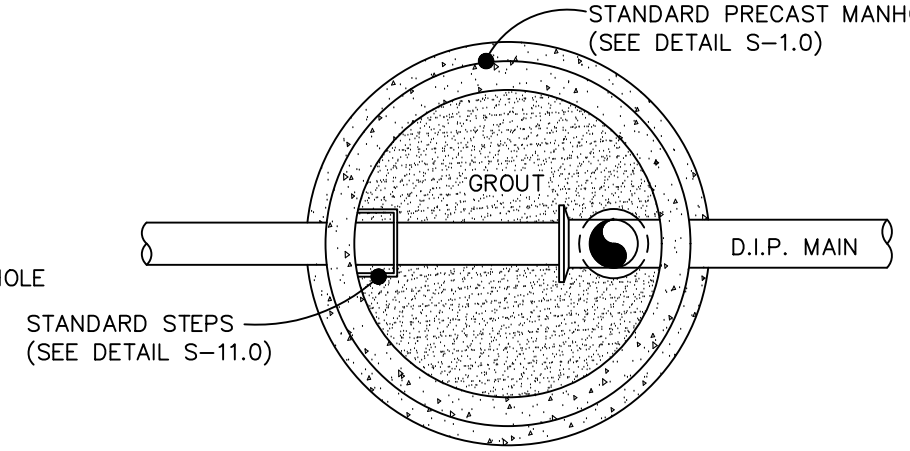
SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020





SECTION



PLAN VIEW

NOTES:

1. INSIDE DROP MANHOLES SHALL ONLY BE ALLOWED BY WRITTEN PERMISSION FROM CHESTER COUNTY WASTEWATER RECOVERY.
2. ONE INSIDE DROP ALLOWED FOR 5' MANHOLE.
3. PIPE SIZE FOR DROP TO EQUAL INFLOW SEWER PIPE SIZE.
4. MECHANICAL JOINT OR PUSH–ON FITTINGS, TO BE USED.
5. SAW–CUT OR DRILL ALL HOLES FOR PIPE AND BOLTS.
6. DROP MANHOLE MANDATORY WHEN DIFFERENTIAL BETWEEN INVERTS IS GREATER THAN 24 INCHES.
7. STAINLESS STEEL STRAPS AND BOLTS SHALL BE USED ON ALL DROPS GREATER THAN 5 FEET AT 18 INCH INTERVALS.
8. INSIDE DROP FOR RETROFITTING EXISTING MANHOLES.
9. 8" DIAMETER LINE MAX FOR 5' MANHOLE; 12" DIAMETER LINE MAX FOR 6' MANHOLE.
10. INSIDE DROP NOT PERMITTED IN MANHOLES SMALLER THAN 5 FEET.

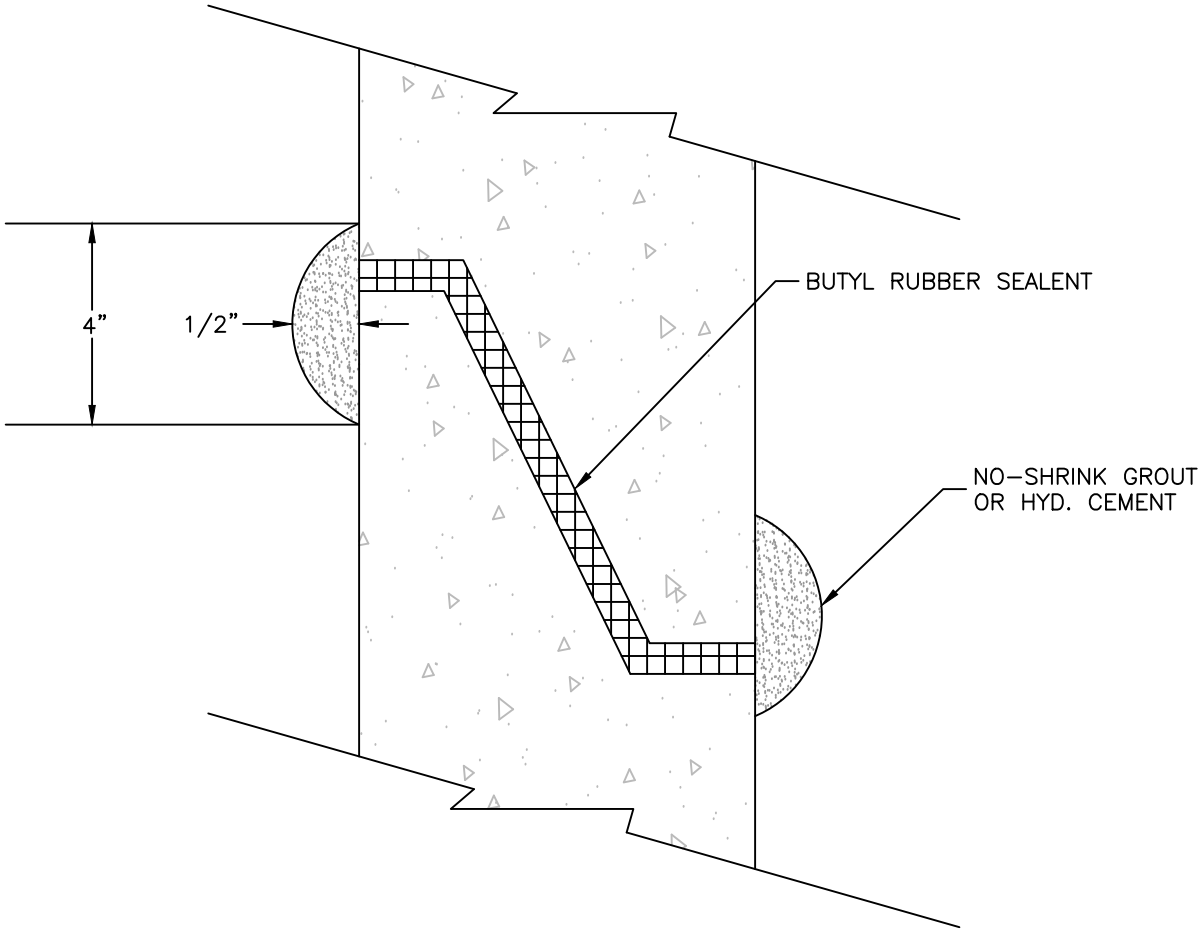
DETAIL No.
S–6.0

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

STANDARD INSIDE DROP MANHOLE

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



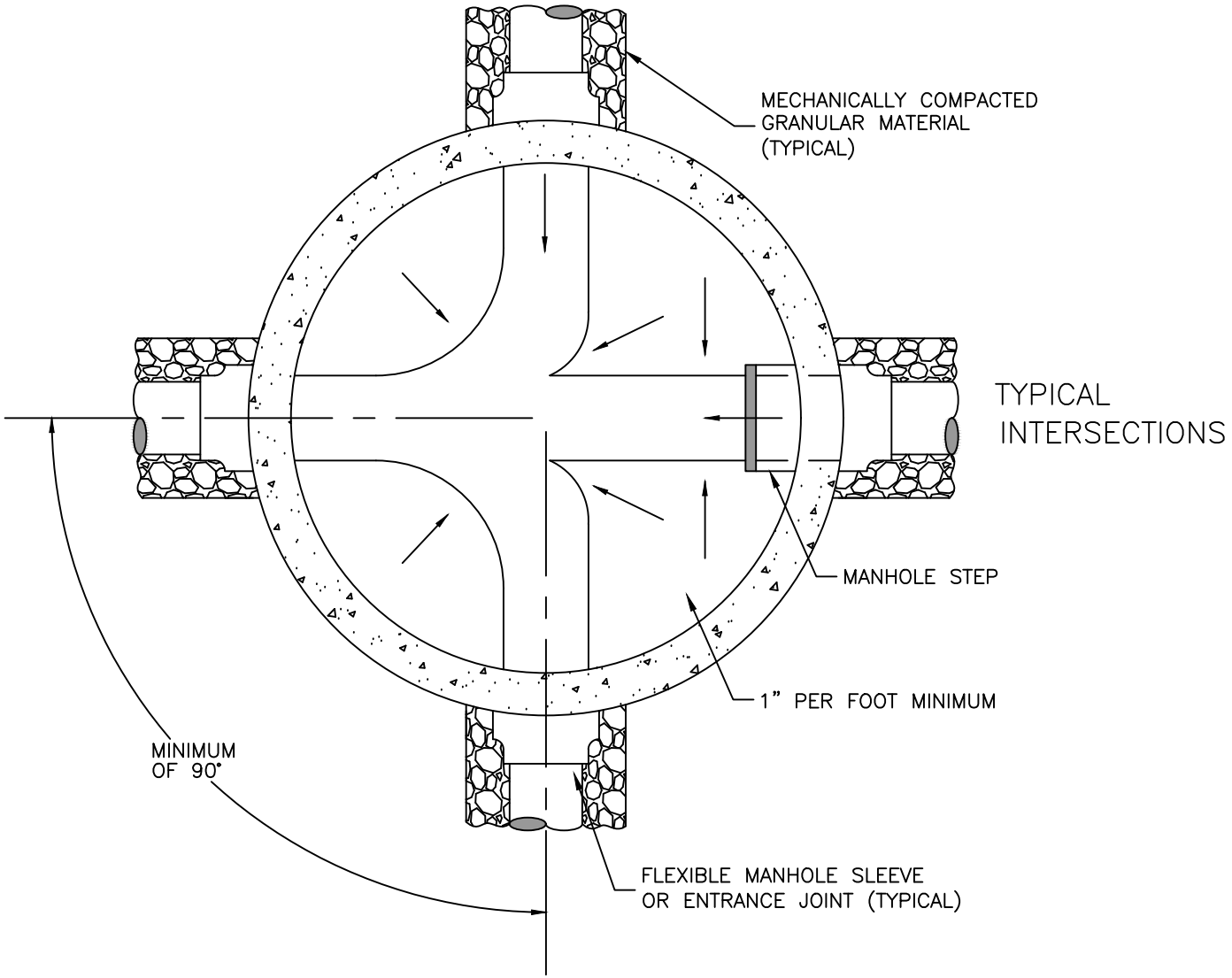
CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

PRECAST MANHOLE JOINT DETAIL

SCALE: N.T.S.

DETAIL No.
S–7.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



NOTES:

1. SHAPE ALL INVERTS & TROWEL SMOOTH.

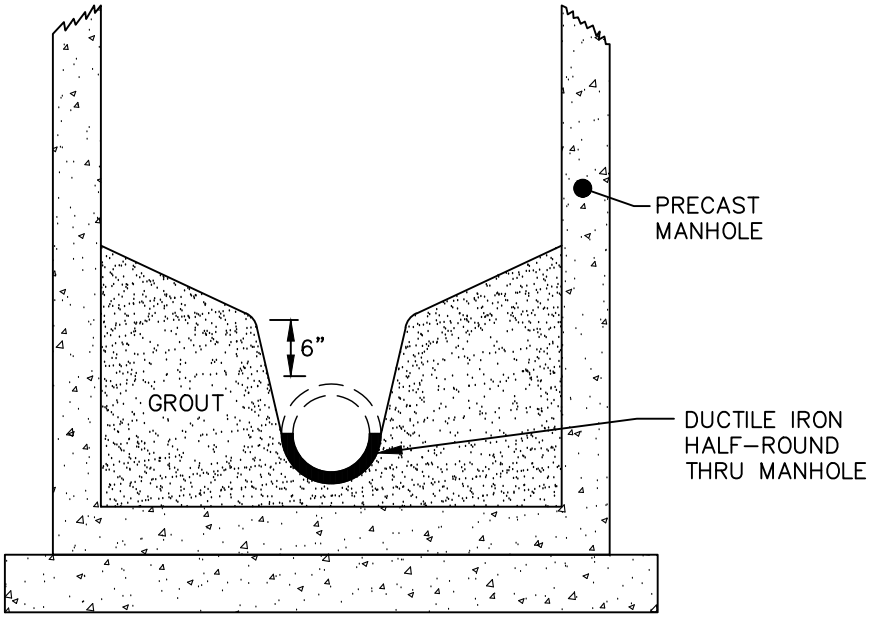
DETAIL No.
S–8.0

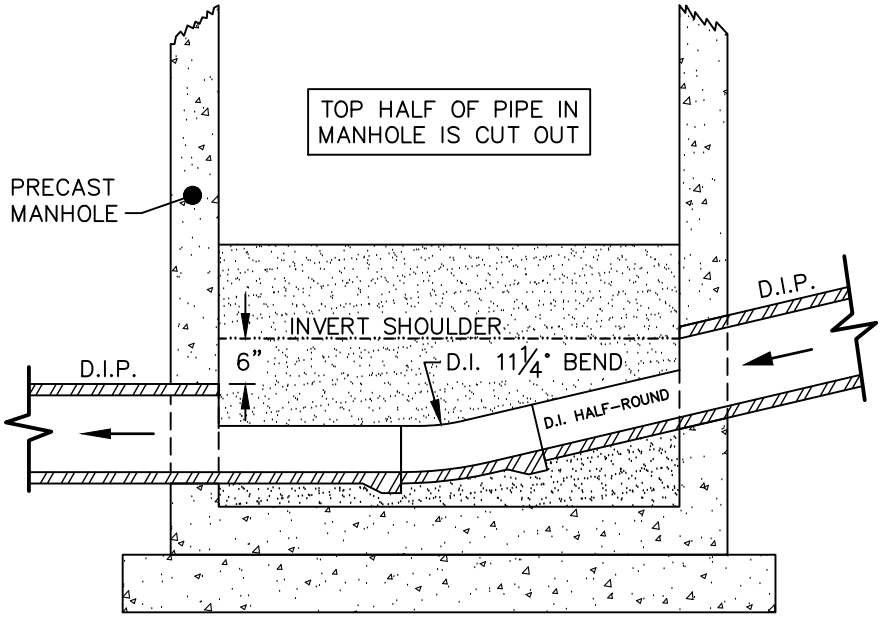
CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

MANHOLE INVERT

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020





NOTES:

1. NO HORIZONTAL ALIGNMENT CHANGE CAN BE MADE WITHIN THIS MANHOLE TYPE. USE ON GRADES OF 10% OR GREATER.

2. EACH JOINT OF PIPE BETWEEN HIGH VELOCITY MANHOLE & MANHOLE UPGRADE SHALL HAVE A THRUST COLLAR

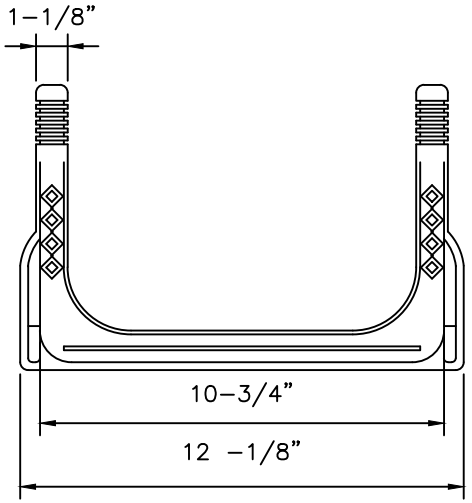
CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

STANDARD HIGH VELOCITY MANHOLE INVERT

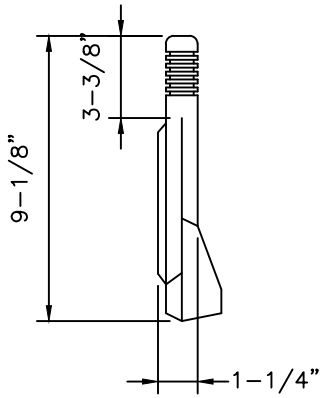
SCALE: N.T.S.

DETAIL No.
S–9.0

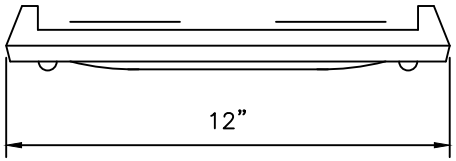
REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



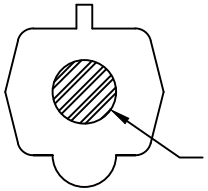
PLAN VIEW



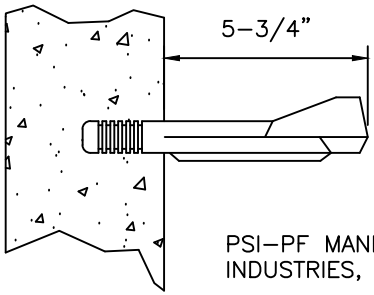
SIDE ELEVATION



FRONT ELEVATION



SECTION ” A – A ”



PSI–PF MANHOLE STEP BY M.A.
INDUSTRIES, INC. OR APPROVED EQUAL

NOTES:

1. STEPS TO BE PLACED 12” ON–CENTER VERTICALLY.

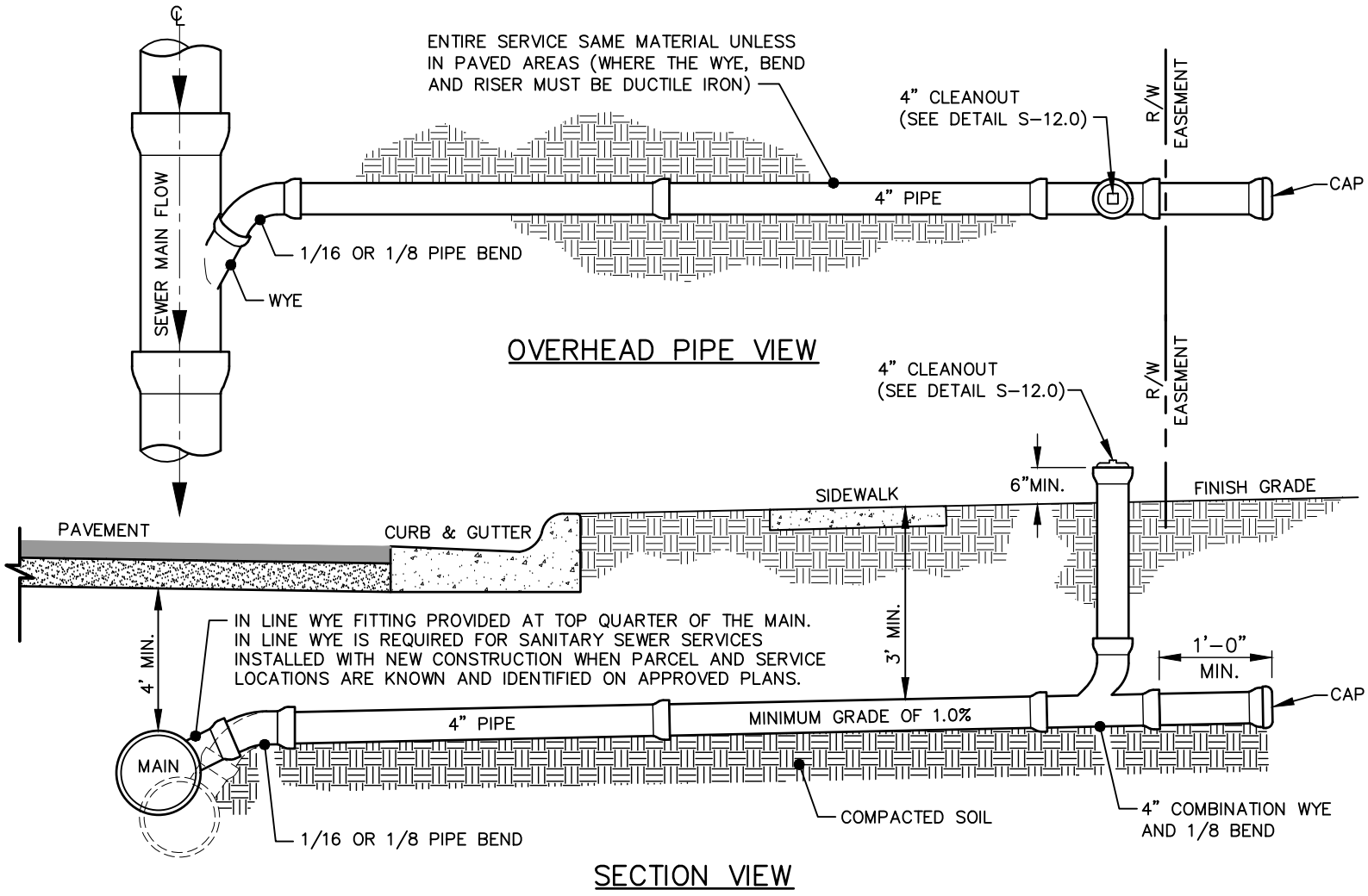
CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

MANHOLE STEPS

SCALE: N.T.S.

DETAIL No.
S–10.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



NOTES:
1. CLEANOUT SHALL BE PLACED AT RIGHT-OF-WAY OR EDGE OF EASEMENT.
2. DO NOT INSTALL C.O. INSIDE A FENCE.
3. CONTRACTOR TO MARK EACH SEWER STUBOUT WITH A TREATED 4X4 POST PAINTED GREEN. THE POST SHALL BE A MINIMUM OF 4 FOOT HIGH. CONTRACTOR TO MAINTAIN POST UNTIL FINAL COMPLETION.
4. IN LINE WYE IS NOT TO BE INSTALLED VERTICAL UNLESS APPROVED BY THE DISTRICT.

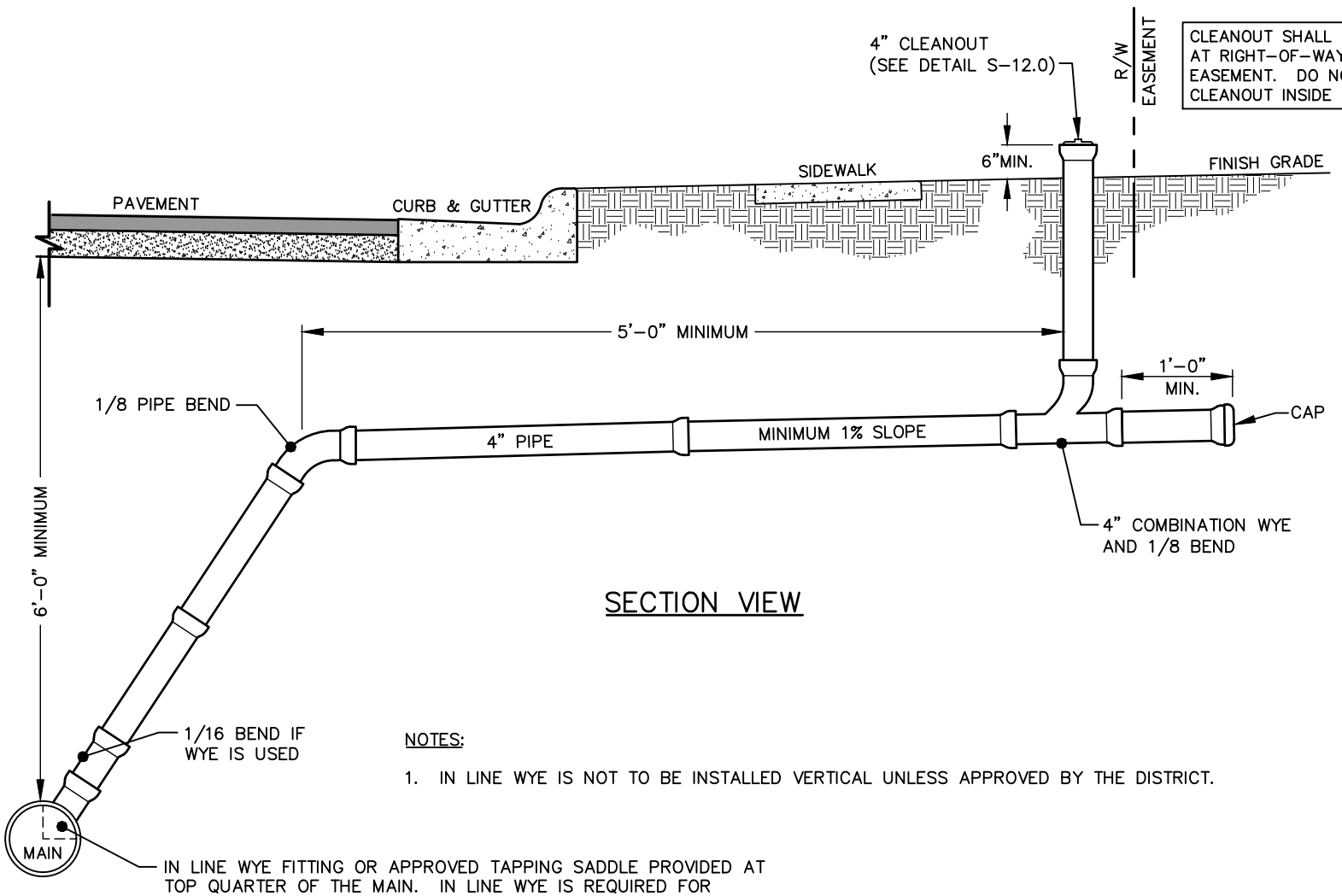
DETAIL No.
S-11.0

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

STANDARD 4 INCH SANITARY SEWER SERVICE

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



SECTION VIEW

NOTES:

1. IN LINE WYE IS NOT TO BE INSTALLED VERTICAL UNLESS APPROVED BY THE DISTRICT.

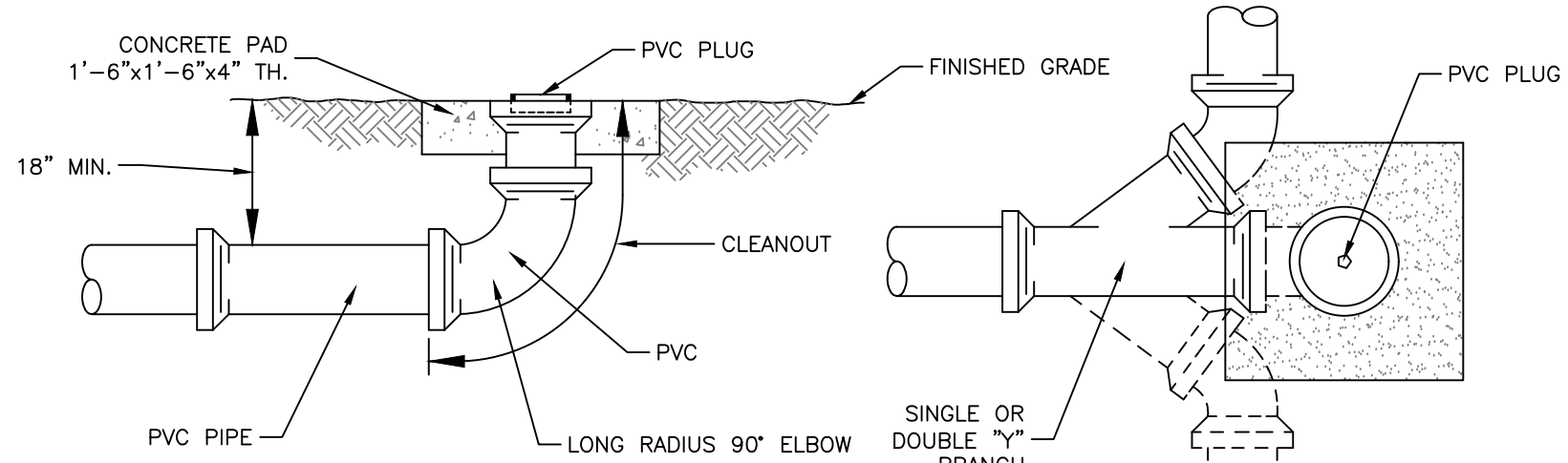
DETAIL No.
S-11.1

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

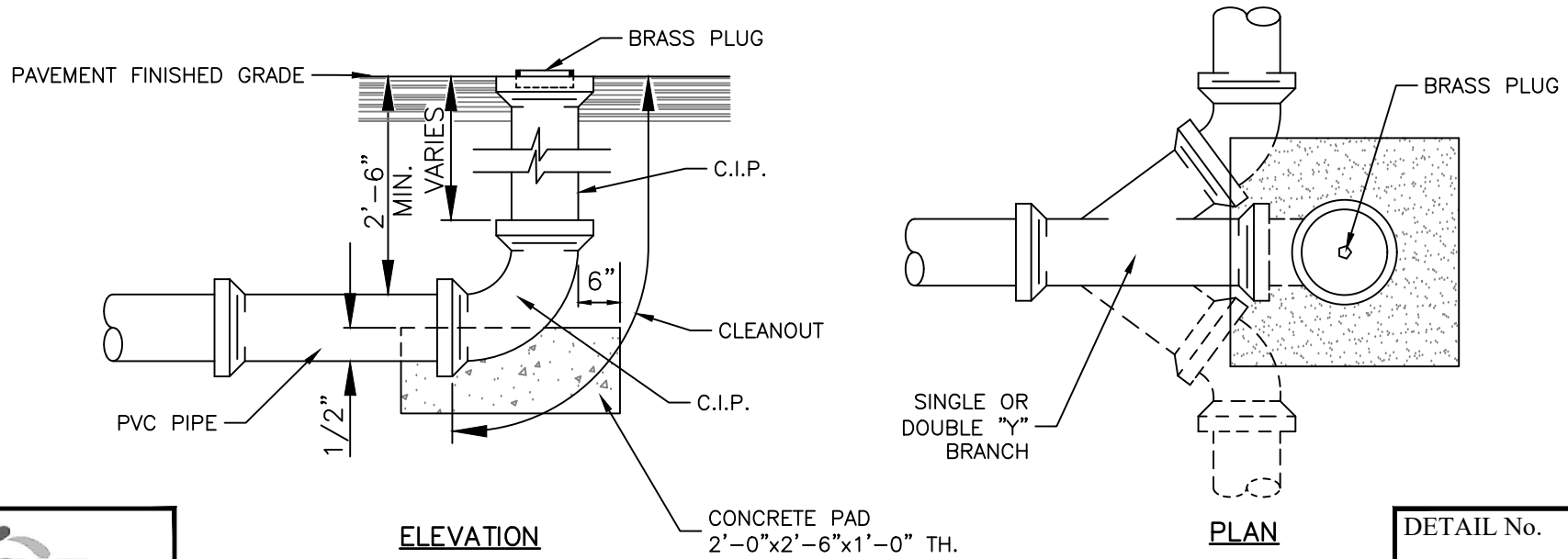
DEEP 4 INCH SANITARY SEWER SERVICE

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



CLEANOUT DETAIL IN EARTH AREA



CLEANOUT DETAIL IN PAVED AREA

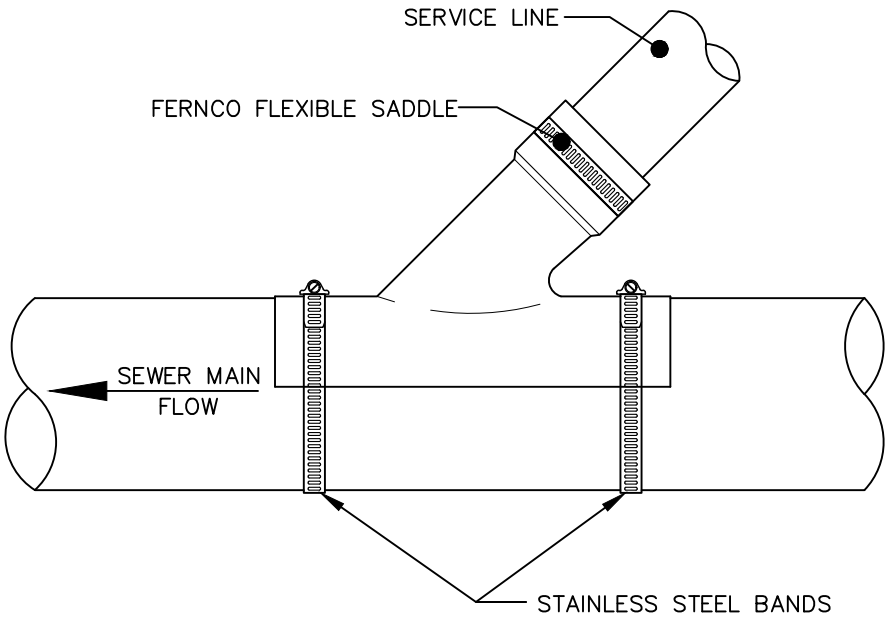
DETAIL No.
S-12.0

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

SERVICE LATERAL CLEANOUT

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



SEWER MAIN

NOTES:

1. IN–LINE WYE FITTING TO BE PROVIDED WITH NEW CONSTRUCTION.

2. CONTRACTOR TO MARK EACH SEWER STUBOUT WITH A TREATED 4x4 POST PAINTED GREEN. THE POST SHALL BE A MINIMUM OF 4 FOOT HIGH. CONTRACTOR TO MAINTAIN POST UNTIL FINAL COMPLETION.

CHESTER COUNTY
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3261 LANCASTER HWY
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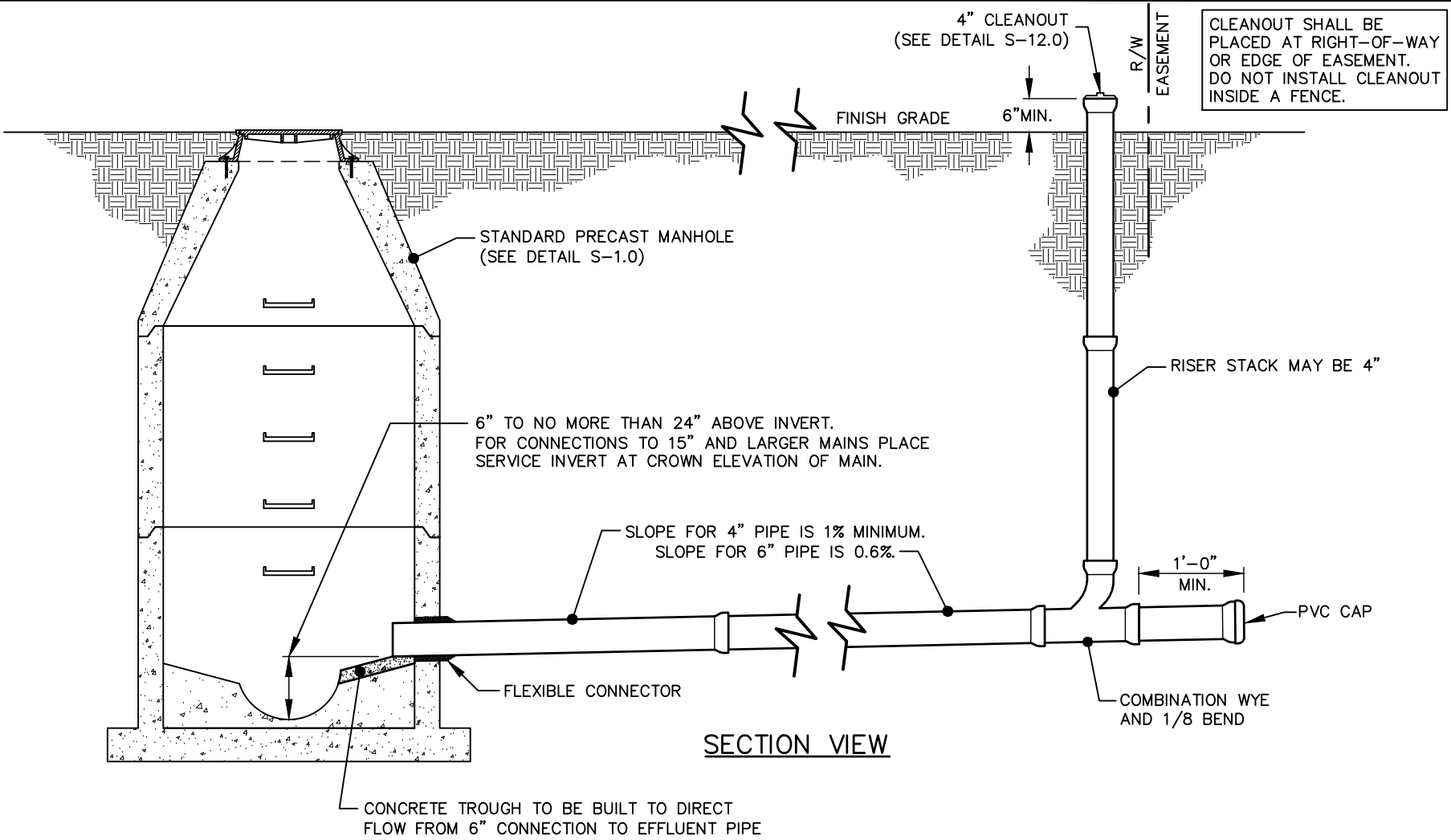
SANITARY SEWER LATERAL SADDLE CONNECTION TO EXISTING MAIN

SCALE: N.T.S.

DETAIL No.
S–13.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



NOTES:

1. INSTALLATION TO BE THE SAME AS FOR STANDARD 4 INCH SEWER SERVICE CONNECTION (SHEET S-15.0 & S-16.0).

CHESTER COUNTY
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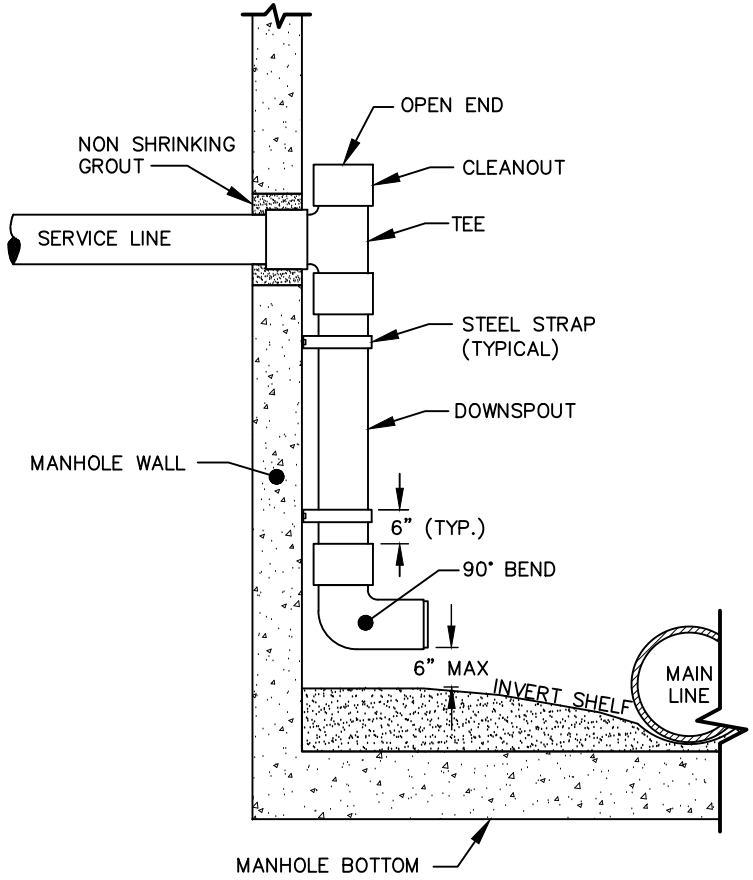
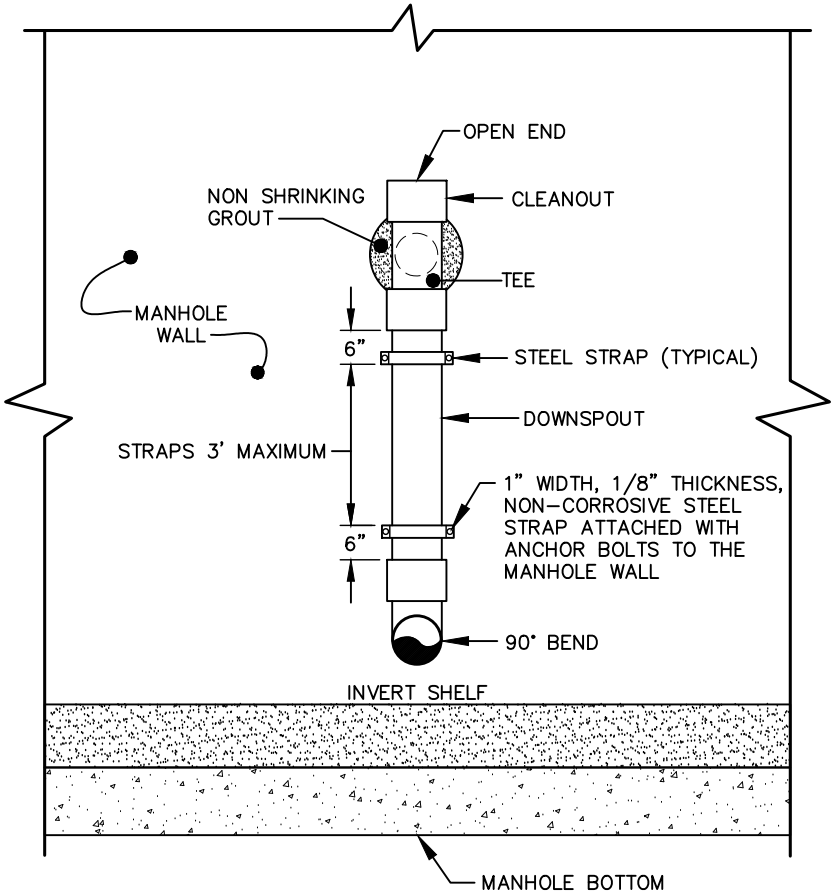
STANDARD SANITARY SEWER SERVICE MANHOLE TAP

SCALE: N.T.S.

DETAIL No.
S-14.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020





NOTES:

1. PIPING CONFIGURATION TO BE USED ON ALL DROPS OVER 12 INCHES.
2. DROPS TO BE CONSTRUCTED OF DUCTILE IRON OR SCH. 80 PVC PIPE.
3. SERVICE LINE MAY NOT ENTER MANHOLE THROUGH CONE SECTION OR ITS JOINT.
4. THIS DETAIL SHALL NOT BE USED FOR FORCE MAINS.

CHESTER COUNTY
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3261 LANCASTER HWY
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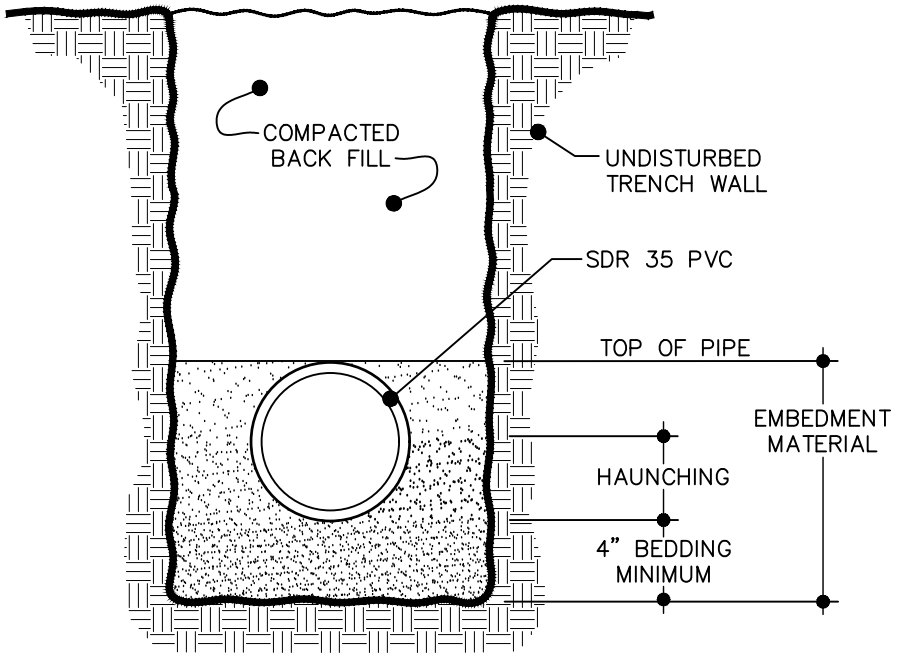
STANDARD INSIDE DROP FOR SANITARY SEWER SERVICE

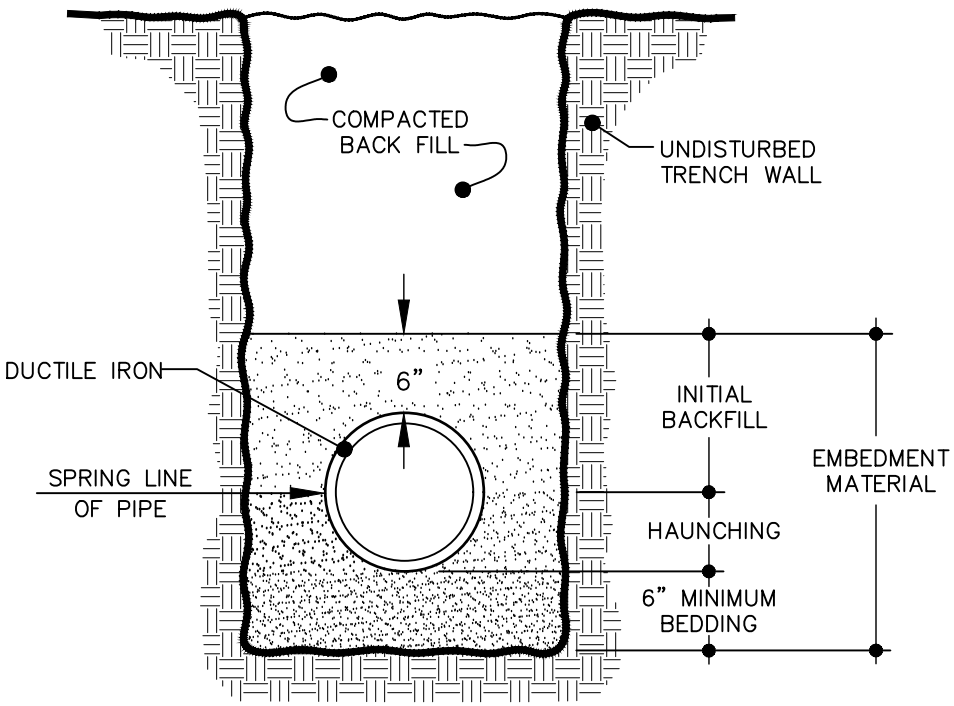
SCALE: N.T.S.

DETAIL No.
S-15.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



STANDARD BEDDING
FOR 3' TO 14' DEPTHS



SPECIAL BEDDING
FOR 14'–30' DEPTHS

NOTES:

1. EMBEDMENT MATERIAL MUST BE CLASS I (#67 WASHED STONE IS TYPICALLY USED).
2. EMBEDMENT MATERIAL SHALL BE COMPACTED TO A MINIMUM 95% STANDARD PROCTOR DENSITY FOR CLASS I MATERIAL.
3. STANDARD BEDDING SHALL BE UTILIZED FOR ALL CASES WHERE TRENCH BOTTOMS ARE UNSTABLE DUE TO SOIL TYPE OR MOISTURE CONDITIONS.
4. ALL SANITARY SEWER LINES LESS THAN 3 FEET AND OVER 14 FEET IN DEPTH MUST BE DUCTILE IRON PIPE.

DETAIL No.
S–16.0

CHESTER COUNTY
WASTEWATER RECOVERY
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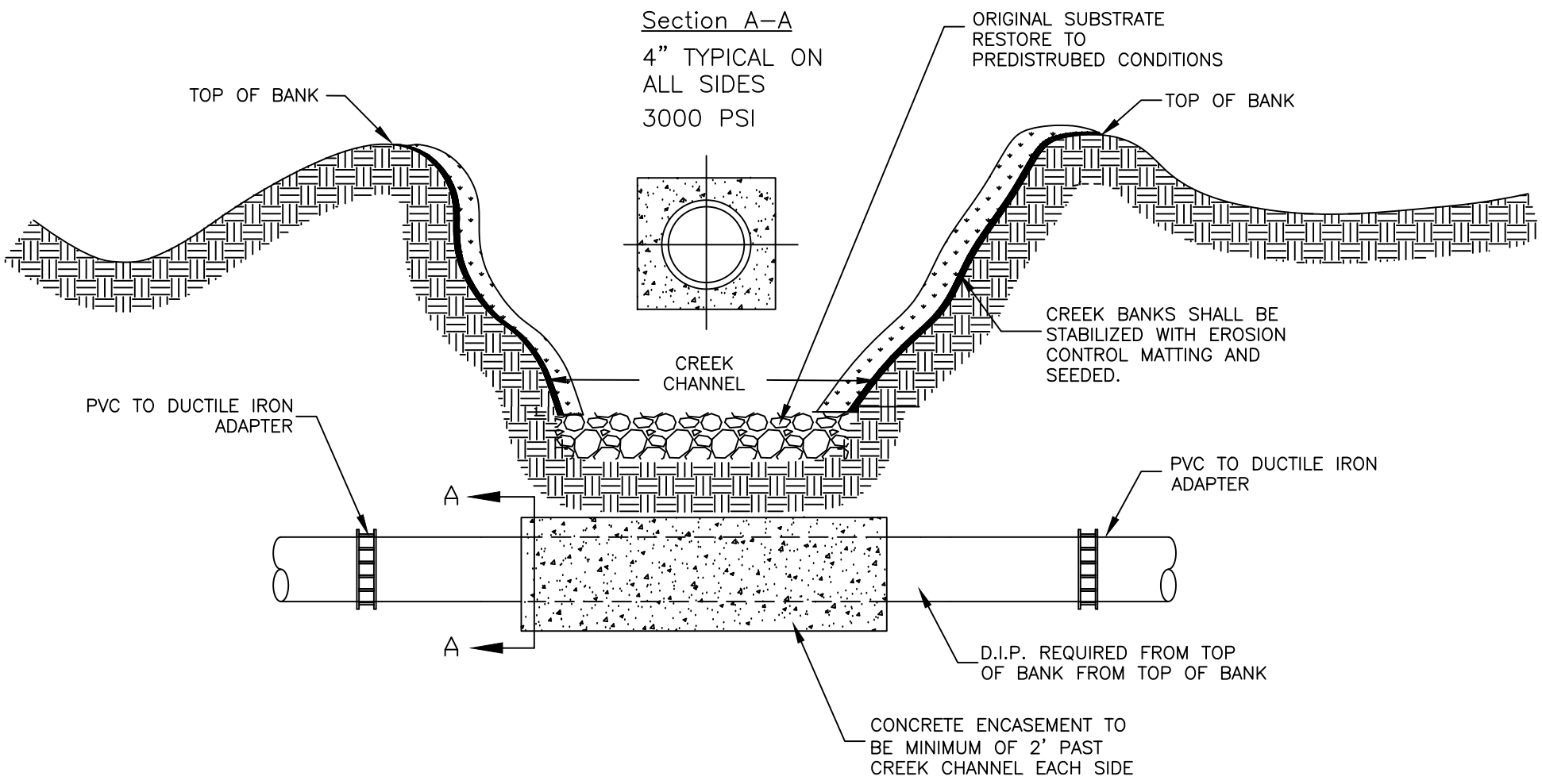
BEDDING FOR PVC SANITARY SEWER PIPE

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



NOTES:

1. RESTORE CREEK BANKS TO PRECONSTRUCTION CONTOURS.

CHESTER COUNTY
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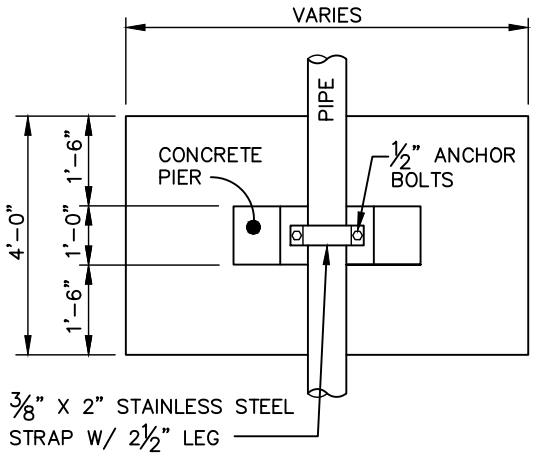
BELOW GRADE CREEK CROSSING

SCALE: N.T.S.

DETAIL No.
S–17.0

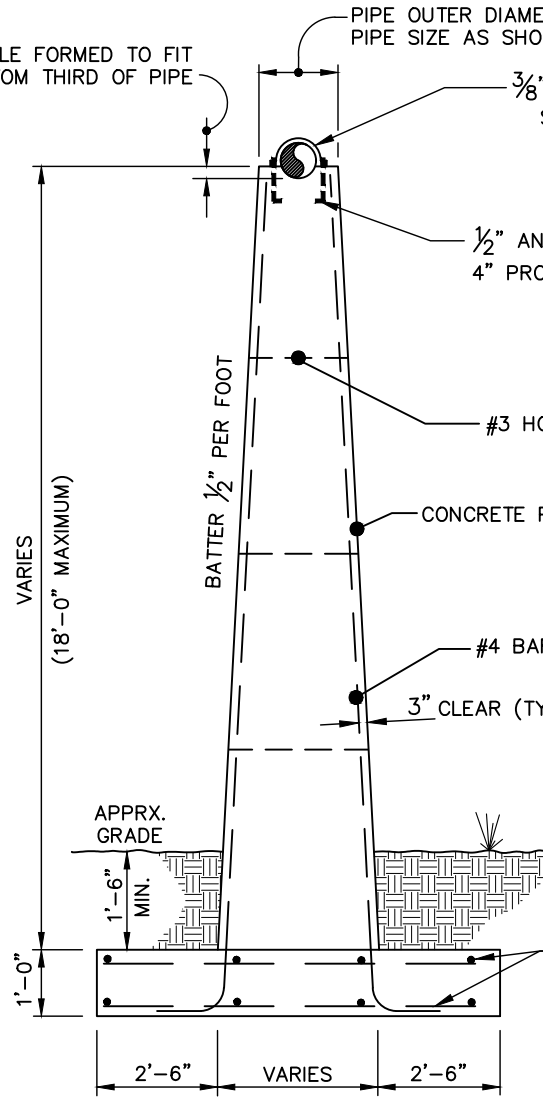
REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



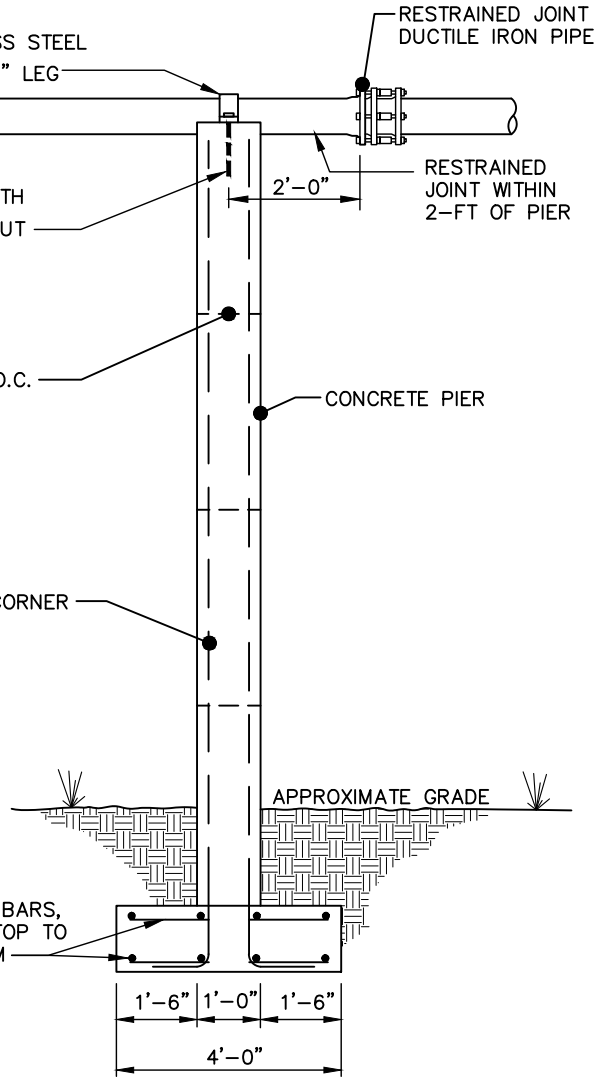
PLAN VIEW

NOTES:
1. REINFORCING STEEL SHALL BE GRADE 40.
2. CONCRETE SHALL BE 3,000 P.S.I. OR GREATER.

NOTES:
1. PIERS OVER 3 FEET IN HEIGHT TO BE REINFORCED.
2. BOTTOM OF PIPE MUST BE A MINIMUM OF 24 INCHES ABOVE NORMAL WATER LEVEL BUT NO LOWER THAN THE 25–YEAR FLOOD ELEVATION.
3. CAST–IN–PLACE CONCRETE SHALL BE FIELD TESTED.
4. AT A MINIMUM, ONE PIER MUST BE INSTALLED EVERY 20 FEET OR AS DIRECTED BY CHESTER COUNTY WASTEWATER RECOVERY..
5. FOOTING DESIGN SHALL BE CONFIRMED BY LICENSED S.C. PROFESSIONAL ENGINEER.
6. SUBSURFACE CONDITIONS SHALL BE CONFIRMED BY LICENSED S.C. GEOTECH ENGINEER TO VERIFY LOADING.
7. PRECAST PIERS REVIEWED ON CASE BY CASE BASIS.



END VIEW



SIDE VIEW

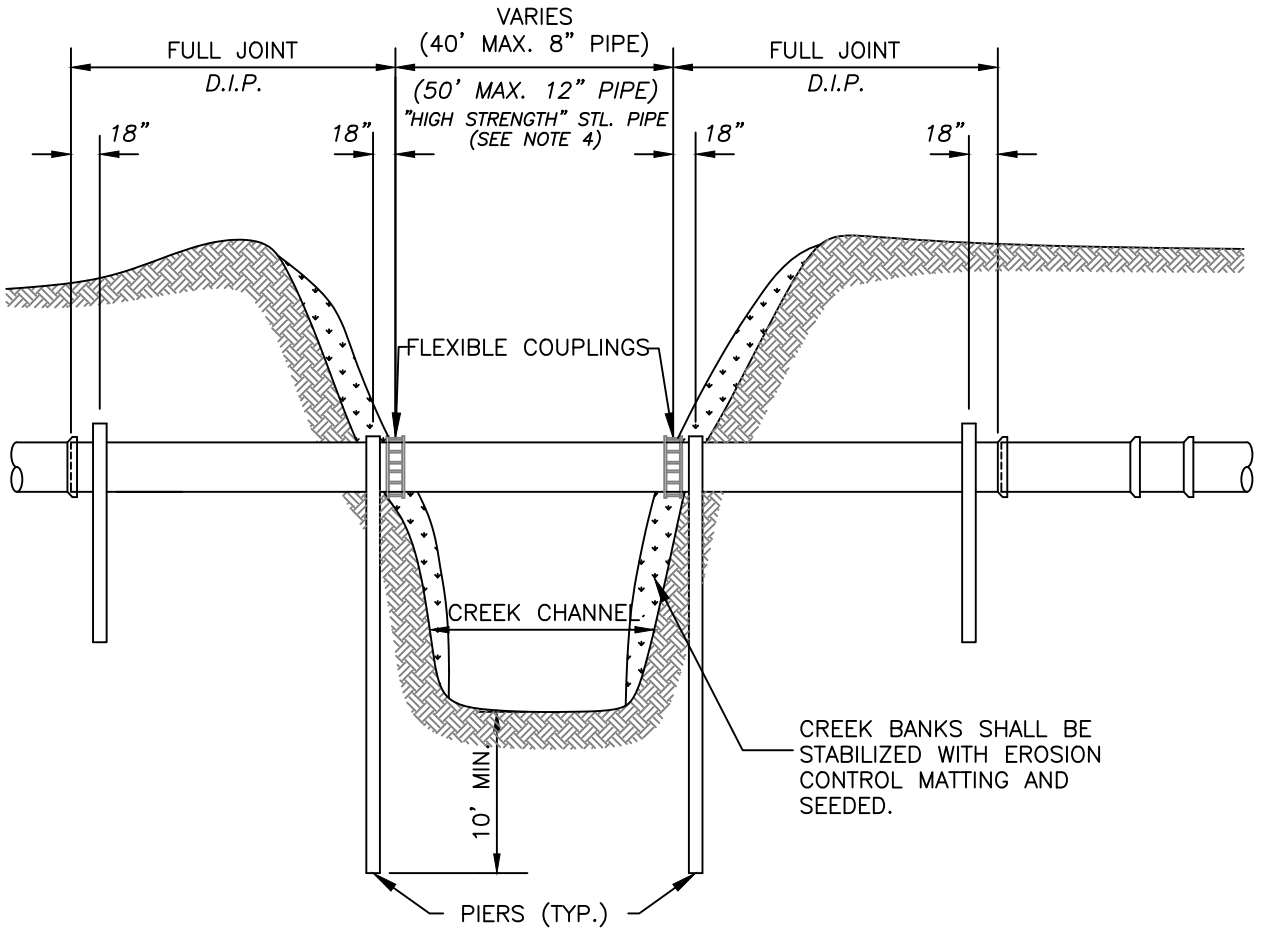
DETAIL No.
S–18.0

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

STANDARD AERIAL CROSSING

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



NOTES:

1. FLEXIBLE COUPLING SHALL BE LONG BODY TYPE.
2. MINIMUM DEPTHS SHALL BE IN UNDISTURBED SOIL.
3. MAXIMUM HEIGHT FROM PIPE TO UNDISTURBED SOIL IS TO BE 20 FEET.
4. STEEL PIPE MUST BE SEAMLESS OR STRAIGHT SEAM LONG SPAN STEEL PIPE, ASTM A-53 GRADE B CARBON STEEL WITH 4 MIL EPOXY COATING INSIDE AND OUTSIDE. SPIRAL WELD PIPE IS NOT PERMITTED.

DETAIL No.
S-19.0

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
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CREEK CROSSING AERIAL HIGH-STRENGTH STEEL COUPLINGS

SCALE: N.T.S.

REV.	DATE
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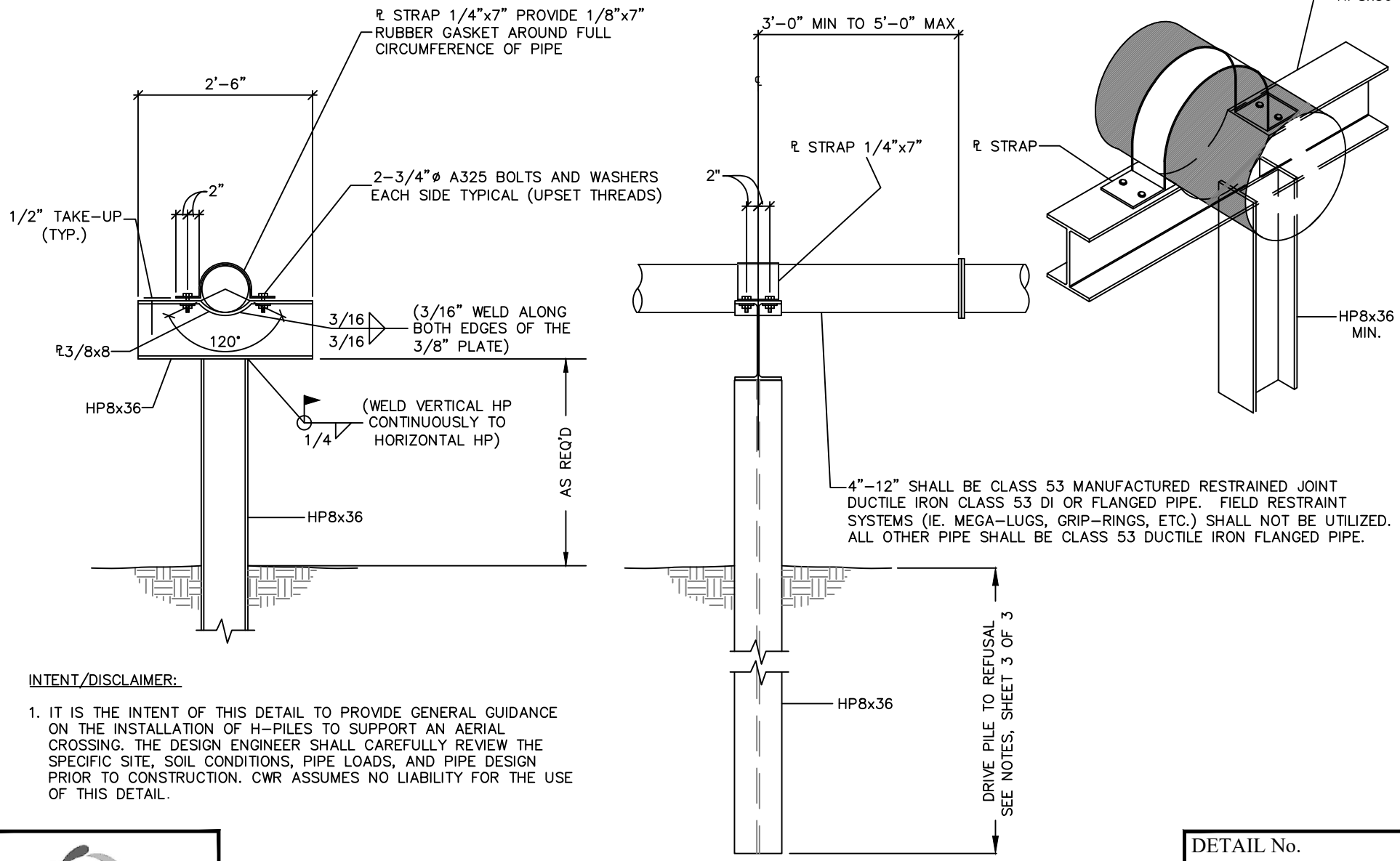
1	OCTOBER 2020



TYPICAL "H" PILE SUPPORT

INTENT/DISCLAIMER:

1. IT IS THE INTENT OF THIS DETAIL TO PROVIDE GENERAL GUIDANCE ON THE INSTALLATION OF H-PILES TO SUPPORT AN AERIAL CROSSING. THE DESIGN ENGINEER SHALL CAREFULLY REVIEW THE SPECIFIC SITE, SOIL CONDITIONS, PIPE LOADS, AND PIPE DESIGN PRIOR TO CONSTRUCTION. CWR ASSUMES NO LIABILITY FOR THE USE OF THIS DETAIL.

DETAIL No.
S-20.0

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
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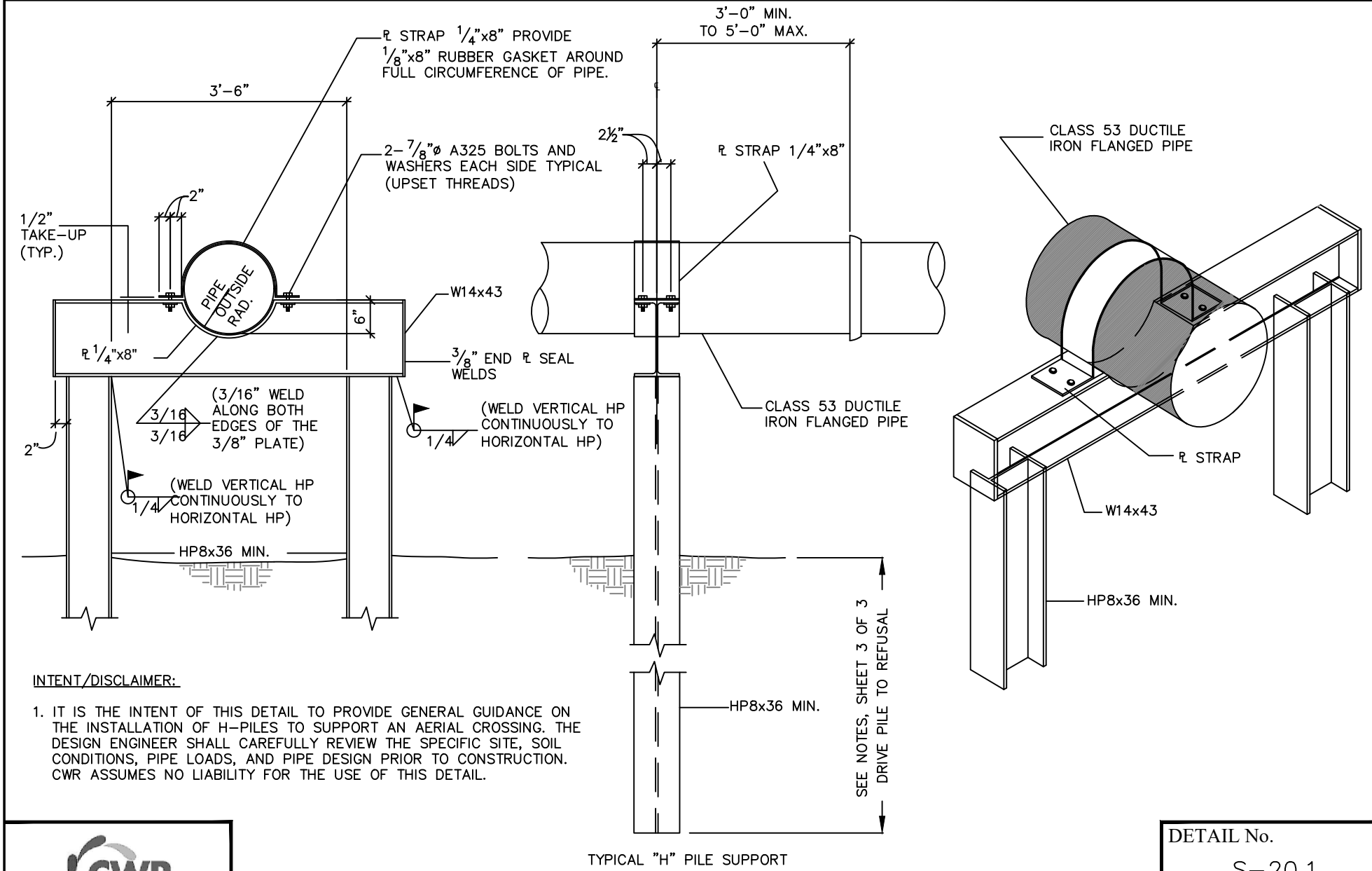
PHONE: (803) 377-3541

H-PILE DETAIL 4" THRU 16" PIPE FOR AERIAL CROSSINGS

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



TYPICAL "H" PILE SUPPORT

INTENT/DISCLAIMER:

1. IT IS THE INTENT OF THIS DETAIL TO PROVIDE GENERAL GUIDANCE ON THE INSTALLATION OF H-PILES TO SUPPORT AN AERIAL CROSSING. THE DESIGN ENGINEER SHALL CAREFULLY REVIEW THE SPECIFIC SITE, SOIL CONDITIONS, PIPE LOADS, AND PIPE DESIGN PRIOR TO CONSTRUCTION. CWR ASSUMES NO LIABILITY FOR THE USE OF THIS DETAIL.

CHESTER COUNTY
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H-PILE DETAIL> 16" THRU 24" PIPE FOR AERIAL CROSSINGS

SCALE: N.T.S.

DETAIL No.
S-20.1

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020

NOTES:

1. STEEL H–PILES SHALL CONFORM TO THE REQUIREMENTS OF ASTM A992 GRADE 50.
2. A SUBSURFACE GEO–TECHNICAL REPORT IS REQUIRED TO DETERMINE PILE EMBEDMENT LENGTH.
3. THIS DETAIL IS FOR GUIDANCE/INFORMATION ONLY. THE DESIGN ENGINEER SHALL BE RESPONSIBLE FOR PROVIDING A PROJECT SPECIFIC DESIGN.
4. FOR ALL AERIAL CROSSINGS, A PROJECT SPECIFIC DESIGN SHALL BE SUBMITTED TO CWR FOR REVIEW AND APPROVAL.
5. A SUBSURFACE GEO–TECHNICAL EVALUATION IS REQUIRED IN ORDER TO DESIGN THE PILE LENGTH, EMBEDMENT, AND SPACING FOR THE SPECIFIC PROJECT LOCATION. THE DESIGN ENGINEER SHALL PROVIDE A COPY OF THE REPORT AND THE DESIGN TO CWR.
6. THE DESIGN ENGINEER SHALL FURNISH A STRUCTURAL DESIGN BASED UPON ACTUAL FIELD CONDITIONS AND THE INTENDED USE OF THE STRUCTURE. LATERAL LOADS MAY REQUIRE THE ADDITION OF A BATTERED PILE. THE DESIGN ENGINEER SHALL CONSIDER SUCH LOADS AS ICE/SNOW, FLOODING, ETC.
7. FOR AERIAL SUPPORT OF PRESSURE MAINS, THE ENGINEER SHALL ENSURE THAT THE PIPE JOINTS CAN PROVIDE THE NECESSARY THRUST RESTRAINT. CALCULATIONS SHALL BE SUBMITTED TO CWR FOR REVIEW, PRIOR TO CONSTRUCTION.
8. LOCATION AND SPACING OF PILES SHALL BE BASED UPON ACTUAL FIELD CONDITIONS AND AS SPECIFIED BY THE DESIGN ENGINEER. EACH PIPE JOINT SHALL BE SUPPORTED BY A PILE, UNLESS OTHERWISE APPROVED BY CWR.
9. ANY CHANGES TO THIS DETAIL SHALL BE REVIEWED AND APPROVED BY CWR PRIOR TO CONSTRUCTION.
10. ANY REVISIONS TO THIS DETAIL SHALL BE SIGNED AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER AND SUBMITTED TO CWR FOR REVIEW.
11. PILES SHOULD NOT BE PLACED IN THE CENTERLINE OF THE STREAM.
12. PILES SHALL BE DRIVEN UTILIZING A VIBRATORY HAMMER OR PILE HAMMER.
13. ALL PILES SHALL BE DRIVEN TO REFUSAL. THE DESIGN ENGINEER SHALL PROVIDE CWR WITH CALCULATIONS AND/OR A REPORT THAT CLEARLY DEFINES WHAT CONSTITUTES REFUSAL. SHOULD THE CONTRACTOR UTILIZE A DIFFERENT DRIVING METHOD THAN SPECIFIED, THEN REVISED CALCULATIONS SHALL BE PROVIDED TO CWR.
14. PILES SHALL BE CUT OFF SQUARE AT THE REQUIRED ELEVATIONS WITH METHOD OF CUT APPROVED BY THE DESIGN ENGINEER.
15. EXPANSION JOINTS SHALL BE PROVIDED AS REQUIRED. THE EXPANSION JOINTS SHALL BE SUPPORTED BY PLACEMENT OF PIERS WITHIN 3 FEET ON BOTH SIDES OF THE JOINT OR AS SPECIFIED IN THE DESIGN.
16. ALL PILE LOCATIONS SHALL BE STAKED IN THE FIELD.
17. ALL WELDS SHALL BE BY A CERTIFIED WELDER.
18. ALL STEEL MEMBERS AND STRAPS WILL BE POWER TOOL CLEANED TO A MIN. OF SSPC–SP3 AND HOT–DIP GALVANIZED PER ASTM A123. BOLTS AND WASHERS WILL BE HOT–DIP GALVANIZED PER ASTM A153. ALL WELDS WILL BE GRINDED AND COATED WITH 2 COATS OF A COLD APPLIED GALVANIZING PAINT.
19. ALL DI PIPE IN SANITARY SEWER SERVICE SHALL BE PROTECTO 401 LINED.

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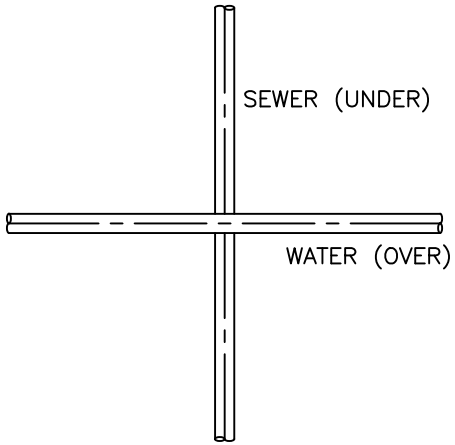
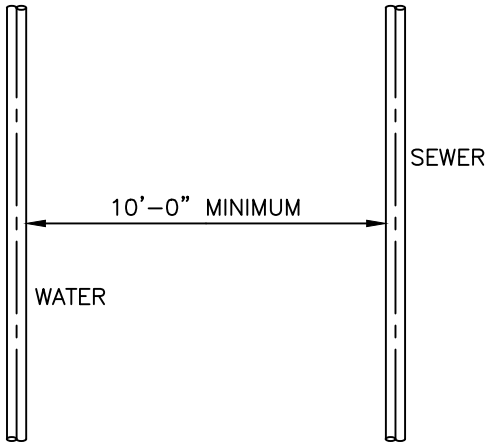
H-PILE DETAIL NOTES

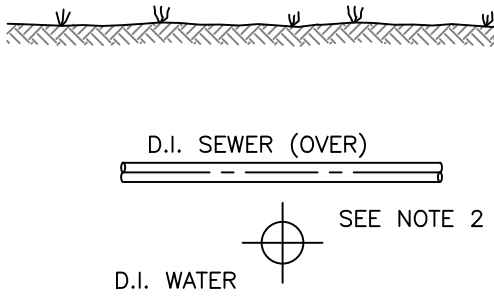
SCALE: N.T.S.

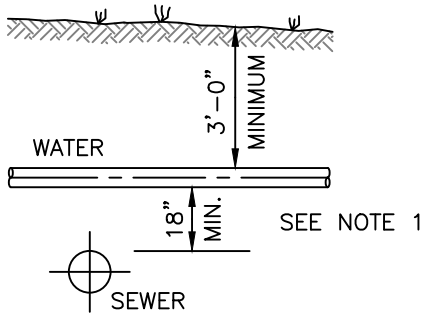
DETAIL No.
S–20.2

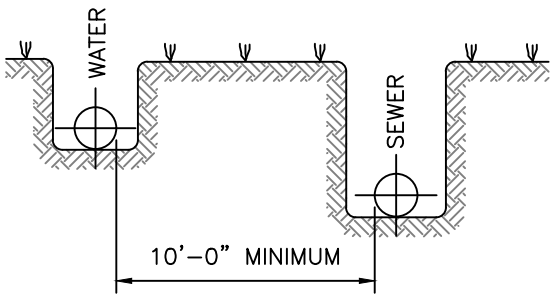
REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020

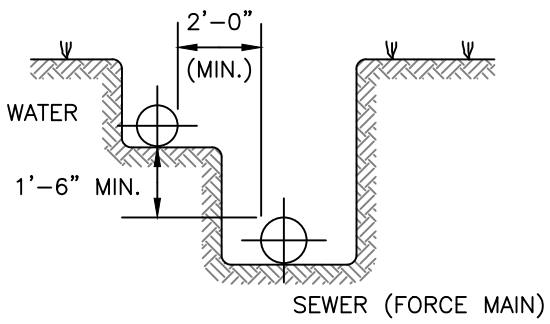












NOTES:

1. WHEN WATER MAIN IS ABOVE SEWER , BUT LESS THAN 18" CLEAR , WATER & SEWER MAINS SHALL BE CONSTRUCTED OF DUCTILE IRON PIPE WITH MECHANICAL JOINTS FOR A LATERAL DISTANCE MEASURED AT RIGHT ANGLES TO THE SEWER OF AT LEAST 10 FEET ON EACH SIDE OF SEWER.

2. WHERE WATER IS LAID UNDER SEWER , BOTH WATER AND SEWER PIPE SHALL BE CONSTRUCTED OF DUCTILE IRON PIPE WITH MECHANICAL JOINT FOR A LATERAL DISTANCE MEASURED AT RIGHT ANGLES TO THE SEWER OF AT LEAST 10 FEET ON EACH SIDE OF SEWER.

DETAIL No.
S–21.0

CHESTER COUNTY
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PIPE SEPARATION REQUIREMENTS

SCALE: N.T.S.

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2	OCTOBER 2021
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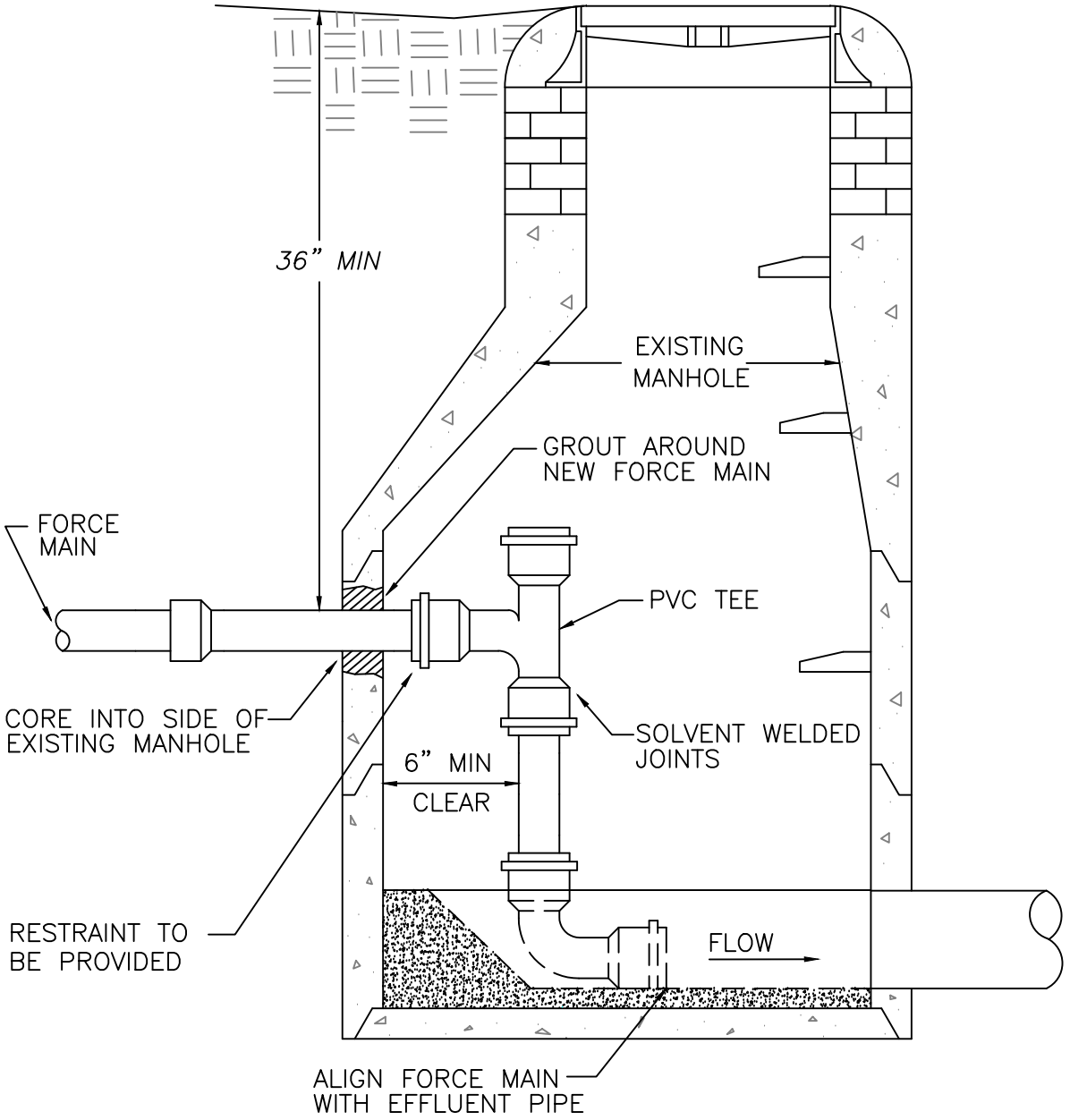

DETAIL No.
S-22.0

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
RICHBURG SC 29729
PHONE: (803) 377-3541

FORCE MAIN DISCHARGE MANHOLE
1.5" THRU 6" PIPES

SCALE: N.T.S.

REV.	DATE
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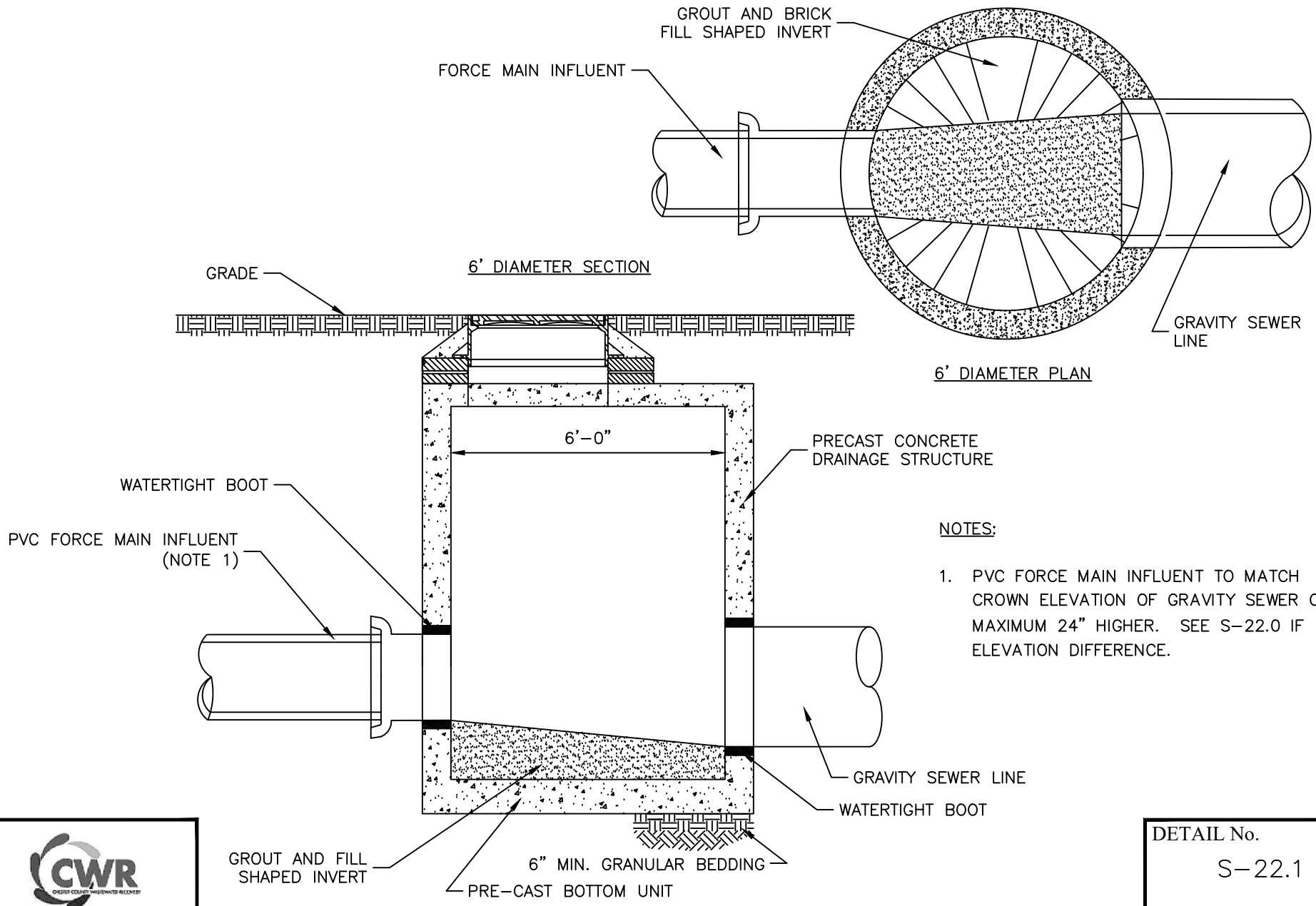
1	OCTOBER 2020



NOTES:

1. PVC FORCE MAIN INFLUENT TO MATCH CROWN ELEVATION OF GRAVITY SEWER OR MAXIMUM 24" HIGHER. SEE S-22.0 IF ELEVATION DIFFERENCE.

DETAIL No.
S-22.1

CHESTER COUNTY
WASTEWATER RECOVERY
3261 LANCASTER HWY
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PHONE: (803) 377-3541

LARGE FORCE MAIN DISCHARGE MANHOLE 8" AND GREATER

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
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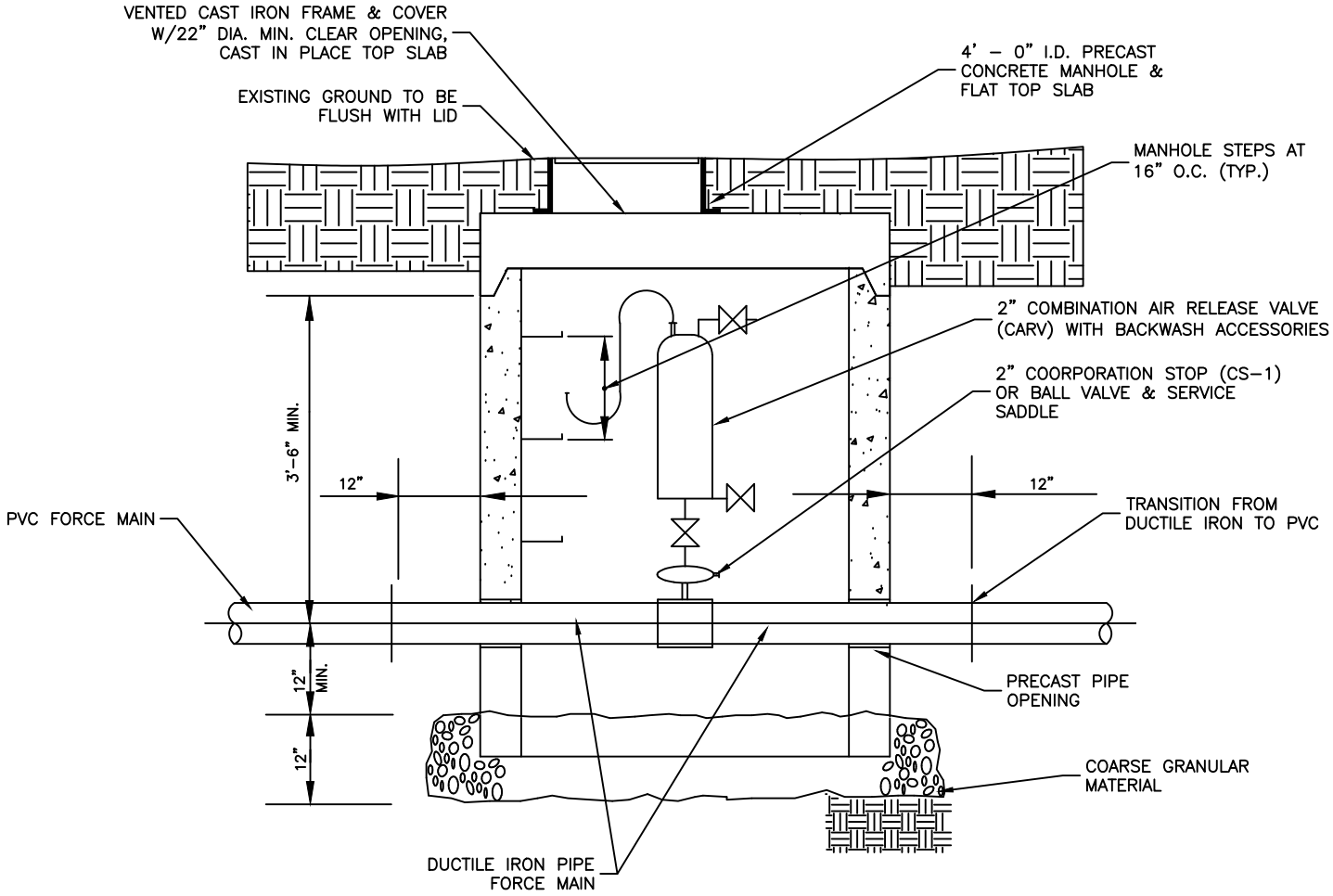

NOTES:

1. ALL PIPING, VALVES, SURFACES, ETC. SHALL BE COATED PER SECTION 099600 OF THE SPECIFICATIONS.

DETAIL No.
S–23.0

CHESTER COUNTY
WASTEWATER RECOVERY
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STANDARD COMBINATION AIR VALVE MANHOLE (FOR FORCE MAINS)

SCALE: N.T.S.

REV.	DATE
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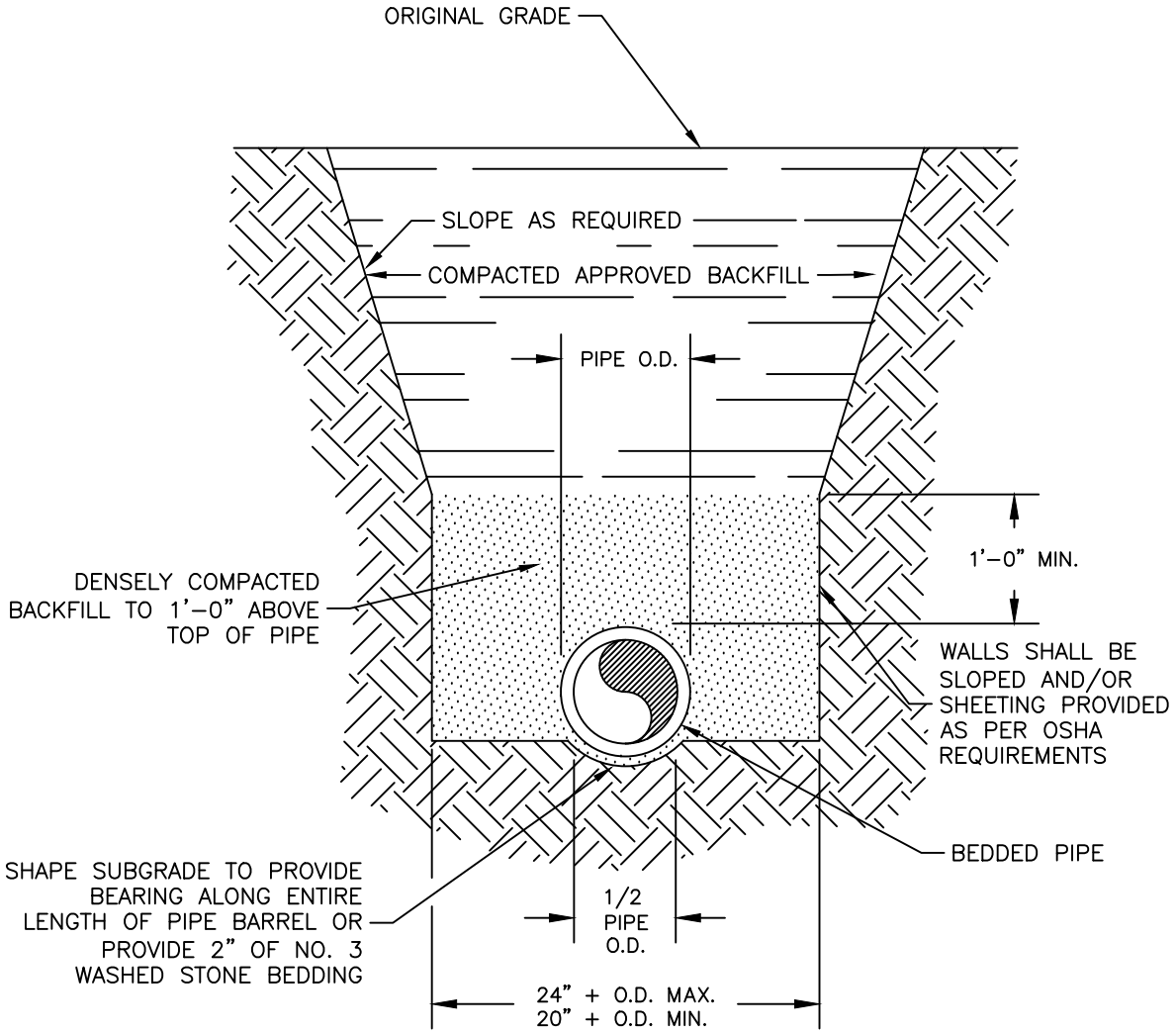

NOTES:

1. 6" OF NO. 3 WASHED STONE BEDDING REQUIRED WHEN IN ROCK FOR PVC PIPE OR 4" FOR D.I.P.

DETAIL No.
S–24.0

CHESTER COUNTY
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TRENCH/BEDDING FOR FORCE MAINS

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
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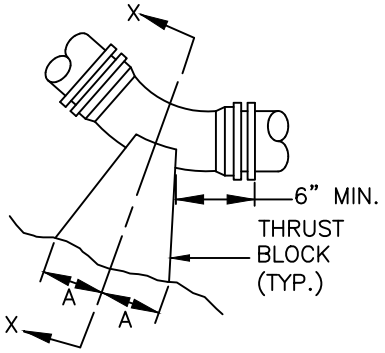
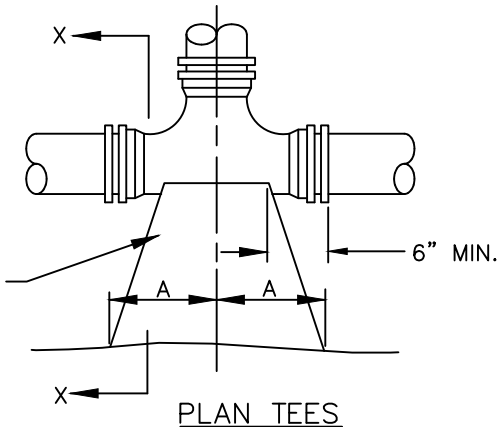
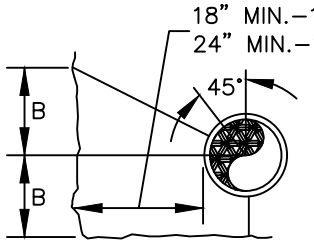


PLAN BENDS

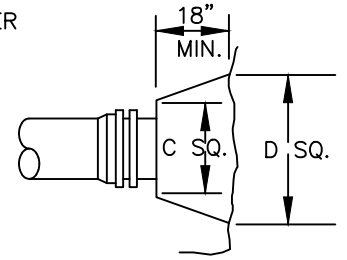


PLAN TEES

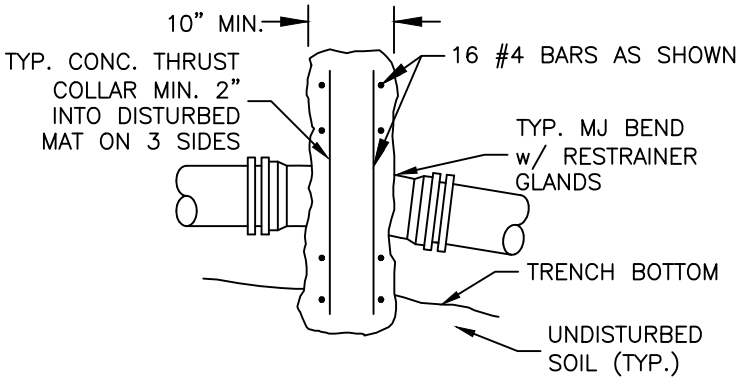


SECTION X–X

BENDS & TEES



PLAN & ELEV. PLUGS



SECTION – VERT. BEND

NOTES:

1. FOR VERT. BEND DOWN IN ECCESS OF 1 1/4" ANCHORAGE SHALL BE RECOMMENDED BY ENGINEER.
2. FOR VERT. BEND UPWARD, BLOCKING TO BE SIMILAR TO THAT FOR HORZ. BEND.
3. GLANDS & BOLTS SHALL BE PROTECTED FROM CONC. WHEN POURING THRUST BLOCKS.
4. ALL THRUST BLOCK & SUPPORT CONC. SHALL BE CLASS B.
5. RECOMMENDED BLOCKING ASSUMES DRY CLAY (4000 LBS/SF). GEOTECHNICAL CONSULTANT TO VERIFTY SOIL CONDITIONS PRIOR TO PLACEMENT OF BLOCKING.

THRUST BLOCK DETAILS

PIPE SIZE	90° BEND		45° BEND		22 1/2° BEND		11 1/4° BEND		TEE		PLUG	
	A	B	A	B	A	B	A	B	A	B	C	D
4"	8"	12"	8"	8"	6"	6"	6"	6"	8"	9"	10"	6"
6"	10"	12"	8"	10"	8"	8"	8"	8"	10"	10"	12"	18"
8"	15"	13"	10"	10"	8"	8"	8"	8"	10"	12"	12"	24"
10"	20"	16"	12"	14"	8"	12"	8"	12"	14"	16"	16"	30"
12"	20"	16"	12"	14"	8"	12"	8"	12"	14"	16"	16"	30"

CHESTER COUNTY
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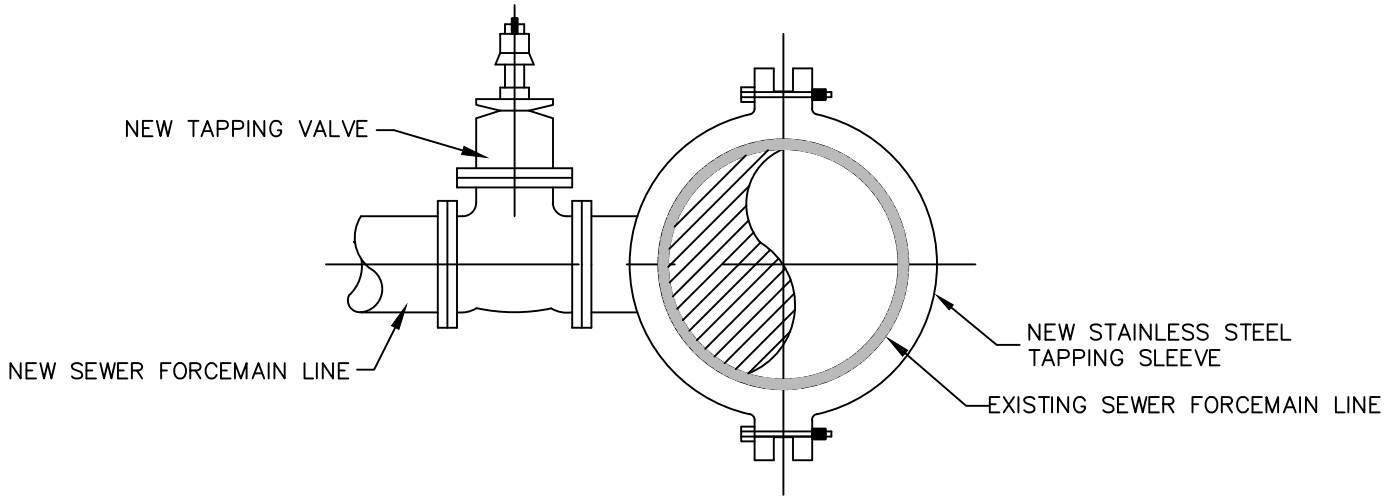
CONCRETE THRUST BLOCKING - BENDS, TEES, & INCLINE BLOCKING

SCALE: N.T.S.

DETAIL No.
S–25.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



ELEVATION
N.T.S.

NOTES:

1. BOLTS TO BE STAINLESS STEEL.
2. INSTALLATION TO INCLUDE TEST PLUG.
3. FLANGE MAY BE EPOXY COATED DI INSTEAD OF STAINLESS.

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TAPPING SLEEVE AND VALVE

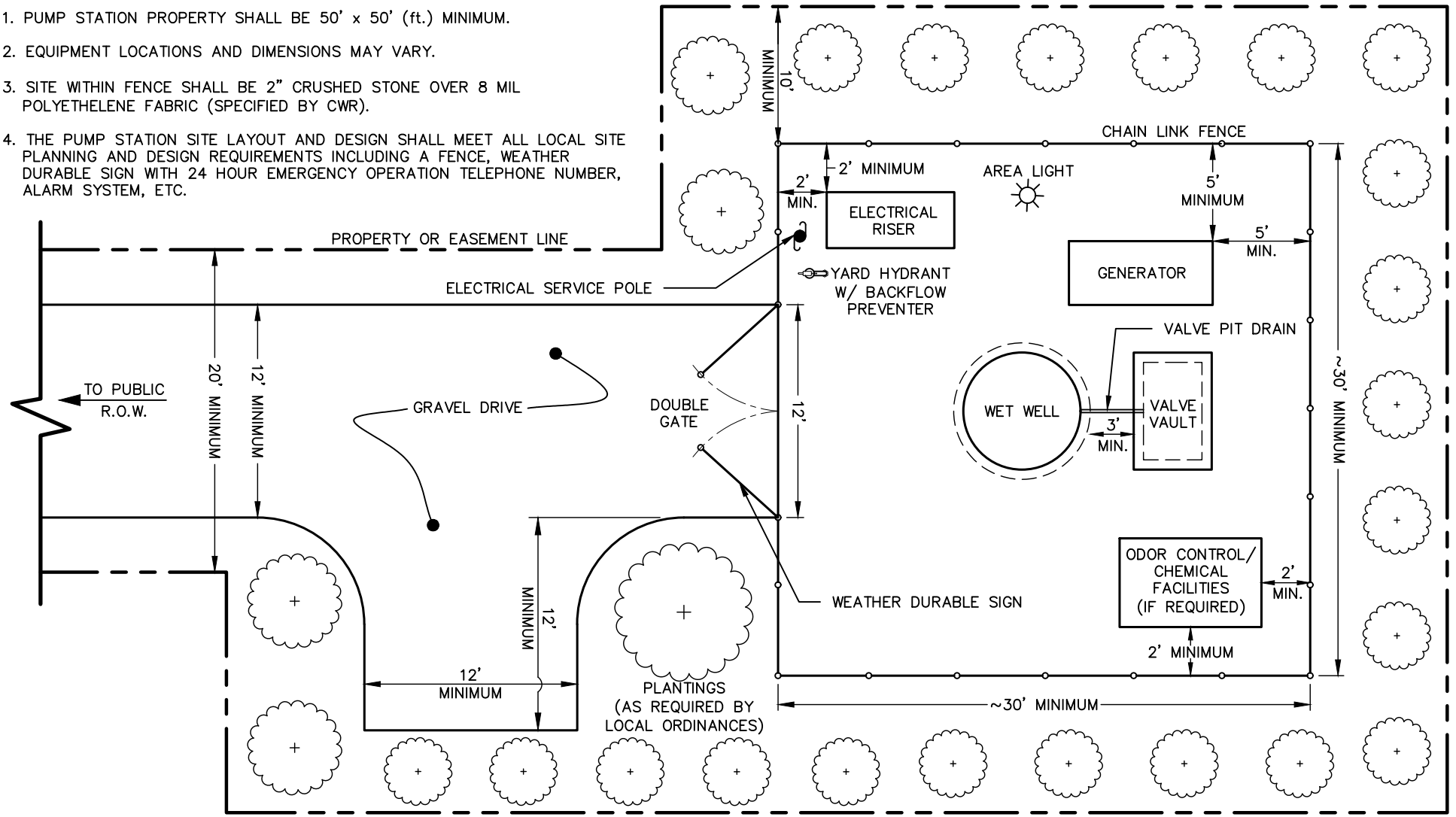
SCALE: N.T.S.

DETAIL No.
S-26.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020

NOTES:

1. PUMP STATION PROPERTY SHALL BE 50' x 50' (ft.) MINIMUM.
2. EQUIPMENT LOCATIONS AND DIMENSIONS MAY VARY.
3. SITE WITHIN FENCE SHALL BE 2" CRUSHED STONE OVER 8 MIL POLYETHELENE FABRIC (SPECIFIED BY CWR).
4. THE PUMP STATION SITE LAYOUT AND DESIGN SHALL MEET ALL LOCAL SITE PLANNING AND DESIGN REQUIREMENTS INCLUDING A FENCE, WEATHER DURABLE SIGN WITH 24 HOUR EMERGENCY OPERATION TELEPHONE NUMBER, ALARM SYSTEM, ETC.



DETAIL No.
S-27.0

CHESTER COUNTY
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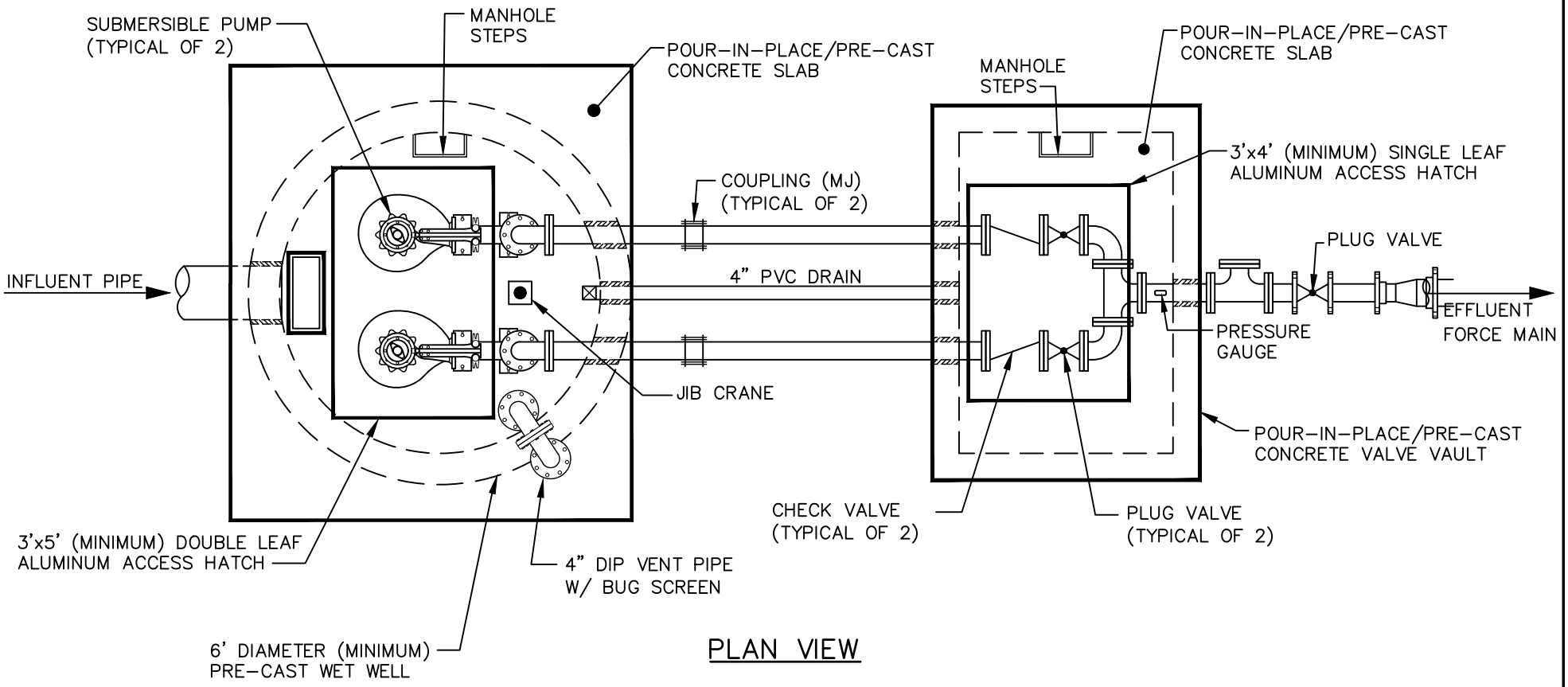
PUMP STATION SITE LAYOUT

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



PLAN VIEW

NOTES:

1. PUMP STATIONS SHALL MEET ALL STATE MINIMUM DESIGN REQUIREMENTS AND BE APPROVED BY THE CHESTER SEWER DISTRICT.
2. WET WELLS SHALL BE EPOXY COATED.
3. ALL PIPE AND VALVE SIZES DISPLAYED ARE MINIMUM SIZES, AND THE ACTUAL SIZES WILL BE DETERMINED BY THE HYDRAULIC DESIGN OF A PROFESSIONAL ENGINEER.

SEE SHEET S-29.0 FOR PROFILE VIEW

DETAIL No.
S-28.0

CHESTER COUNTY
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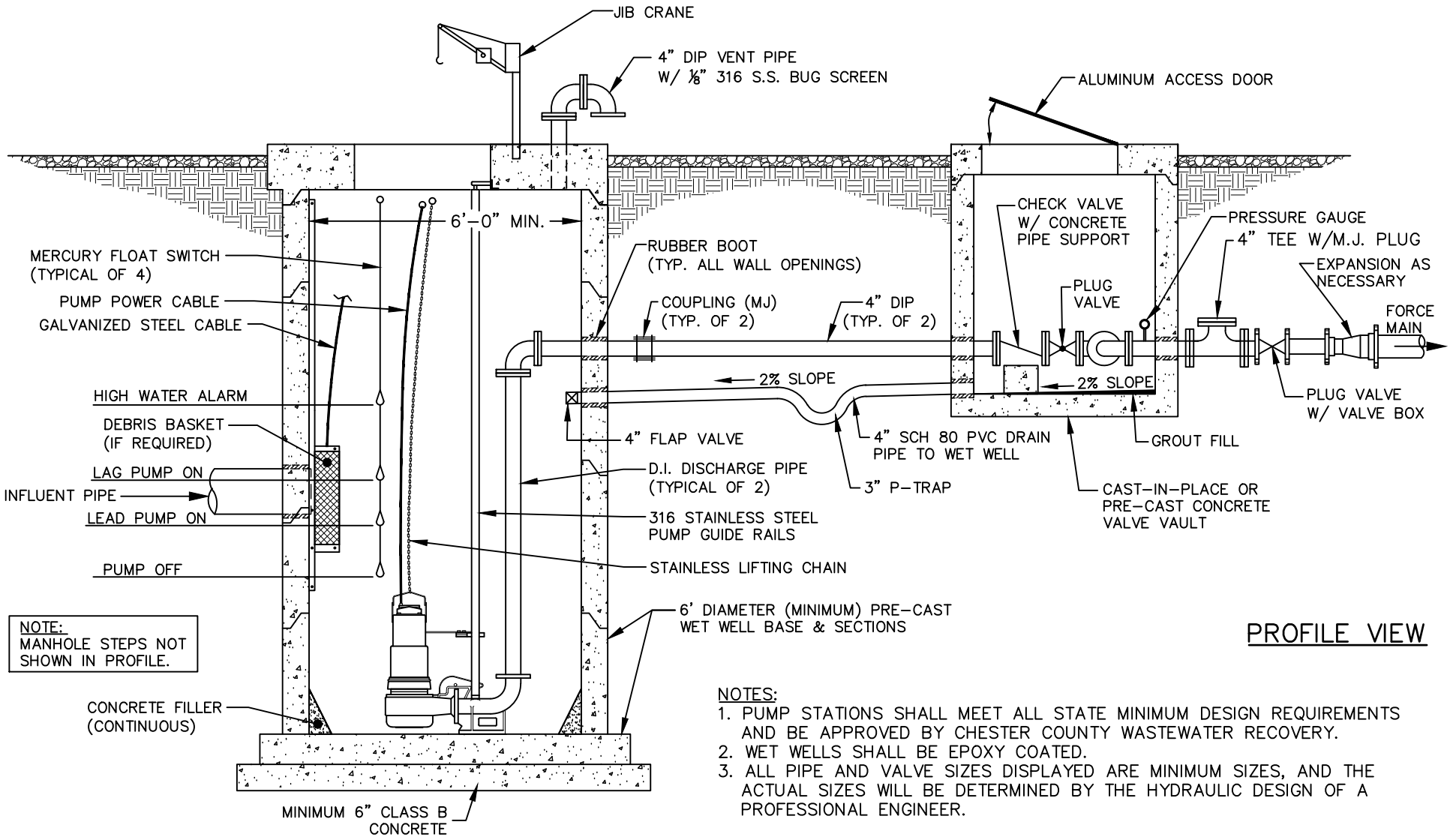
RICHBURG SC 29729
PHONE: (803) 377-3541

WET WELL AND VALVE VAULT PLAN

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



PROFILE VIEW

NOTES:
1. PUMP STATIONS SHALL MEET ALL STATE MINIMUM DESIGN REQUIREMENTS AND BE APPROVED BY CHESTER COUNTY WASTEWATER RECOVERY.
2. WET WELLS SHALL BE EPOXY COATED.
3. ALL PIPE AND VALVE SIZES DISPLAYED ARE MINIMUM SIZES, AND THE ACTUAL SIZES WILL BE DETERMINED BY THE HYDRAULIC DESIGN OF A PROFESSIONAL ENGINEER.

DETAIL No.
S-29.0

CHESTER COUNTY
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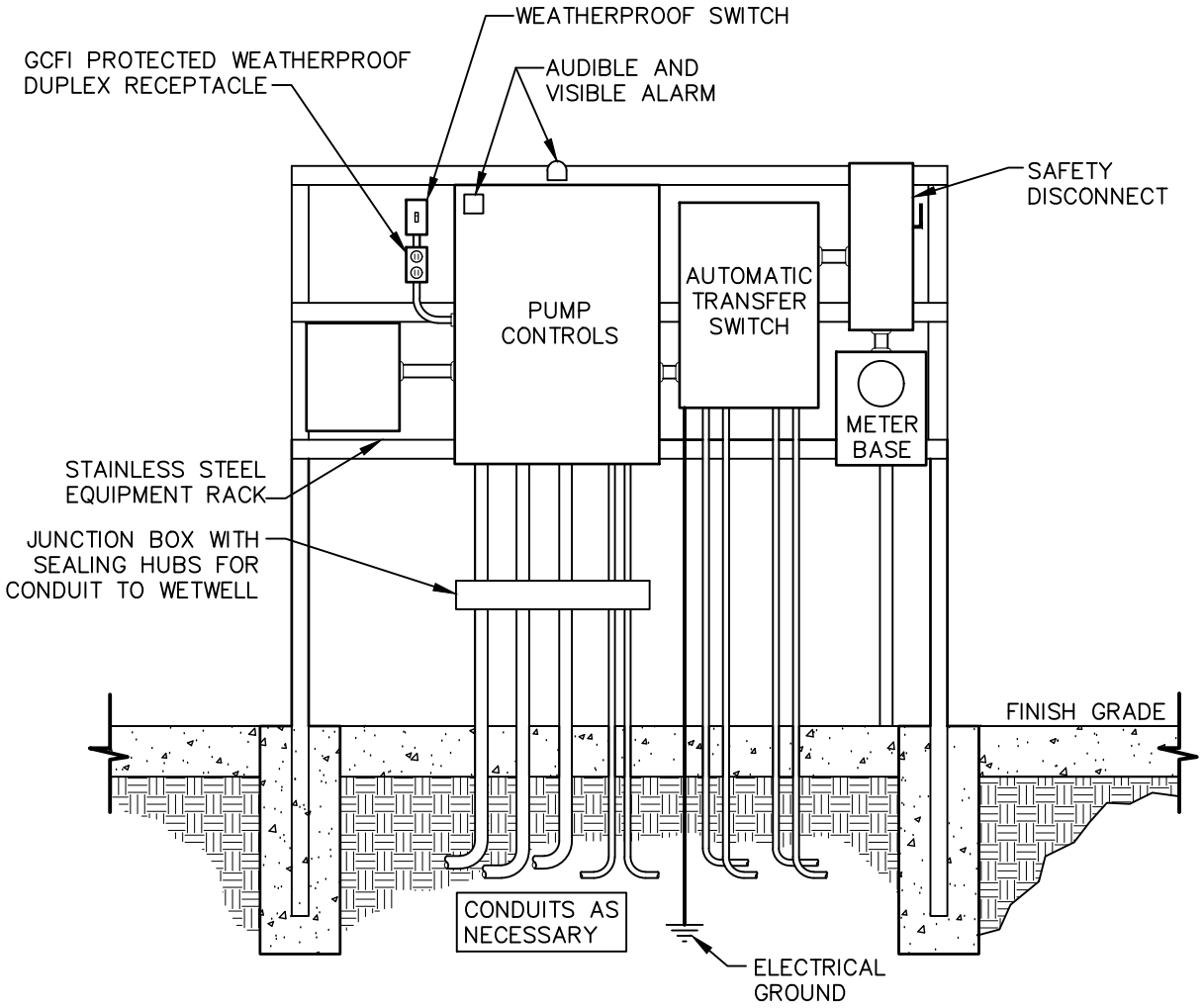
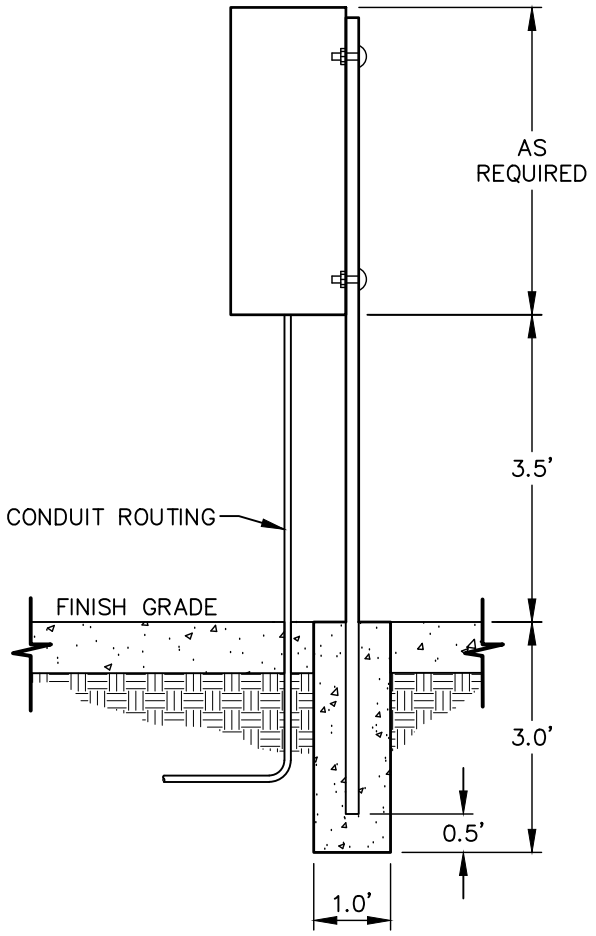
WET WELL AND VALVE VAULT ELEVATION

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020





NOTES:

1. ALL ELECTRICAL SYSTEMS SHALL MEET OR EXCEED **NEC** REQUIREMENTS.
2. CWR MAY REQUIRE INSTALLATION OF EQUIPMENT INSIDE OF A BUILDING. VERIFY REQUIREMENTS WITH CWR.
3. PROVIDE POLE MOUNTED SITE LIGHT ADJACENT TO CONTROL PANEL.

DETAIL No.
S-30.0

CHESTER COUNTY
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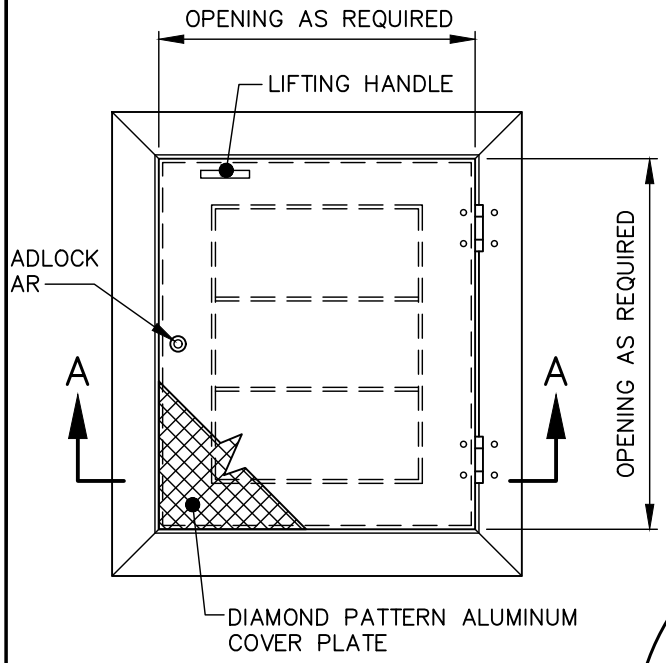
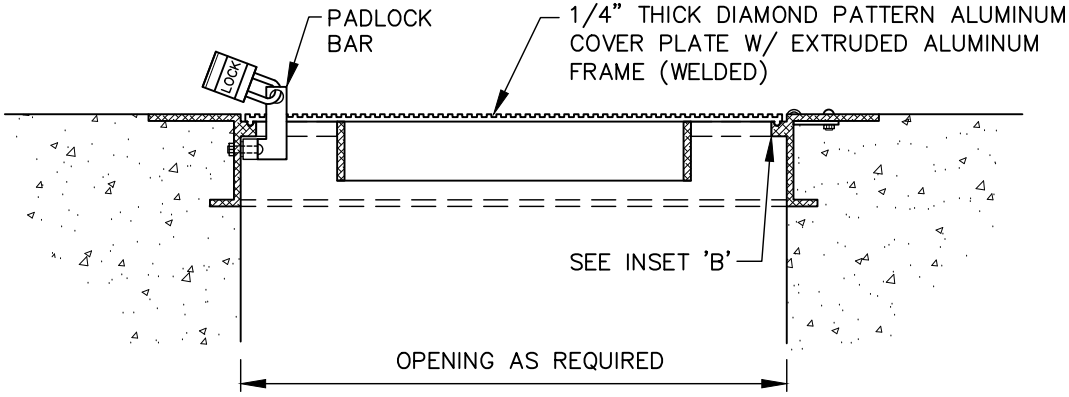
ELECTRICAL RISER

SCALE: N.T.S.

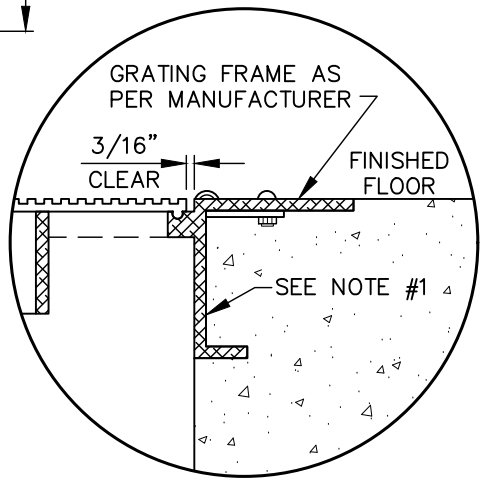
REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



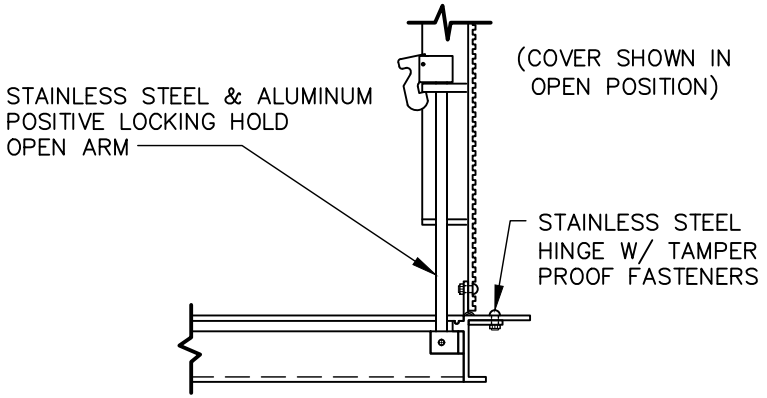
PLAN VIEW



SECTION "A–A"



INSET "B"



DETAIL

NOTES:

1. ALL ALUMINUM SURFACES IN CONTACT WITH CONCRETE OR GROUT SHALL BE COATED WITH BITUMINOUS MATERIAL FOR PROTECTION.
2. HATCHES SHALL BE SINGLE OR DOUBLE HATCH DEPENDING ON OPENING SIZE AND MANUFACTURER'S RECOMMENDATIONS.
3. CHESTER COUNTY WASTEWATER RECOVERY RESERVES THE RIGHT TO REQUIRE THE HATCH TO BE LOAD RATED.

DETAIL No.
S–31.0

CHESTER COUNTY
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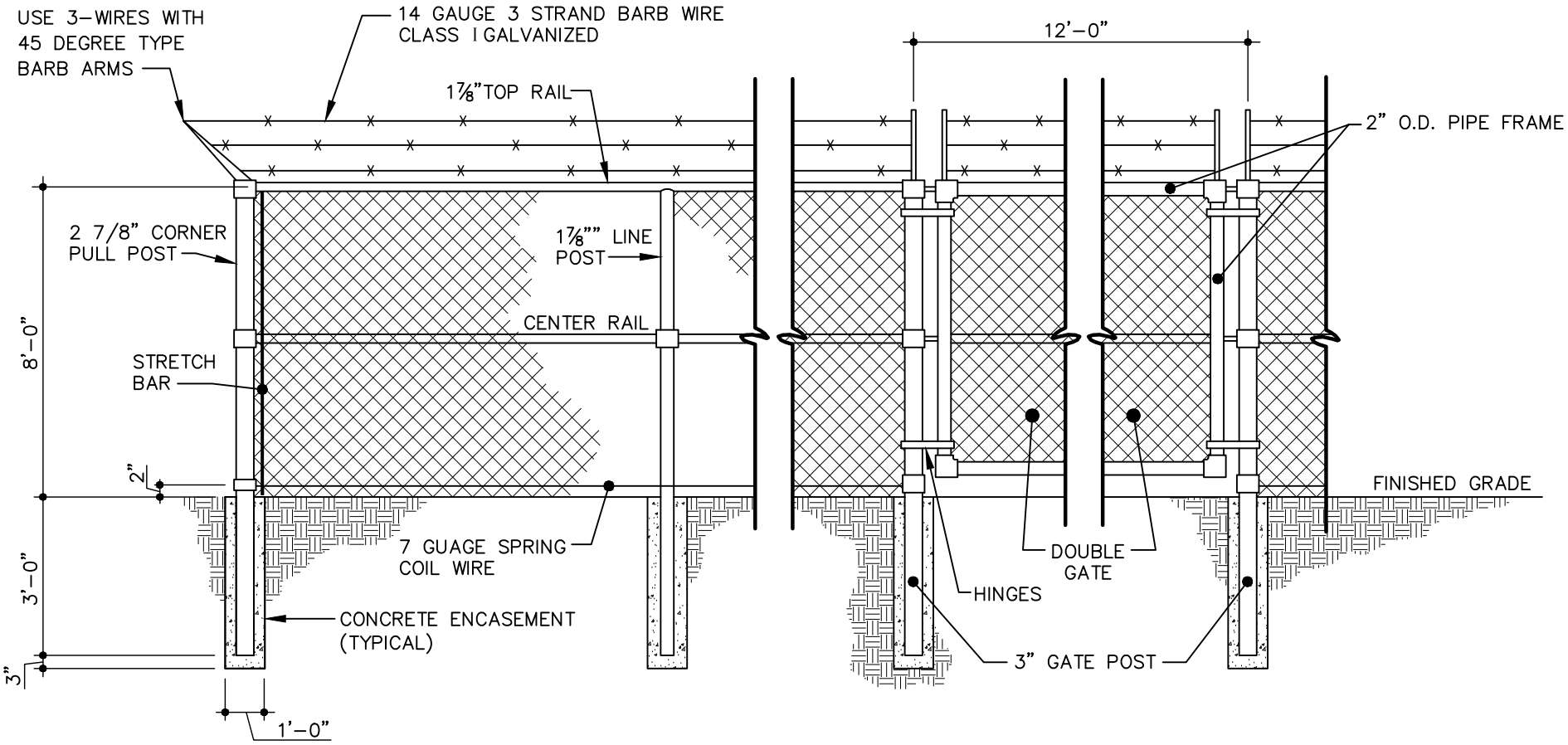
ALUMINUM ACCESS HATCH

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



NOTES:

1. DOUBLE GATE SHALL HAVE A LOCKING MECHANISM, DROP ROD, AND TRUSS ROD.

2. ALL FENCE COMPONENT MATERIALS SHALL BE CLASS I GALVANIZED COATED.

DETAIL No.
S–32.0

CHESTER COUNTY
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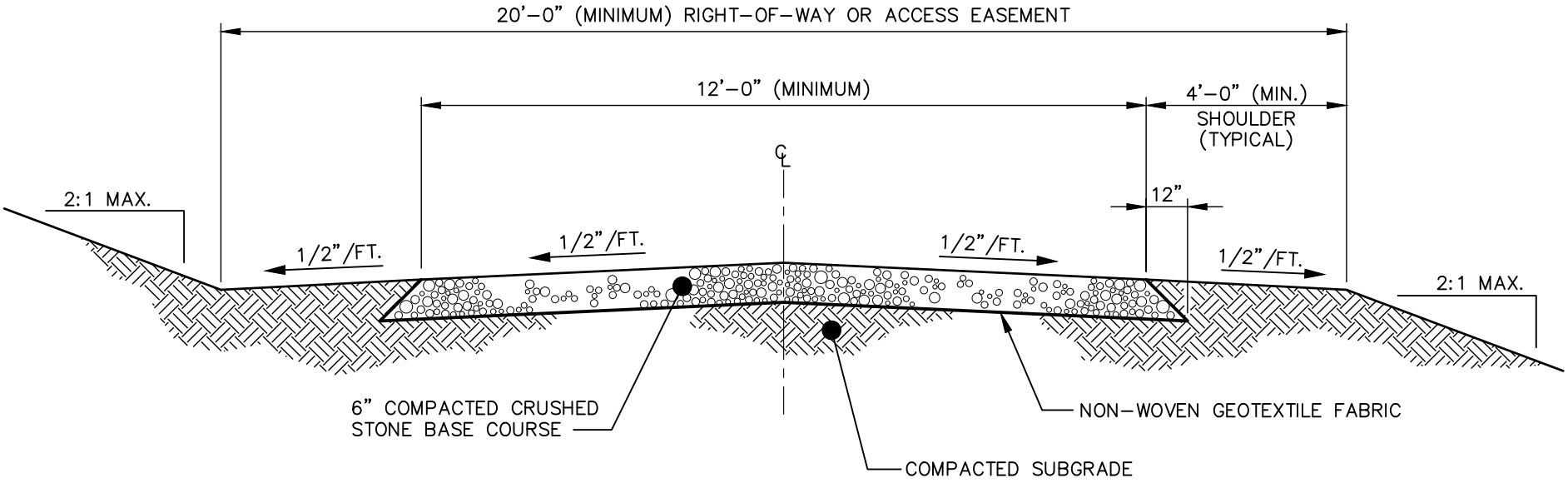
CHAIN LINK FENCE & GATE

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



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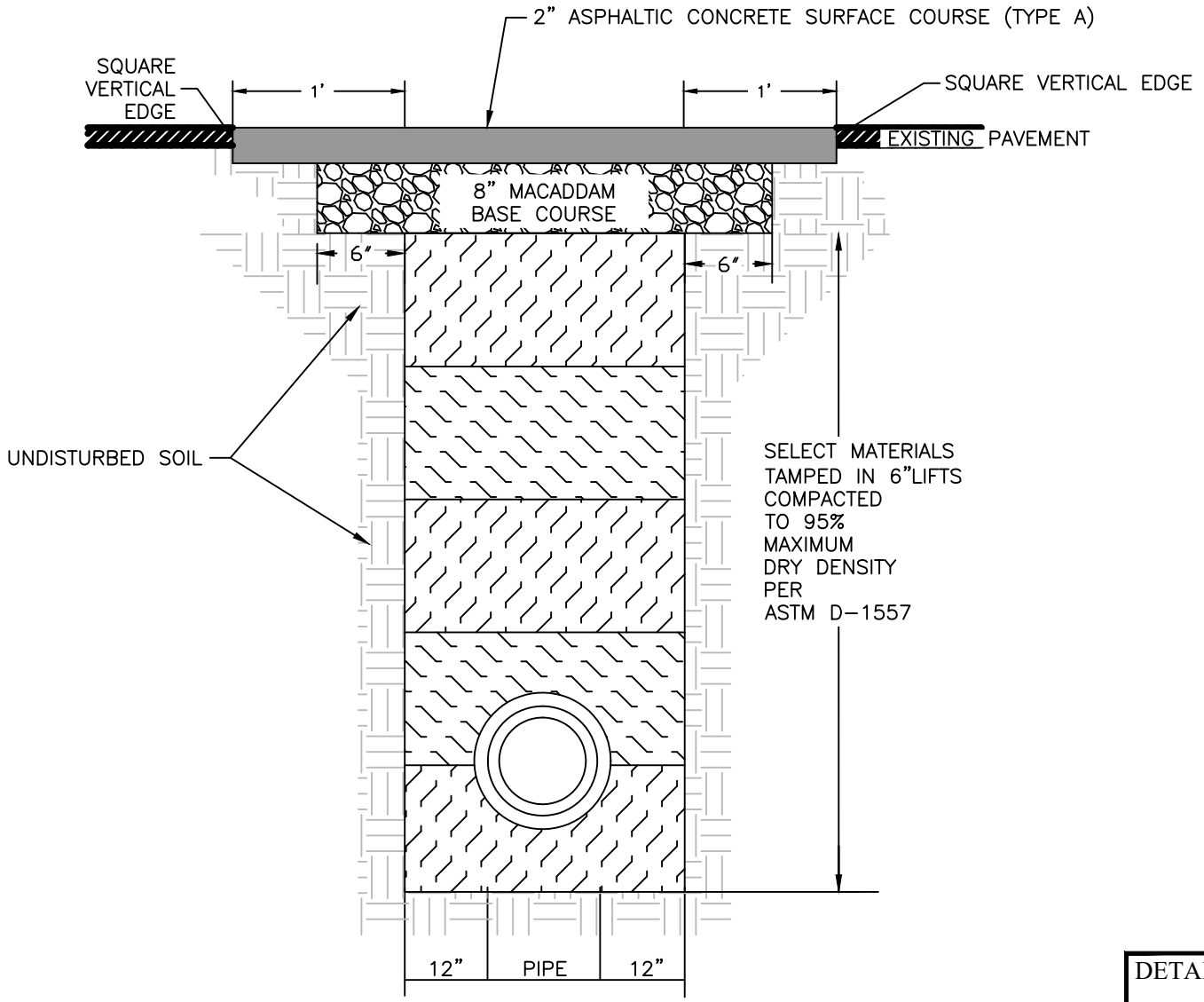
PUMP STATION ACCESS ROAD

SCALE: N.T.S.

DETAIL No.
S–33.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



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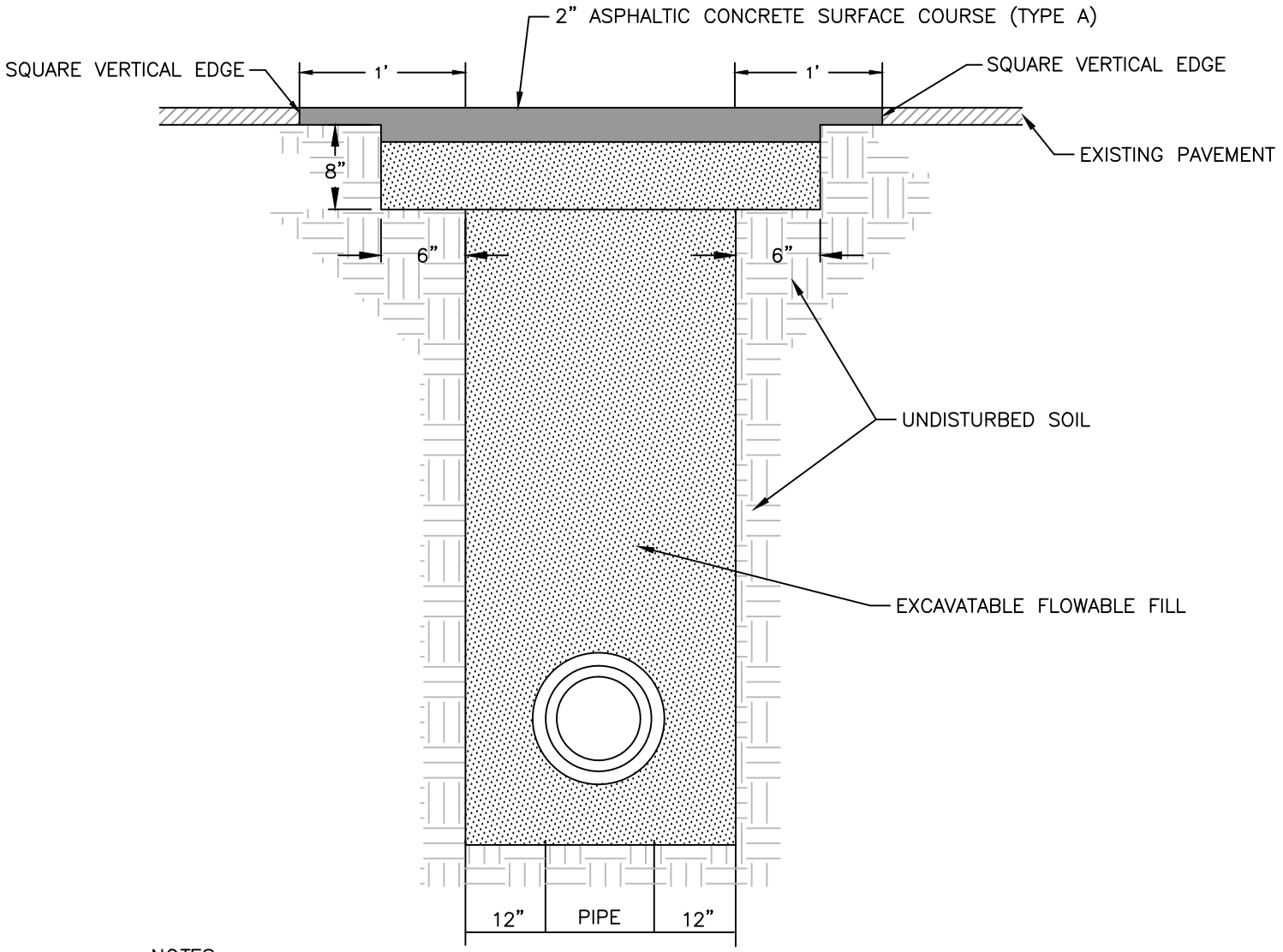
TYPE 1 CUT & PATCH

SCALE: N.T.S.

DETAIL No.
S-34.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



NOTES:

1. CONTRACTOR SHALL USE STEEL PLATES IF NECESSARY TO ALLOW CONCRETE/FLOWABLE FILL TO CURE.

DETAIL No.
S-35.0

CHESTER COUNTY
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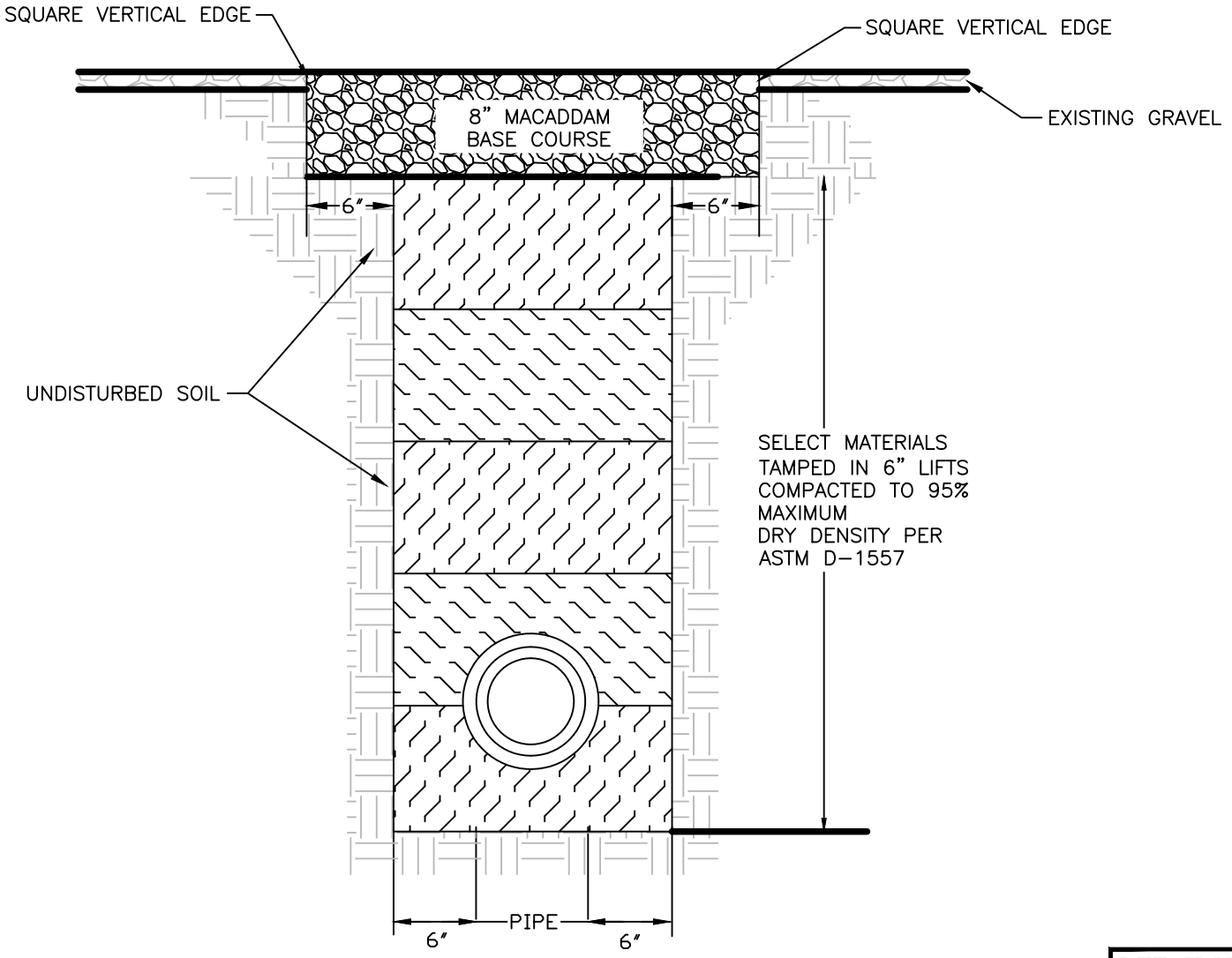
TYPE 2 CUT & PATCH

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



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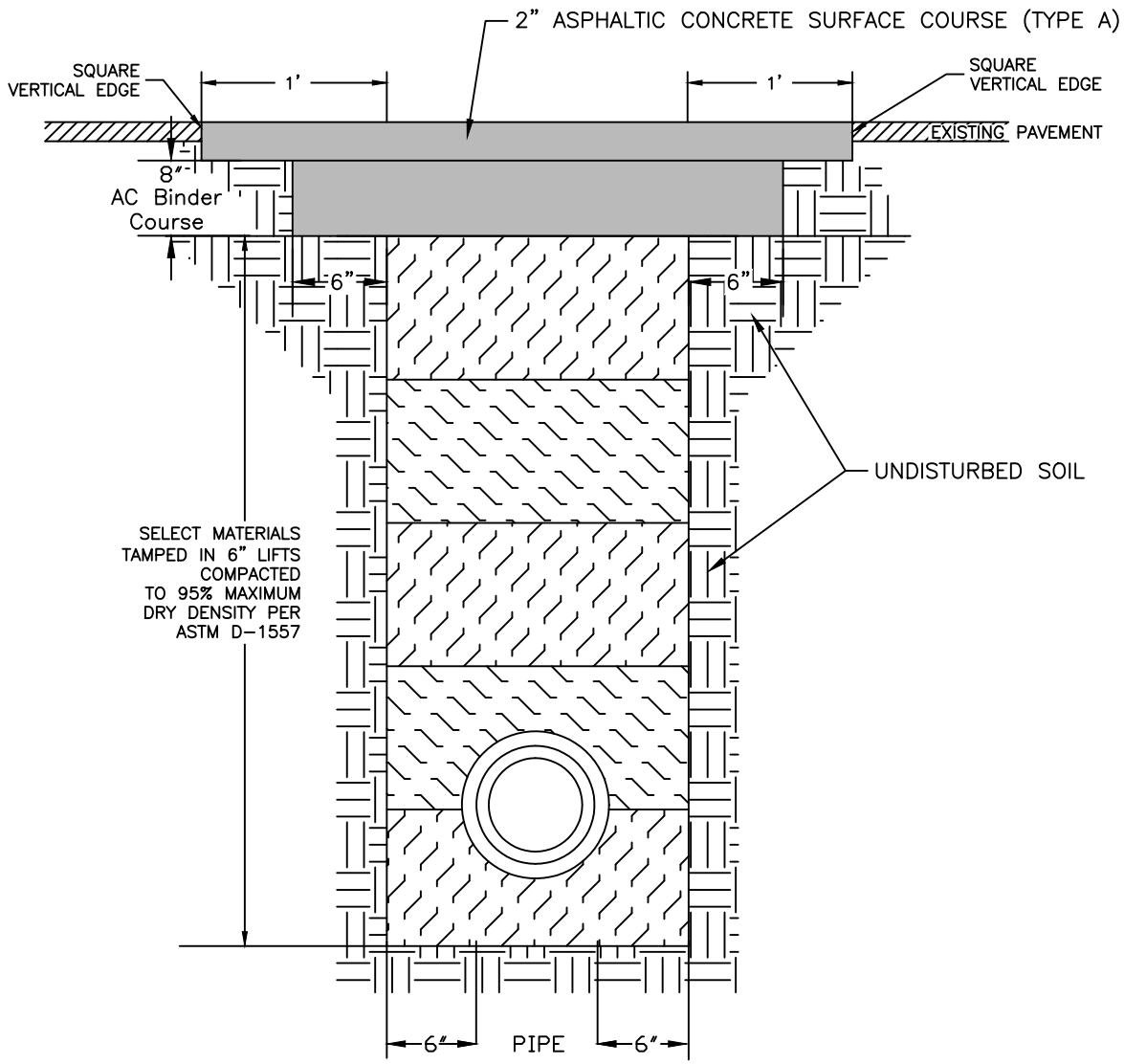
TYPE 3 CUT & PATCH

SCALE: N.T.S.

DETAIL No.
S-36.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



CHESTER COUNTY
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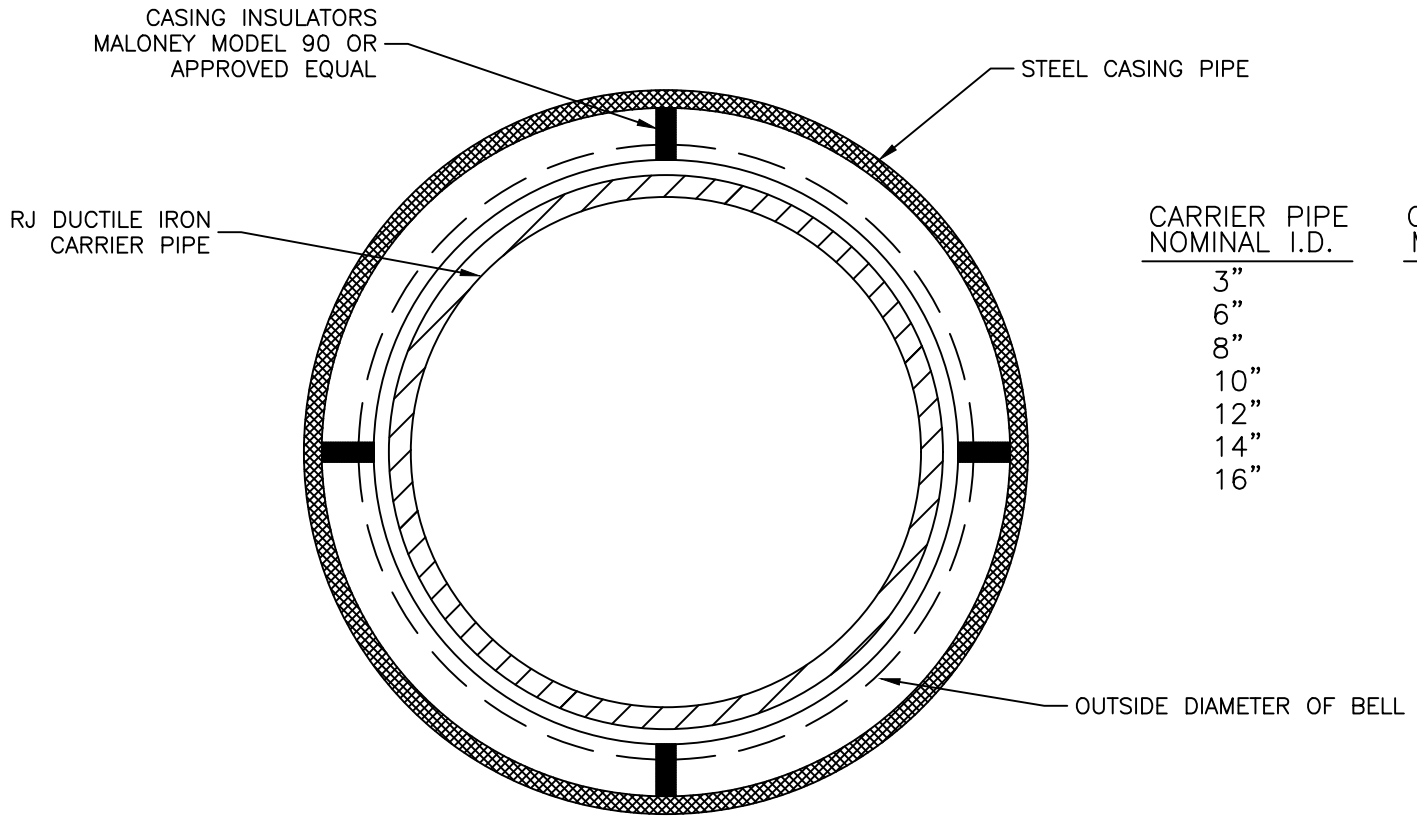
TYPE 4 CUT & PATCH

SCALE: N.T.S.

DETAIL No.
S-37.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



CARRIER PIPE NOMINAL I.D.	CASING PIPE MINIMUM I.D.
3"	6"
6"	12"
8"	16"
10"	18"
12"	20"
14"	24"
16"	30"

CROSS SECTION OF BORE

N.T.S.

NOTES:

1. CASING PIPE INSTALLED IN SCDOT RIGHT-OF-WAY TO BE A MINIMUM OF 0.250" THICKNESS. IF CASING PIPE IS 30" OR GREATER. THE CASING PIPE THICKNESS MUST BE A MINIMUM OF 0.312". ALL CASING IN RAIL ROAD RIGHT-OF WAY IS REQUIRED TO BE A MINIMUM OF 0.375" THICKNESS.

DETAIL No.
S-38.0

CHESTER COUNTY
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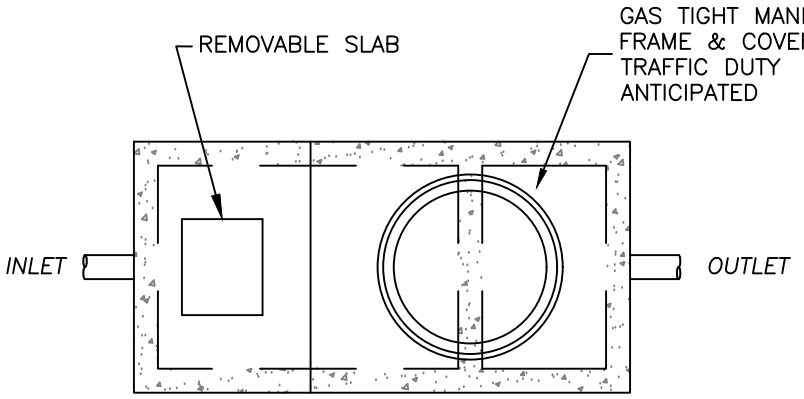
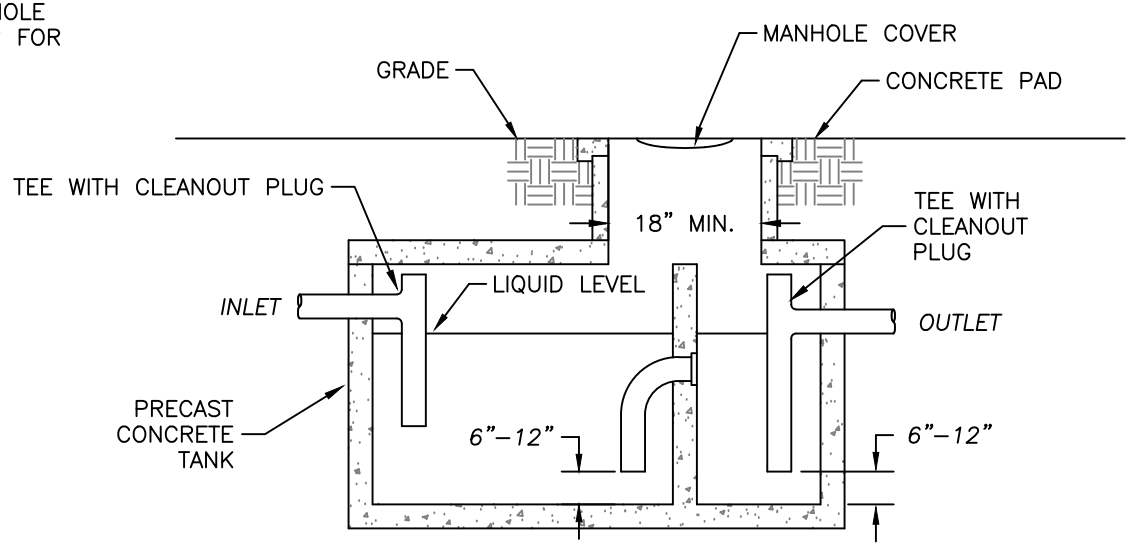
CASED BORE

SCALE: N.T.S.

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020



PLAN VIEW



SECTION

NOTES:

1. ALL GREASE INTERCEPTORS ARE SIZED BASED ON 20 GALLON PER SEAT / PER BED.
2. GREASE INTERCEPTOR SIZING: MINIMUM – 1000 GALLONS, MAXIMUM – 2000 GALLONS.
3. IF MORE TANKS ARE REQUIRED, THEN TWO OR MORE TANKS MUST BE INSTALLED IN SERIES.
4. ALL GREASE INTERCEPTORS MUST BE INSTALLED WITH LOCKING METAL RINGS AND COVERS.
5. GREASE INTERCEPTORS SHOULD BE INSTALLED IN A NON–TRAFFIC AREA, BUT IF THEY ARE NOT, TRAFFIC RATED TOPS WILL BE REQUIRED.
6. AVOID INSTALLING GI IN THE DRIVE–THRU LANE.
7. DO NOT INSTALL GREASE INTERCEPTORS NEAR GARBAGE CONTAINMENT AREAS.
8. AN AVAILABLE HOSE BIB MUST BE INSTALLED FOR CLEAN OUT PURPOSES BY A HAULER.
9. FOOD GRINDERS MUST NOT BE CONNECTED TO GREASE INTERCEPTORS – ALL KITCHEN WASTE SHOULD BE DISPOSED OF IN GARBAGE CONTAINER.
10. MOP SINKS, FLOOR DRAINS, 3–COMP SINKS, AND PRE–RINSE BASIN ONLY FROM DISHWASHER MUST BE CONNECTED TO THE GREASE INTERCEPTOR.
11. ICE MACHINES, HAND SINKS, TEA/SODA STATIONS, PREP SINKS, AND THE OUTPUT OF THE DISHWASHER MUST GO TO THE SANITARY LINE.
12. MUST BE APPROVED BY CWR PRETREATMENT APPLICATION AVAILABLE AT: WWW.CMDCSD.COM

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GREASE TRAP

SCALE: N.T.S.

DETAIL No.
S–39.0

REV.	DATE
2	OCTOBER 2021
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SEWER NOTES:

1. ALL 8" PVC SANITARY SEWER IS TO BE SDR35 PVC SANITARY SEWER PIPE UNLESS NOTED OTHERWISE.
2. ALL SANITARY SEWER SERVICES ARE BE SCHEDULE 40 PVC.
3. STONE BEDDING IS REQUIRED FOR ALL DR35 PVC SEWER PIPE IN ACCORDANCE WITH THE CURRENT CHESTER SEWER DISTRICT STANDARDS (NO, 67 STONE 6 INCHES BENEATH PIPE AND 6 INCHES ON EACH SIDE UP TO THE SPRINGLINE OF THE PIPE.)
4. ALL CLEANOUTS ARE TO BE LOCATED ON THE HOUSE SIDE OF THE SIDEWALK WHERE APPLICABLE.
5. ALL SEWER SERVICES ARE TO BE LOCATED 5 FEET FROM THE CENTER OF THE LOTS AND 10 FEET CLEAR FROM WATER UNLESS NOTED OTHERWISE.
6. NOTIFY ENGINEER AND CHESTER COUNTY WASTEWATER RECOVERY 48 HRS. BEFORE PRESSURE AND MANDREL TESTS.
7. CONTRACTOR TO MARK CURB WITH "S" PERPENDICULAR TO SEWER SERVICES.
8. CONTRACTOR TO INSTALL SERVICES IN LOCATION SHOWN ON PLAN SO THAT THEY DO NOT INTERFERE WITH FUTURE DRIVEWAY LOCATIONS.
9. CONTRACTOR TO MARK EACH SEWER STUBOUT WITH A TREATED 4x4 POST PAINTED GREEN. THE POST SHALL BE A MINIMUM OF 4 FEET HIGH. CONTRACTOR IS TO MAINTAIN POST TILL FINAL COMPLETION.
10. SERVICES MAY BE ON THE LOW SIDE OF THE LOT, IF GRADE DICTATES. CLEANOUTS SHALL NOT BE LOCATED WHERE A DRIVEWAY MAY BE CONSTRUCTED.
11. DUCTILE IRON PIPE SHALL BE USED WHERE SEWER MAIN IS EXPOSED, ABOVE GROUND, CLOSER TO SURFACE THAN FOUR FEET, DEEPER THAN 12 FEET, OR OUTSIDE THE ROAD R.O.W. CEMENT LINED LONG SPAN STEEL PIPE SHALL BE USED AT ALL CREEK CROSSING.
12. DUCTILE IRON PIPE SHALL BE USED WHERE SEWER MAIN CROSSES WITHIN 18" (VERTICAL) OF WATER MAINS OR 12" OF OTHER UNDERGROUND PIPES OR CONDUITS. DUCTILE IRON PIPE MUST EXTEND AT LEAST NINE FEET BEYOND BOTH SIDES OF THE PIPES BEING CROSSED.
13. MATERIALS AND PLANS ARE TO COMPLY WITH THE CURRENT CHESTER COUNTY WASTEWATER RECOVERY STANDARD SPECIFICATIONS AND DETAILS.

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STANDARD NOTES

SCALE: N.T.S.

DETAIL No.
S-40.0

REV.	DATE
2	OCTOBER 2021
1	OCTOBER 2020