

Specifications



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Technical Specifications for Sanitary Sewer Line Extensions

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PROCEDURE FOR APPROVAL PRIOR TO INSTALLATION OF SANITARY SEWER LINE EXTENSIONS

Any individual or lot developer (Developer) contemplating the installation of a Sanitary Sewer line with the intent of deeding the Ownership of same to the Authority is hereby instructed to proceed as follows:

1. Developer must fully comply with the requirements of Section L of the Rules and Regulations.
2. Design Plans shall be submitted to the Authority in accordance with Section L of the Rules and Regulations. At a minimum the drawings shall contain the following information:
 - A. Sanitary Sewer Plan View.
 - i. Topographical Survey of entire lot plan owned by applicant with contour intervals not greater than two (2) feet.
 - ii. Name of street(s)
 - iii. Street construction (blacktop, gravel, etc.)
 - iv. Width of pavement (or driving surface)
 - v. Width of right-of-way
 - vi. Location of utilities (gas, electric, telephone, etc.) and associated rights-of-way
 - vii. Property lines and N/F Owners of all adjacent properties
 - viii. Stationing on center line of Sanitary Sewer
 - ix. Sanitary Sewer right-of-way to be dedicated to the Authority
 - x. North arrow
 - xi. Horizontal Datum: NAD83, Pennsylvania State Plane Coordinate System, South Zone
 - xii. Vertical Datum: NAVD88
 - xiii. Scale of drawing to be 1" = 50'

- xiv. Proposed sewer lines, manholes, clean outs, taps and related facilities. Each manhole and cleanout shall be labeled in plan view with a discrete label (nomenclature may be provided by Authority). Sewer lines shall be labeled with flow direction.

B. Sanitary Sewer Profile View

- i. Scale of drawings to be 1" = 50' Horizontally and 1" = 10" Vertical.
- ii. Elevations, sizes and types of crossing or closely parallel underground utilities
- iii. Elevation of center line of intersecting streets
- iv. Existing and proposed ground profile to be along center line of sewer with stationing
- v. Invert elevations of streams and drainage channels and their widths
- vi. Buildings being served (basement of lowest floor)
- vii. Manhole and cleanouts shall be labeled to match the plan view and all elevations including, Rim, Invert out and Invert in elevations shall be shown.
- viii. Size, type, length and slope of pipe between manholes and cleanouts shall be shown

SECTION 1

SOIL EROSION AND SEDIMENTATION CONTROL (E&SC) PLANNING

I. GENERAL

1. Prior to final approval of an Authority Sanitary Sewer Line Extension, the Developer shall demonstrate proof that the County Conservation District (Butler or Allegheny) has been consulted and a permit has been obtained or provide proof of exemption from a permit. The Authority shall not take Ownership of Sanitary Sewer lines if proper permitting procedures have not been followed or if outstanding violations exist.
2. When preparing an E&SC Plan for a permit or during construction when a permit is not required, the following guidelines are considered good practice and should be viewed as minimum best management practices. The County Conservation District (CCD) has final jurisdiction and their requirements and the permit they issue shall be followed.

II. RECOMMENDED MINIMUM E&SC PLAN PROCEDURES

1. If the Contractor designated with responsibility to install erosion and sedimentation control features is different than the permit applicant he shall be required to submit appropriate application to become a co-permittee on the NPDES permit with the permit applicant and thereby be designated as co-permittee.
2. Contact the CCD at least 3 days prior to the start of earth disturbance operations.
3. The Developer will be responsible for the proper construction, stabilization, and maintenance of all erosion and sedimentation controls and related Items included on the E&SC Plan.
4. A copy of the approved E&SC plan must be posted at the construction site at all times in accordance with the laws of the Commonwealth of Pennsylvania. This is required even if a permit is not.
5. E&S controls must be constructed, stabilized, and functional before general site disturbance within the tributary areas of those controls is begun.
6. Silt fencing must be installed parallel to existing contours or constructed at level alignments. Ends of fencing must extend 10', traveling up-slope at 45° to the alignment of the main fencing section.

7. Stock pile heights shall not exceed 35 feet nor shall the side slopes exceed 2:1. Stock piles shall be located on site by the Developer at locations approved by the CCD.
8. Vehicles may only enter and exit at the location of approved and installed construction entrances.
9. All sediment traps must be protected from unauthorized acts of third parties.
10. The Developer shall be responsible for protection of existing trees and shrubs to remain from unnecessary damage.
11. During earth moving activities, silt barriers shall be securely staked in place and properly maintained until the disturbed area is satisfactorily stabilized with a uniform 70% perennial vegetative cover or other stabilizing surface material specified.
12. During construction activities, the smallest area possible shall be disturbed to accomplish the work to be executed. Disturbed areas that will not be constructed upon shall be immediately seeded with a perennial groundcover as specified.
13. During construction, the Developer shall make certain that all runoff is directed to the sedimentation control measures. The Developer shall inspect and clean out all sedimentation control measures after every rainfall/storm water runoff occurrence/storm event.
14. Until the site is stabilized, all erosion and sedimentation controls must be maintained properly. Maintenance must include inspections of all erosion and sedimentation controls after each storm event and on a weekly basis. All preventative and remedial maintenance work, including cleanout, repair, replacement, regrading, reseeding, mulching, and renetting must be performed immediately.
15. All necessary repair work will be conducted within 24 hours after each rain event or weekly as needed. The Developer is responsible for all maintenance items.
16. All temporary interceptor channels shall be inspected on a weekly basis and within 24 hours of all rain events.
17. All temporary interceptor channels shall be maintained by removing all debris and collected sediments to ensure proper designed function of each channel. All removed debris shall be disposed of properly. All removed sediments shall be spread across the site, once these materials have dried, material shall be used in fill operation or disposed of properly.

18. Sediment must be removed from inlet protection devices after each storm event. All erosion and sedimentation control measures must be inspected weekly and after every runoff event.
19. Any silt fencing that has been undermined or topped must be replaced with filter outlets immediately.
20. Sediment must be removed where accumulations reach one-half the above ground height of the silt fencing.
21. Any erosion or undercutting of the anchor toe shall be repaired immediately with a rock filter outlet.
22. All broad-based dips shall immediately be maintained to direct flow to silt fence outlet protection.
23. Sediment must be removed from sediment traps when the storage capacity is reduced to 1,300 cubic feet per acre.
24. All sediment removed from E&SC devices will be excavated, spread and dried for use in on-site grading. Remove unsuitable material from site and dispose of material appropriately.
25. During earth moving activities, place excavated material upslope from construction areas. Stockpiles shall be set parallel to the contour of the land.
26. Remove sediment immediately from the traveled way of roads and streets.
27. All soil stockpiles to remain more than 20 days shall be seeded with a temporary seed mix.
28. Stone base shall be placed on roadbeds and driveways within 24 hours of establishing sub-grade.
29. Upon completion of earthmoving and construction activities, disturbed areas that are not to be paved shall be covered within 24 hours with 6" of topsoil. Final grading passes shall be made perpendicular to the direction of stormwater runoff and tracked to help hold soils in place. This includes all cut and fill slopes.
30. All storm water inlets must be protected until 70% perennial vegetative cover is achieved. Inlets which do not discharge to a sediment trap must be protected until the tributary areas are stabilized.
31. All sedimentation control measures are to remain until all disturbed areas are fully stabilized with a permanent uniform 70% perennial vegetative cover and rip-rapped where specified and detailed on the plans.

32. Vegetation is to be inspected for uniform cover and reseeded as needed.
33. Reseed and mulch barren areas not producing a uniform 70% perennial vegetative cover in any given area within 24 hours of discovering the deficiencies.
34. Stream bank restoration shall consist of bushy type vegetation to minimize erosion. Suggested species are dogwood (cornus spp.) and willow (salix spp.).
35. Should any measures contained within the plan prove incapable of adequately removing sediment from on-site flows prior to discharge or stabilizing the surfaces involved, additional measures must be immediately implemented by the Developer to eliminate all such problems.
36. Should unforeseen erosive conditions develop during construction, the Developer shall take action to remedy such conditions and to prevent damage to adjacent properties as a result of increased runoff and/or sediment displacement. Stockpiles of wood chips, hay bales, crushed stone and other mulches shall be held in readiness to deal immediately with emergency problems of erosion.
37. The Developer must develop, and have approved by the CCD, a separate E&SC plan for each spoil, borrow or other work area not detailed on the approved plan, whether located within or outside of the construction limits.
38. After final site stabilization (min. 70% perennial vegetative cover) has been achieved, temporary erosion and sedimentation control must be removed. Areas disturbed during removal of the controls must be stabilized.
39. The Developer is advised to become thoroughly familiar with the provisions of Appendix 64, Erosion Controls and Regulations, Title 25, Part 1, PADEP, Sub-part C, Protection of Natural Resources, Article iii, Water Resources, Chapter 102, Erosion Control.
40. The E&SC plan and plan narrative are for the Installation, maintenance and measures to control erosion and sedimentation only. Refer to appropriate plan sheets for all utility, stormwater, site improvement and other construction information.
41. The Developer will be responsible for the removal of any excess material and make sure site(s) receiving the excess has an approved E&SC plan that meets the conditions of Chapter 102 and/or other state, federal regulations.
42. All building materials and wastes must be removed from the site and recycled or disposed of in accordance with the PADEP's solid waste

management regulations § at 25 PA. Code 260.1 et. Seq., § 287.1 et. Seq.
No building material § 271.1 et. Seq., and or wastes or unused building
materials shall be buried, dumped, or discharged at the site.

SECTION 2

TRENCHING, BACKFILLING AND COMPACTING

I. GENERAL

1. Trenching, backfilling and compacting for the installation of Sanitary Sewer facilities is critical to the infrastructure's short and long term durability and function. The following practices shall be considered a minimum:

II. PREPARATION

1. Identify required lines, levels, contours, and datum locations.
2. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
3. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
4. Maintain and protect above and below grade utilities which are to remain. Developer shall comply with Pennsylvania One Call Act 287 as amended by PA Act 199 or latest Act.

III. SHORING

1. Support excavation with sheeting, shoring and bracing or a "trench box" as required to comply with Department of Labor & Industry and the Federal Occupational Safety and Health Act of 1970.
2. Trench excavation shall be in strict accordance with OSHA Regulations and selection of 1) sloping and benching systems, and/or 2) support, shield or other systems. A registered professional engineer's certified design calculations will be required for protective systems where trench depth is greater than 20-feet, in accordance with paragraphs 1926.652 (b) and (c) of the Regulations. In addition, a professional engineer's certification and usage specification for trench shoring/shielding systems or sloping of trenches will be required where the trench depth is 20-feet or less in accordance with Subpart B of the Regulations. The professional engineer must be registered in the Commonwealth of Pennsylvania.
3. Using skilled labor, drive or set sheeting, sheet piling, braces or shores in place and arrange such that they may be withdrawn as the excavations are backfilled, without injury to piping and structures, and without injury to or settlement of adjacent structures and pavements.

4. When tight plank or steel sheeting is required, drive such sheeting in advance of the excavation. Make joints of tongue and groove or interlocking type and as watertight as possible.
5. Where the maximum width of trench may be exceeded under these Specifications and where permitted by Federal and State Regulations, the sides of the trench may be sloped in lieu of providing sheeting and bracing. If the sloping of trench banks is permitted, the slope shall begin at a point of 12 inches above the top of the pipe. Install sheeting to support the vertical part of the excavation as required by Federal and State Regulations.
6. Remove sheeting, bracing and shores as trenches and other excavations are being backfilled.
 - A. In withdrawing sheeting and sheet piling, exercise care to ensure that all voids or holes left by planks as they are withdrawn are backfilled and thoroughly rammed with thin rammers provided especially for that purpose.
 - B. Exercise care to carry backfill up evenly on all sides of items installed in excavations.

IV. EXCAVATING

1. Perform soil E&SC work in accordance with the E&SC Plan.
2. General:
 - A. Excavation shall be performed to the lines and grades indicated on the Drawings.
 - B. Perform excavation and backfilling using machinery except where hand excavation and backfilling is required or is necessary to protect existing structures, utilities, or other private or public properties.
 - C. Begin excavation in trenches at the control point having the lower invert and proceed upward.
 - D. Remove rock to sub-grade at least twenty-five (25) feet in advance of pipe laying.
 - E. Do not interfere with 45 degree bearing splay of foundations.
3. Sub-grade Preparation:
 - A. Do not excavate below depths indicated or specified except where

unsuitable material is encountered at sub-grade.

- B. Remove unsuitable material found below sub-grade and backfill with PENNDOT 3B or 4B Limestone Coarse Aggregate conforming to PENNDOT Publication 408, Section 703.2.
 - C. Remove rocks or other hard matter protruding through trench bottom at sub-grade which could damage pipe or impede consistent backfilling or compaction. Backfill with first class bedding to required sub-grade. Compact in four (4) inch lifts.
 - D. Remove rock below sub-grade if shattered due to excessive drilling impact or splitting operations if it is unfit for foundations. Backfill to sub-grade with concrete or other material acceptable to the Authority.
4. Excavated Material Storage:
- A. Separate and stockpile in designated area, excavated materials suitable for use as backfill. Remove from the site, excess materials and excavated materials not suitable for backfill.
5. Trench Width:
- A. From sub-grade elevation to an elevation at least twelve inches above the top of the outside barrel of the pipe, excavate trench banks to vertical lines and not less than the minimum nor more than the maximum widths specified in Table A below. If shoring is required, the following Table A dimensions apply to the inside face of sheeting.

TABLE A		
Diameter of Pipe	Minimum Trench Width (Outside Diameter of Pipe at the Barrel Plus)	Maximum Trench Width (Outside Diameter of Pipe at the Barrel Plus)
4 through 24 inches	12 inches	16 inches
27 through 36 inches	20 inches	24 inches
42 through 72 inches	26 inches	30 inches
Larger than 72 inches	30 inches	36 inches

- B. From a point twelve inches above the top of the outside barrel of the pipe, maintain trench banks as follows:
 - i. Vertical as possible for trenches in paved or unpaved roadways.
 - ii. In open areas, trenches may be sloped at angles required to make trench stand, however, in no case shall angle exceed one-half horizontal to one vertical.
 - iii. Top of trench shall not exceed limits of right-of-way or construction easement if such is in place.
 - iv. Maintain trenches such that there is no conflict with State or OSHA regulations.
6. Length of Open Trench:
- A. Complete trench excavation at least twenty-five (25) feet but not more than one hundred (100) feet in advance of pipe laying and keep trenches free from obstructions, except that at the end of a work day or at the discontinuance of work, the pipe laying may be completed to within five feet of the end of the open trench.
 - B. The Developer shall limit all trench openings to a distance commensurate with all rules of safety.
 - C. If the work is stopped either totally or partially, the Developer shall refill the trench and temporarily restore over the same at his expense. The trench shall not be opened until he is ready to proceed with the construction of the pipeline.

V. PIPE BEDDING

- 1. Place pipe bedding as specified herein. Place material in trench for full width. Place on each side of pipe and fittings simultaneously.
- 2. Carefully place bedding on undisturbed sub-grade or compacted sub-grade. Work pipe bedding material by hand under pipe haunching to provide adequate side support. Place in three (3) inch layers.
- 3. From pipe springline to twelve (12) inches above outside of pipe barrel carefully place Bedding material in four (4) inch layers. Place and compact carefully so as not to disturb pipe.

4. Pipe bedding material: PENNDOT 2B Limestone Coarse Aggregate conforming to PENNDOT Publication 408, Section 703.2.

VI. BACKFILL

1. Backfill trenches to contours and elevations indicated on Drawings.
2. Maintain optimum moisture content of fill materials to attain required compaction density.
3. Do not use frozen backfill materials or place backfill on frozen sub-grade or trench sub-grade.
4. Perform backfilling by methods which will result in thorough compaction of backfill material.
5. Backfill to Final Restoration Elevation: Backfill from one (1) foot above the top of pipe to Final Restoration Elevation using suitable backfill materials. Consolidate backfill materials evenly from center to side of trench to prevent arching.
6. If there is a deficiency of backfill material, provide borrow material as required.
7. Backfill material:
 - A. Suitable Trench Backfill Material: On site excavated soil or soil-rock mixed materials free of topsoil, slag, vegetation, lumber, metal and refuse; and free of rock or similar hard objects larger than six inches in greatest dimension. Rock to soil ratio shall not exceed one part rock to three parts soil. Suitable backfill has a moisture content near its optimum moisture content (not excessively wet or dry).
 - B. Clean Organic Material Backfill: One site excavated material free of vegetation, lumber, slag, metal and refuse, and free of rocks or similar hard objects larger than one inch in greatest dimension. Rock to soil ratio shall not exceed one part rock to three parts soil.
 - C. Aggregate Backfill: PENNDOT 2A Limestone Coarse Aggregate conforming to PENNDOT Publication 408, Section 703.

VII. COMPACTION

1. Solidly tamp each layer of bedding around the pipeline and above pipeline using proper tamping tools made especially for this purpose. Compact each layer to 95% of maximum proctor using ASTM D698 Standard Proctor Test

Methods determined at maximum density at optimum moisture content as determined by AASHTO T 99.

2. Do not use rolling equipment or heavy tampers to consolidate backfill until at least two (2) feet of backfill is placed over the top of the pipe.
3. The use of HYDRA-HAMMER for compacting backfill in trenches is prohibited.
4. The use of puddling or jetting for compacting backfill in trenches is prohibited.
5. Compaction Tests: During the course of backfilling and compacting, the Authority may at various locations and depths of trenches request that the Developer make field tests to verify that compaction is being achieved. Perform field density tests according to AASHTO T 191 or ASTM D2922 and ASTM D3017.
6. If compaction tests indicate that Work does not meet specified requirements, remove Work, replace, compact and retest.

VIII. ANTI-SEEP COLLAR/TRENCH PLUG

1. Anti-seep collars and/or trench plugs shall be installed in accordance with the details and at the locations shown on the Drawings.

IX. CLEAN-UP AND MAINTENANCE

1. General: During construction, the surfaces of all areas including, but not limited to, roads, streets, and driveways shall be maintained on a daily basis to produce a safe, desirable, and convenient condition. Streets shall be swept and flushed after backfilling, and re-cleaned as dust, mud, stones and debris caused by the work, or related to the work again accumulates.
2. Remove surplus excavated materials, rubbish and other construction debris from the site after backfilling is completed.
3. Construction site shall be left clean at end of each working day.

SECTION 3

SANITARY SEWER PIPING

I. QUALITY CONTROL

1. Inspect each section of pipe and each pipe fitting before laying in conformance with the inspection requirements of the appropriate referenced standard.
2. Remove rejected pipe from the Project.

II. PREPARATION

1. General
 - A. Clean piping interior prior to laying pipe and following pipe laying.
 - B. Keep open ends of piping and pipe attachment openings capped or plugged until actual connection or actual pipe testing. Prevent water and debris from washing into the pipe.
2. Earthwork: Perform earthwork for sewer installation as specified herein.
3. Coating and lining Touch-Up: For pipe and fittings that have a specified coating and/or lining, touch-up chipped, cracked, or abraded surfaces and finished joints with two coats of the particular coating or lining material.

III. SEWER CONSTRUCTION METHODS

1. General Requirements: Use proper and suitable tools and appliances for the proper and safe handling, lowering into trench and laying of pipes.
 - A. Lay pipe proceeding upgrade true to line and grades given. Lay bell and spigot pipe with bell end upgrade.
 - B. Exercise care to ensure that each length abuts against the next in such manner that no shoulder or unevenness of any kind occurs along inside bottom half of pipe line.
 - C. No wedging or blocking permitted in laying pipe.
 - D. Before joints are made, bed each section of pipe full length of barrel with recesses excavated so pipe invert forms continuous grade with invert of pipe previously laid. Do not bring succeeding pipe into position until the preceding length is embedded and securely in place.

- E. Dig bell holes sufficiently large to permit proper joint making and to ensure pipe is firmly bedded full length of its barrel.
 - F. Walking or working on completed pipeline, except as necessary in tamping and backfilling, not permitted until trench is backfilled one-foot deep over top of pipes.
 - G. Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying.
 - H. Take up and replace with new, such in-place pipe sections found to be defective.
 - I. Bedding materials and concrete work for pipe bedding as specified herein.
2. Joints: Make joints in strict accordance with manufacturer's installation instructions and such included reference standards. Make joints absolutely watertight and immediately repair detected leaks and defects.
3. Laying Specified Types of Plastic Pipe:
- A. Installation and joint assembly according to ASTM D 2321 for Class I bedding material.
 - B. Pipe sections shall be standard manufactured lengths to the fullest extent possible and where cut lengths are required must have a minimum laying length of 5 feet.
4. Laying Ductile Iron Pipe: Installation and joint assembly according to ANSI/AWWA C 600, and as follows:
- A. Where necessary to field cut pipe use approved pipe cutter, milling cutter or abrasive wheel saw.
 - B. Pipe sections shall be standard manufactured lengths to the fullest extent possible and where cut lengths are required must have a minimum laying length of 5 feet.
5. Connections to Existing Manholes or Structures: Cut required opening or openings by such methods so as to prevent cracking and spalling concrete. Make openings of sufficient size to accommodate pipe with PVC Waterstop installed and one inch of annular grout space or manhole connector as specified herein. Grout annular space using non-shrink and non-metallic grout making connection watertight. Form a new invert channel in the existing manhole base to properly conduct the flow through the existing

manhole. Do not permit ground water, surface water or debris to enter the existing facilities through the new connection.

6. Plugging Existing Facilities: Plug pipe opening(s) (if required) where noted on the drawings or as required by Authority. Provide watertight seal using Class A concrete or grout.
7. Reconnection of Existing Service Connections: Use wye fittings for connection to the sewer main. Use pipe if required as specified herein. Make connection to existing piping with flexible pipe couplings as specified herein.
 - A. Use commercially manufactured wye fittings and one-eighth bends.
 - B. Set wye branches at proper vertical angles as required to bring service connections to the proper depth.
 - C. Fittings shall be installed with respect to existing service connection location.
8. Concrete Encasement: Where required, Sanitary Sewer pipe shall be concrete encased as per standard details using Class B, 3,000 PSI concrete.
9. Where open trenching operations are not permitted through roadways, railways, streams, etc., the Sanitary Sewer piping shall be installed by boring, jacking or tunneling techniques approved by permittee (PENNDOT, Railway Owner, PADEP, Etc.).

IV. STEEP SLOPE CONSTRUCTION METHODS

1. For slopes greater than 20%, trench anchors shall be constructed as per standard details. Table B below shows the maximum spacing of trench anchors:

TABLE B	
Sewer Slope	Trench Anchor Spacing
20%-35%	Not greater than 36 feet center-to-center
35%-50%	Not greater than 24 feet center-to-center
Greater than 50%	Not greater than 16 feet center-to-center

V. SANITARY SEWER MATERIALS

1. Polyvinyl Chloride Pipe (PVC), Gravity Sewer:
 - A. Pipe:
 - i. Sizes 4"-15": Type PSM PVC SDR-35, ASTM D 3034.
 - ii. Sizes 18"-30": PVC SDR-35, ASTM F 679.
 - iii. PVC compound shall meet requirements of cell class 12454-B as per ASTM D 1784
 - B. Fittings: Conforming to same applicable ASTM Specification requirements for pipe.
 - C. Joints: Push-on with elastomeric gasket, ASTM D 3212; and ASTM F 477 for gasket specifications.
 - D. Pipe bell design shall incorporate a gasket locked in a groove so as to prevent displacement when pipes are joined.
2. Polyvinyl Chloride Pipe (PVC), Force Mains:
 - A. Pipe:
 - i. Sizes 4"-12": PVC in accordance with AWWA C 900.
 - ii. Minimum Class 150 (DR 18), 500 psi sustained pressure rating (ASTM D2241) and minimum burst pressure rating of 755 psi (ASTM D 1599). Use Class 200 (DR 14) pipe as required.
 - iii. PVC compound shall meet requirements of cell class 12454-B as per ASTM D 1784
 - B. Fittings: Ductile Iron - Conforming to same fitting specifications used for DIP.
 - C. Joints: Push-on with elastomeric gasket, ASTM D 3139; and ASTM F 477 for gasket specifications.
 - D. Pipe bell design shall incorporate a gasket locked in a groove so as to prevent displacement when pipes are joined.
3. Ductile Iron (DIP), Gravity Sewer and Force Mains:
 - A. Pipe: Produced in accordance with AWWA C151

- B. ANSI Wall Thickness Class: Class 52
 - C. Fittings: Class 350 DI in accordance with ANSI/AWWA C153/A21.53
 - D. Joints: Rubber-Gasket Joints suitable for Sanitary Sewage: ANSI/AWWA C111/A21.11 for buried pipe.
 - i. For gravity pipe installation, provide push-on joints except where other types of joints are indicated on the drawings or required herein.
 - ii. For pressure force mains, provide push on restrained joints and mechanically restrained joints as required at bends and offsets. Restraining calculations shall be as per DIPRA standards. Concrete thrust blocking shall be permitted when constructed in strict accordance with standard details.
 - E. Lining Material: DIP and fittings shall be coated inside with 40 mils nominal dry film thickness of Protecto 401 ceramic epoxy per ASTM G 95 and ASTM B 117.
 - F. Pipe External Coating: Factory coated outside with bituminous material; minimum 1 mil dry thickness. Bituminous material and finished coat conforming to seal coat requirements in ANSI/AWWA C151/A21.51.
 - G. All buried DI pipe and fittings shall receive a polyethylene wrap conforming to ANSI/ASTM D 1248 and be installed as per AWWA C105.
4. Shielded Flexible Pipe Coupling: Clamped design, virgin PVC stainless steel shielded coupling with four type #301 stainless steel bands, such as manufactured by Fernco Joint Sealer Co.
 5. Underground Warning Tape: Required for all underground Sanitary Sewer pipe.
 - A. Printed polyethylene tape, three inches minimum width, color coded, one inch minimum lettering, printed with "Caution Sewer Line Below" and suitable for installation in all soil types. Color of tape to be consistent with the American Public Works Association Uniform Color Code.
 - B. Shall be magnetic detectable.
 - C. Provide for gravity and pressure Sanitary Sewer pipe; Green.
 - D. Place 24" above Sanitary Sewer pipe
 6. Double Body Sewage Combination Air Valves for Force Mains

- A. Combination Air Valve shall consist of a sewage air & vacuum valve and a sewage air release valve, piped together with a shutoff valve between them providing a single connection to the pipeline. The assembly shall be factory tested as a unit. Valve Manufacturer shall provide valve sizing.
- B. Sewage Air and Vacuum Valve
 - i. Valve shall be the same size as the combination air valve with threaded inlet and outlet to 3" size and ANSI B16.1 Class 125 flanged inlet and threaded outlet in larger sizes. Body and cover shall be ASTM A126 Class B cast iron. Valve body shall be tapped 1/2" NPT near the top and 1" NPT near the bottom to allow for the installation of flushing attachments.
 - ii. Valve shall have a 316 stainless steel plug and removable 316 stainless steel seat ring in a ductile iron cage. The plug shall contain a renewable resilient O-ring seat of Buna-N or other suitable material retained in a dovetail groove. There shall be a single float ball of 18-8 stainless steel, attached to a stainless steel stem by means of a universal connection.
- C. Sewage Air Release Valve
 - i. The air release valve shall have an ASTM A126 Class B cast iron body and cover and threaded inlet and outlet connections. Valve body shall be tapped 1/2" NPT near the top and 1" NPT near the bottom to allow for the installation of flushing attachments. Valve shall have an 18-8 stainless steel float and a replaceable seat of Buna-N or other suitable material. Internal linkage mechanism shall be 18-8 stainless steel, plastic or bronze is not acceptable. The linkage mechanism shall be capable of being removed from the cover without disassembly of the mechanism.
 - ii. The valve shall have a 2-inch threaded inlet connection and a 1/2-inch outlet with a 3/16-inch diameter stainless steel orifice for working pressures up to 150 PSI.
- D. Accessories: Provide flushing attachments to include 1/2" flushing valve, 1" blowoff valve, 5 feet of rubber hose and quick disconnect couplings.
- E. Function: The combination air valve shall exhaust large quantities of air during the filling of a pipeline or vessel and automatically close after all the air has been vented. The valve shall continue to release small quantities of air under pressure as often as needed to keep the system free of accumulated air. The valve shall automatically open to allow air to re-enter during draining or whenever a negative pressure occurs.

F. Sizing: Valve sizing shall be selected based on Manufacturer's recommendations. Sizing is subject to Authority's approval.

G. Acceptable Manufacturers: GA Industries, Inc., Val-Matic Valve and Manufacturing Corp. or approved equivalent.

VI. BUILDING SEWER CONNECTIONS

1. All Building Sewer Connections shall be 6" diameter unless specifically shown or called for as a different size. The type of pipe used shall be of the same type of pipe as the main sewer, except as otherwise specified or as noted on the drawings.
2. A constructed Building Sewer Connection that is to be connected at a future time shall not be covered until a sketch is prepared that shows where the end of the installed Building Sewer Connection is located. The sketch shall include measurements to fixed features that will exist after construction is completed. A copy of the sketch shall be retained by the Developer and an additional copy shall be provided to the Authority.
3. The Developer shall also mark the end of an installed Building Sewer Connection with a treated 2"x4" post with the depth to the invert marked above grade.
4. Construction of Building Sewer Connections shall be in accordance with the Authority's standard details as per the Authority's Sewer Service Application.

VII. SANITARY SEWER PIPE TESTING

1. General Requirements:
 - A. Provide tools, materials (including water), apparatus and instruments necessary for pipe line testing.
 - B. Install necessary plugs, supports, blocking etc as may be required to properly conduct testing of the pipe.
 - C. Conduct tests in the presence of and to the satisfaction of the Authority.
2. Testing Equipment:
 - A. Use testing apparatus equipped with a control panel with necessary piping, control valves and gauges to control air or water flow rate to piping test section; and to monitor pressure within piping test section and pressure within test section seal plugs. Prevent accidental overloading

of piping test section.

- B. Provide an extra pressure gauge of known accuracy to frequently check test equipment and apparatus.
 - C. Testing equipment and associated testing apparatus subject to Authority's approval.
3. Cleaning Prior to Tests: Before tests are conducted, clean piping including sewers, branches and service connections until free of dirt or silt or construction debris.
4. Low Pressure Air Testing of Gravity Pipes:
- A. Three (3) working days prior to testing, submit to Authority certificates that all gauges have been calibrated and are accurate to 0.1 PSIG.
 - B. Test each newly installed section or run of pipe. For gravity Sanitary Sewer line, the test run will be between manholes and/or end points of the sewer line.
 - C. Slowly introduce air pressure to approximately four (4) PSIG. If ground water is present, determine its elevation above the springline of the pipe by means of a piezometric tube. For every foot of ground water above the springline of the pipe, increase the starting air pressure reading by 0.43 PSIG. Do not increase pressure above ten (10) PSIG.
 - D. Allow pressure to stabilize for at least five (5) minutes. Adjust pressure to 3.5 PSIG plus the increased pressure as determined above if ground water is present and start the test.
 - E. Test:
 - i. Determine the test duration for a sewer section with a single pipe size from the following tables (Table C and Table D):

Table C - Low Pressure Air Test Times Ductile Iron Pipe Only	
Nominal Pipe Size	Time: Seconds/100 feet
8-inches and less	70 seconds
10-inches	110 seconds
12-inches	158 seconds
15-inches	248 seconds
18-inches	356 seconds
21-inches	485 seconds
24-inches	634 seconds

27-inches	765 seconds
30-inches	851 seconds
36-inches	1,020 seconds

Table D - Low Pressure Air Test Times PVC Pipe Only	
Nominal Pipe Size	Minimum Time
8-inches and less	5 minutes
10-inches	6 minutes
12-inches	7 minutes
15-inches	8 minutes
18-inches	9 minutes
21-inches	10 minutes
24-inches	11 minutes
27-inches	12 minutes
30-inches	13 minutes
36-inches	15 minutes.

- ii. Record the drop in pressure during the test period. If the air pressure has dropped more than one (1) PSIG during the test period, the pipeline is presumed to have failed. If the one (1) PSIG air pressure drop has not occurred during the test period, the test shall be discontinued and the line will be deemed to have passed the air test.
- iii. If the line fails, determine the source of the air leakage, make corrections and re-test the line.

5. Deflection Testing

- A. Perform vertical ring deflection testing on all portions of PVC sanitary sewer piping (excluding lateral piping) in the presence of the Authority.
- B. Testing shall occur after the backfill has been in place for at least thirty (30) days but not longer than twelve (12) months.
- C. Maximum allowable deflection for installed pipeline shall be limited to 5% of pipe's inside base diameter as determined by the applicable ASTM standard for the pipe.
 - i. Perform deflection testing with a properly sized "Go, No-Go" mandrel. Mandrels shall have an odd number of fins, not less than nine (9) in number. Mandrels shall have a diameter equal to 95% of the inside base diameter of the pipe as discussed above.

- ii. Pipe exceeding the allowable deflection shall be located, excavated, replaced and retested (low-pressure air test and deflection testing as specified).
- 6. Lamping: Developer shall assist Authority in the lamping operation by shining a light at one end of each gravity pipeline segment between manholes. The Authority shall observe the light at the other end of the pipeline. Pipeline that has not been installed with a uniform line and grade will be rejected based on these visual observations. If a “full-moon” is not observed the Developer shall replace the pipeline to the proper line and grade and repeat all testing procedures.
- 7. Pressure and Leakage Testing of Force Mains, Low Pressure Systems and Pressurized Building Sewer Lines:
 - A. Pressure pipelines of either PVC or DI material shall be tested as follows:
 - i. The section under test shall be filled with water and maintained full for a period of not less than 24 hours.
 - ii. The pressure and leakage tests shall first consist of increasing the water pressure (based on the elevation of the lowest point of the section under test and corrected to the gauge elevation) to a pressure in PSI equal to the pressure rating of the pipe and maintaining such pressure for a period of 30 minutes.
 - iii. The pressure and leakage test shall then consist of dropping the water pressure (based on the elevation of the lowest point of the section under test and corrected to the gauge elevation) to a pressure in pounds per square inch numerically equal to 50 pounds greater than the normal working pressure of the line. Such test shall be maintained for an additional one and one-half (1 ½) hours.
 - iv. For all pipelines not underground, the section tested shall be considered as having failed to pass the test if the pressure test (b) cannot be maintained without additional pumping.
 - v. For all underground piping at the end of the test period for both the pressure test (ii), and the leakage test (iii), the section tested will be accepted if the total leakage is not greater than .40 gallons per inch diameter per mile of pipe per hours.
 - B. Pressure shall be measured at low point on section of pipelines. The Developer shall furnish all gauges, meters, pumps, and other equipment required and shall maintain said equipment in condition for accurate testing as determined by the Authority.

- C. Where practical, pipelines shall be tested in lengths between line valves or plugs of no more than 1,500 feet.
- D. Where leaks are visible at exposed joints and/or evident on the surface where joints are covered, the pipe shall be rejoined and leakage minimized regardless of total leakage as shown by test.
- E. Lines which fail to meet tests shall be repaired and retested as necessary until the test requirements are complied with.
- F. All pipe, fittings, and other materials found to be defective under the test shall be removed and replaced.
- G. If air relieve valves or services are not provided at high points in the lines, a corporation stop shall be provided by the Developer to bleed off air as the line is filled.

SECTION 4

SANITARY SEWER MANHOLES

I. BASIC MATERIALS

1. Precast Reinforced Concrete Manhole Components

A. Materials and Construction: Conforming to requirements specified in ASTM C 478 except as follows:

- i. Concrete: Composition and compressive strength conforming to ASTM C 478 except use Type II sulfate resistant Portland cement in manhole components and increase compressive strength to 4500 psi (at 28 days) in precast bases.
- ii. Casting and Curing: Wet cast and steam curing process in accordance with Section 3.6.11 and 3.7.2 of AWWA C 302.
- iii. Manhole Component Seals: Manhole component joints factory formed for self-centering concrete to concrete bearing employing preformed plastic sealing compound. Materials as specified herein.
- iv. Manhole Component Design: Base, tapered and straight riser section, and top section dimensions and diameters, not consistent with ASTM C 478, are as indicated on standard details.
- v. Manhole Steps: Factory installed in manhole components, prealigned vertically, spaced on equal centers, and located the minimum distance from ends of risers and top sections as indicated on standard details. Materials as specified herein.
- vi. The base slab of the precast manholes, wet wells, and valve vaults shall engage the surrounding soil to resist the buoyant forces of the 100-yr water surface as shown on the plans. Provide a factor of safety of 1.5 against floating. Connections between precast pieces of the structure shall also be capable of resisting 150% of the buoyant force. If the 100-yr water surface elevation is not shown on the plans, it shall be presumed to be 1-ft above the top slab of the structure.

B. Precast Bases and Riser Sections: Design, materials and construction as specified herein.

C. Pipe Openings: Custom preformed during manufacturing in each base and riser section requiring such, to accommodate type of pipe and pipe

opening seal provided.

D. Precast Top Sections: Designs as required by standard details, of materials and construction as specified herein except additional and differing requirements as follows:

- i. Hold Down Bolt Inserts: Factory cast in top section no less than four 3/4-inch threaded inserts or slotted inserts to accommodate manhole frame hold down bolts. Threaded inserts of 3-inches depth. Both insert types designed for an ultimate load in tension of 12,500 pounds. Inserts factory plugged for shipping. Coordinate insert location with manhole component manufacturer to assure proper location in top sections.
- ii. Flat Slab Tops: Thickness versus diameter as indicated on standard details. Tops factory formed to properly accept and support required manhole frame and cover Highway Loading Class HS-20 and formed to join riser section in a matching joint.
- iii. Eccentric Cone Tops: Manufactured to same minimum wall thickness and with same area of circumferential steel reinforcement as riser sections.

E. Precast Grade Rings:

- i. Precast Concrete: Leveling and adjusting units of 3-inches or 4-inches thickness of materials and constructions as specified previously. Factory cast grade rings with hold down bolt holes matching location of same in manhole frame. Design must provide for full bearing of manhole frame.
- ii. Multipurpose Rubber Adjustment Riser: The rubber spacers shall be manufactured as compressed molded composites of recycled rubber, nylon fiber and polyurethane pre-polymer as manufactured by GNR Technologies, Inc., INFRA-RISER. The finished product shall have the following physical properties, as referenced by ASTM designations:

Density	1.098 g/cm ³	ASTM C 642-90
Durometer Hardness	75 A ∇ 7 pts.	ASTM F 2240
Tensile Strength	1.6 Mpa (232 psi)	ASTM D 412-87
Compression Deformation	under 1 Mpa (145 psi)	ASTM D 575

Compression Set not more than 4% ASTM D 395

- iii. Adhesive/sealant between the casting and the top concrete section for use with Multipurpose Rubber Adjustment Riser shall be urethane based, conforming to ASTM C920-87, Type S, Grade NS, Class 25, Use NT, M, and A. Sealant shall be Chemrex CX-22, as packaged by GNR Technologies.
2. Waterproofed Mortar: material composition meeting ASTM C270, Type M with waterproofing admixture included.
 3. Epoxy Bonding Compound: 2-component, 100% solids, moisture-tolerant structural epoxy adhesive. Shall conform to ASTM C 881 and AASHTO M 235 specifications.
 4. Manhole Steps: Factory installed in manhole components, prealigned vertically, spaced on equal centers, and located the minimum distance from ends of risers and top sections as indicated on standard details. Materials as specified herein.
 - A. Reinforced Plastic Step: Composed of a 1/2-inch Grade 60, ASTM A 615 deformed steel reinforcing bar completely encapsulated in Grade 49108, ASTM D 2146 polypropylene copolymer compound, Type II. M. A. Industries, Inc., Type PS2-PF or PS2-PFS; or equal.
 - B. Manhole step dimensions shall meet requirements of OSHA standards for fixed ladders.
 5. Manhole Frame and Cover:
 - A. General: Gray iron castings conforming to ASTM A 48, Class No. 35B, designed for AASHTO Highway Loading Class HS-20. Provide castings of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion or other defects.
 - B. Finish: Bearing surfaces shall be machined to prevent rocking and rattling under traffic.
 - C. Identification: Cast the letters "SANITARY SEWER" integrally in center of cover in raised letters as shown on standard details.
 - D. Frame Hold-down Anchors: Type 316 stainless steel bolts, nuts and washers.
 - E. Cover Gasket: One piece gasket factory installed in a machined rectangular or dovetail groove in the cover bearing surface. Gasket material shall be of neoprene composition having good abrasion

resistance, low compression set, Type D 40 durometer hardness determined in accordance with ASTM D 2240 and suited for use in sanitary sewer manholes.

- F. Shall be as manufactured by East Jordan Iron Works, Inc., Frame Type 1890-Z1, Neenah Foundry Company, Frame Type 1753-A or approved equal.
 - G. Watertight Manhole Frame and Cover: Same specifications as above, however the frame will have an inner lid with tightening bolt, lock bar and inner lid gasket as indicated by the standard details.
6. Preformed Plastic Sealing Compound:
- A. Fed. Spec. SS-S-210A, Type 1, Rope Form, of either bitumastic base compound or butyl rubber base compound, and shipped protected in a removable two-piece wrapper. Size cross-section of rope form to provide squeeze-out of material around entire interior and exterior circumference when joint is completed.
 - B. Shall be as manufactured by Concrete Sealants, CS-102 or 202, K. T. Snyder Company, Inc.; RAM-NEK or RUB'R-NEK, Hamilton Kent Manufacturing Company; KENT-SEAL NO. 2, or approved equivalent
7. Rubber Compression Gasket: Composition conforming to ASTM C 361 or ASTM C 443.
8. Flexible Manhole Sleeve: Cast integrally with manhole component conforming to requirements specified in ASTM C 923 and shall be fastened with two (2) type 304 stainless steel sleeve clamps with a stainless steel screw providing watertight connection between sleeve and pipe.
9. Cleanout frames and cover. In general conforming to same requirements of Manhole Frame and Covers
- A. Lid to be bolted to frame.
 - B. Identification: Cast the letters "SANITARY" integrally in center of cover in raised letters.
 - C. Frame Hold-down Bolts: Type 316 stainless steel bolts and washers.
 - D. As manufactured by East Jordan Iron Works, Inc., 1574 Monument Box, Neenah Foundry Company, or approved equivalent.
10. Inside drop manhole pipe straps.

- A. Shall be of 304 stainless steel construction with stainless steel hardware. Straps shall be manufactured specifically for this purpose and for use in wastewater conditions.
 - B. Straps shall have minimum dimensions of 1-1/2" x 11 gauge.
 - C. Hardware shall consist of 3/8" stainless steel bolts with matching anchor system.
 - D. Straps shall be evenly spaced along drop pipe at no more than 2 foot on-center and anchored securely to the manhole wall.
11. Inside Drop Bowls: All inside drops shall be constructed with a fiberglass composite bowl that collects and controls the wastewater flow and directs it downward through the pipe. All straps and anchorage shall be 304 stainless steel. Bowl shall be as manufactured by Reliner/Duran, Inc. or approved equivalent.

II. SANITARY SEWER MANHOLE INSTALLATION

1. Inspect precast reinforced concrete manhole components in accordance with requirements of ASTM C 478 regarding repairable defects and defects subject to rejection by the Authority.
2. All material found during the progress of the work, either before or after installation, to have cracks, flaws or other defects, will be rejected by the Authority. All defective materials furnished by the Developer shall be promptly removed from the site.
3. Precast concrete manhole sub-base: Install bases on a 8-inch deep compacted layer of PENNDOT 2A or 2B limestone coarse aggregate.
4. Concrete Channel Fill: Field pour concrete channel fill for each manhole base. Form inverts directly in concrete channel fill. Accurately shape invert to a semi-circular bottom conforming to inside of connecting pipes, and steel trowel finish to a smooth dense surface. Make changes in size and grade gradually. Make changes in direction of entering sewer and branches to a true curve of as large a radius as manhole size will permit. Make slopes gradual outside the invert channels. Use 3000 PSI, Type II concrete as specified herein unless indicated otherwise on drawings or standard details. Pre-poured inverts shall only be used with prior Authority approval.
5. Manhole Wall Erection: Provide precast reinforced concrete straight riser, tapered riser and top sections necessary to construct complete manholes. Fit the different manhole components together to permit watertight jointing and true vertical alignment of manhole steps.

- A. Install sealing compound in accordance with manufacturer's recommendations, and join sections also in accordance with written instructions of manhole component manufacturer. Prime joint surfaces if required by preformed sealing compound manufacturer. If sealing compound is installed in advance of section joining, leave the exposed half of the two piece protective wrapper in place until just prior to section joining. Use preformed sealing compound as the sole element utilized in sealing section joints from internal and external hydrostatic pressure. To improve workability of preformed sealing compound during cold weather, store such at temperature above 70°F or artificially warm compound in a manner recommended by the compound manufacturer. During warm weather stiffen preformed sealing compound by placing under cold water or by other means as recommended by the compound manufacturer.
 - B. Following manhole section installation, trowel sealing compound surface smooth and flush with interior face of manhole.
 - C. Make pipe connections into manhole walls as specified herein for pipes connecting into manhole bases.
 - D. Remove all interior excessive sealing compound after all manhole sections have been set.
6. Lifting Recess Sealing: Seal with properly designed tapered rubber plugs. Drive plugs into recesses in such manner to render them completely water and air tight. Sealing of lifting recesses with grout will not be permitted.
7. Frame and Cover Installation: Where required, make final adjustment of frame to elevation using precast grade rings.
- A. Set precast grade ring using waterproof mortar. Mortar thickness not to exceed 3/4-inch maximum and 3/8-inch minimum. Wet, but do not saturate precast grade rings immediately before laying.
 - B. Preformed Plastic Sealing Compound. Two continuous rings along the inner and outer diameter of grade ring.
 - C. Preset grade rings to proper plane and elevation using wedges or blocks of cementitious material not exceeding one square inch wide on all sides. No more than four wedges or blocks per grade ring permitted. Incorporate wedges or blocks in fresh mortar only in a manner to completely encase each. Crown fresh mortar to produce squeeze-out between grade rings. Tool exposed joints with appropriately shaped tool and compact mortar edge into joints. Clean off excess mortar prior to initial mortar set.

- D. Plastic or rubber grade rings to be installed to manufacture specifications
 - E. Bolt manhole frames in place on manhole top section, or on leveling units if required, after installing 1/2-inch thick preformed plastic sealing compound on bearing surface of manhole frame. Remove excess sealing compound squeeze-out after manhole frame is bolted in place.
 - F. Use bolts of sufficient length to properly pass through leveling units, if any, engage full depth of manhole top section inserts and allowing enough threaded end to pass through manhole frame to properly tighten nut and washer. Tighten manhole frame bolts after mortar has cured.
- 8. Waterproofing: The entire outer surface of all manhole components, including parged grade rings, shall be coated with two (2) coats of a bitumastic coating such as Koppers 300M Epoxy, Pennsbury 32-B-4 Epoxy, or approved equal.
 - 9. Drop Manholes: Construct in accordance with type indicated in standard details. Use same type pipe and fittings in drop connection as used in sewer line from which drop connection is made. Inside drop manholes shall be utilized for pipe sizes 6" through 8". Outside drop manholes shall be used for pipe sizes 10" and greater.

III. SANITARY SEWER MANHOLE TESTING

- 1. General: Test each manhole constructed as specified herein. If the manhole is constructed on an existing sewer where sewage flow must be maintained, the test will be visual.
- 2. Conduct tests in presence of and to complete satisfaction of the Authority.
- 3. Should a manhole not satisfactorily pass testing, discontinue manhole construction in the project until such manhole passes test satisfactorily.
- 4. Provide tools, materials (including water), equipment and instruments necessary to conduct manhole testing as specified herein.
- 5. Prior to testing manholes, thoroughly clean such and seal openings using properly sized plugs.
- 6. Perform testing with frames installed. The joint between the manhole and the manhole frame shall be included in the test.
- 7. The tests of the manholes for acceptance shall be conducted after the backfilling has been completed.

8. Vacuum Testing Equipment:

- A. Use vacuum apparatus equipped with necessary piping, control valves and gauges to control air removal rate from manhole and to monitor vacuum.
- B. Provide an extra vacuum gauge of known accuracy to frequently check test equipment and apparatus.
- C. Vacuum testing equipment and associated testing apparatus subject to Authority's approval.
- D. Provide seal plate with vacuum piping connections for inserting in manhole frame.

9. Vacuum Test Procedure:

- A. Perform vacuum testing in accordance with the testing equipment manufacturer's written instructions.
- B. Draw a vacuum of ten inches of mercury and close the valves.
- C. Consider manhole acceptable when vacuum does not drop below nine inches of mercury for the following manhole sizes and times.
 - i. Four foot diameter – 60 seconds.
 - ii. Five foot diameter – 75 seconds.
 - iii. Six foot diameter – 90 seconds.
- D. Repair and Retest: Determine source or sources of leaks in manhole causing failure. Repair or replace defective materials and workmanship, as is the case, and conduct such additional manhole acceptance tests and such subsequent repairs and retesting as required until manholes meet test requirements. Materials and methods used to make manhole repairs must meet with Authority's approval prior to use.

SECTION 5

LOW PRESSURE SEWER SYSTEM'S AND GRINDER PUMP UNITS MATERIALS AND METHODS OF DESIGN AND CONSTRUCTION

I. GENERAL

1. This Section shall describe the design and construction for materials and methods to be used for low pressure sewer systems and grinder pump units and how they will be permitted and owned.

II. APPLICATION

1. A development shall be considered for a low pressure sewer system when the development is ten (10) residential EDUs or less at full development and there is not gravity sewer service available to the development or connection to the gravity sewer system is cost prohibitive for the development. Any Developer wishing to construct a low pressure sewer system with more connections than ten (10) residential EDUs shall submit such a request to the Authority for their consideration with just reasoning why the low pressure system is the best alternative for the development.

This section also applies to property owners when gravity sanitary sewer service is unavailable. Property owners shall install an Authority-approved grinder pump unit for sanitary sewer service needs when gravity sanitary sewer service is unavailable to service a property as determined by the Authority.

In general, the Authority encourages (and may require) the extension of the gravity system throughout the Authority service district where possible.

III. DESIGN

1. The design of a two or more EDU low pressure system shall be submitted to the Authority Engineer and sealed by a Professional Engineer. The design calculations shall indicate the program or method that has been used as well as all assumptions used in the calculations. The design methodology shall be generally accepted as sound engineering practice. The design calculation shall be prepared in a way that is straightforward for the review Engineer to follow.

IV. OWNERSHIP AND RESPONSIBILITIES

1. The Authority after acceptance of the design and construction will accept Ownership of the conveyance (force main) portion of the system including valves, fittings, cleanouts and other appurtenances that are downstream of

the curb stop (including curb stop) for each individual grinder pump station. The Developer, property owners, Homeowner's association or other(s) shall be responsible for the maintenance and ownership of everything upstream of the curb stop. See Standard Details for demarcation.

V. INDIVIDUAL PACKAGED GRINDER PUMP STATIONS

1. The Developer or property owner shall provide one pump station for each residential unit within the development. The packaged pump station system provided shall be the Environment One Series DH071 and shall have at minimum a 70 gallon receiver. The grinder pump shall be suitably mounted in a basin constructed of high density polyethylene (HDPE), NEMA 6P electrical quick disconnect (EQD), pump removal system, stainless steel discharge assembly/shut-off valve, anti-siphon valve/check valve, each assembled in the basin, electrical alarm panel and all necessary internal wiring and controls. The pump shall have a 1 HP, 240 volt, 60 hertz, single phase motor. All appurtenances including but not limited to the stainless steel discharge, PVC anti siphon valve, check valves, ball valves, grinder, motor, mechanical seal, basin, controls and alarm panel shall be supplied by the manufacturer.
2. Each pump station shall be supplied with a NEMA 4X control panel supplied by the pump station manufacturer that includes a high water alarm circuit with light, relay, buzzer and silencing switch.
3. No "or-equals" will be accepted.

VI. PIPING, VALVES AND FITTINGS

1. The pipe, valves, fittings and appurtenances of the low pressure sewer system/grinder pump unit shall meet the minimum requirements as listed below:
2. Pressure Pipe (Main): The pipe shall be Class 200 (IPS) SDR 21 PVC in compliance with ASTM D-2241 with material properties in compliance with ASTM D-1784. The seals shall be in compliance with ASTM F-477 and the joints shall be in compliance with ASTM D-3139. Other pipe materials may be considered upon submission to the Authority.
3. Pressure Pipe (Lateral): The pipe shall be Schedule 40 PVC with a pressure rating of 330 psi @ 73.4 deg. F. Schedule 40 pipe material properties shall be in compliance with ASTM D-1784 with a cell classification of 12454. Alternatively, the pipe may be SDR 11 polyethylene with a pressure rating of 160 psi @ 73.4 deg. F. SDR 11 pipe material properties shall be in

compliance with ASTM D-3350 with a cell classification of PE:345434C. Other pipe materials may be considered upon submission to the Authority.

4. Ball Valve Curb Stop-Low Pressure Systems: The ball valve shall be a Bronze body, spherical fluorocarbon-coated brass ball providing minimal headloss and ease of opening, must have molded Buna-N rubber seats, be watertight and non-directional, be designed to withstand pressures up to 300 PSI., and be capable of accepting connection to specified pipe. Acceptable manufacturer: Mueller.
5. Check Valve-Low Pressure Systems: The check valves shall be injection molded from non-corroding, glass fiber reinforced PVC, the flapper shall include a non-fouling, integral hinge made from fabric reinforced synthetic elastomer to assure corrosion resistance, dimensional stability, fatigue strength and trouble free operation, must have a full-ported passageway introducing friction loss of less than 6 inches of water at maximum rated flow, have a non-metallic hinge shall be integral part of flapper assembly providing a maximum degree of freedom to assure seating at low back pressure.
6. Curb Box-Low Pressure Systems: The curb box shall be constructed of cast iron and steel pipe. All components shall be heavily coated with asphalt paint to assure durability in the ground. The curb box shall provide minimum of 12 inches of height adjustment downward (shorter) from extended height. Acceptable Manufacturer: Ford Meter Box Company, Inc.
7. Ball Valve Curb Stop/Check Valve Assembly-Individual Grinder Pump Unit: The curb stop shall be pressure-tight in both directions. The ball valve actuator shall include position stop features at the fully opened and closed positions. The curb stop/check valve assembly shall be designed to withstand a working pressure of 235 psi. The stainless steel check valve shall be integral with the curb stop valve. The check valve will provide a full-ported passageway and shall introduce minimal friction loss at maximum rated flow. The flapper hinge design shall provide a maximum degree of freedom and ensure seating at low back pressure. Acceptable manufacturer: Environment One.
8. Curb Box-Individual Grinder Pump Unit: Curb boxes shall be constructed of ABS, conforming to ASTM-D 1788. Lid top casting shall be cast iron, conforming to ASTM A-48 Class 25, providing magnetic detectability, and be painted black. All components shall be inherently corrosion-resistant to ensure durability in the ground. Curb boxes shall provide height adjustment downward (shorter) from their nominal height. Acceptable manufacturer: Environment One.
9. Air/Vacuum release valves, blow-offs and cleanouts shall also be provided as a part of the design where required.

SECTION 6

CONSTRUCTION CONTROLS

I. MAINTENANCE AND PROTECTION OF TRAFFIC

1. General

- A. During the progress of the work, the Developer shall make ample provision for both vehicular and foot traffic on public and private roads. The Developer shall so organize and conduct his work so that traffic can be properly maintained and detouring and rerouting of traffic is kept to a minimum.
- B. The provisions of this Section shall not in any way relieve the Developer of any of his legal responsibilities or liabilities for the public. The Developer shall provide and maintain safeguards, safety devices, and protective equipment and take any other needed actions that may be necessary to protect the public and property in connection with the work. The Developer shall restore all original pavement markings, signs, and traffic control devices.

2. Local Traffic

- A. For local traffic, the Developer shall provide and maintain in safe condition, including snow and ice removal, such drives, temporary roadways, bypasses sidewalks, or temporary structures as may be necessary to provide vehicular and pedestrian ingress and egress for the residents and facilities adjacent to the improvements. Temporary approaches and crossings of intersecting highways shall also be provided and maintained in a safe condition.
- B. The Developer shall also provide free access to all factory entrances, driveways, fire hydrants and water and gas valves located along the line of his work. The Developer shall lay and maintain temporary driveways, bridges, and crossings as in the opinion of the Authority or Owner are necessary to maintain access and to reasonably accommodate the public.

3. Through Traffic

- A. When the street under construction is being used by through traffic including periods of suspension of the work, the Developer shall so maintain by the use of labor, equipment, and materials, that portion of the highway being used, so that it is smooth, free from holes, ruts,

ridges, bumps and dust. The street being used shall be provided with the necessary outlets to drain freely. Pipe trenches or other openings left in hard surface pavement shall be maintained with material as specified.

- B. The Municipalities or State may enter upon that portion of the project where the Developer is responsible for maintaining traffic through part of the entire project, to remove snow and ice and place abrasives at its own expense, as may be considered advisable. The Developer shall be responsible for the removal of abrasives placed.
- C. The Developer shall lay and maintain temporary bridges and crossings such as in the opinion of the Municipality, State or Authority are necessary to accommodate through traffic and the general public.

4. Traffic Control Measures

- A. The installation and operating of all traffic controls and traffic control devices shall conform to the requirements of the "Pennsylvania Work Zone Traffic Control Devices", PennDOT publications hereinafter called the Pennsylvania Manual and other.
- B. Barricades and channelizing devices such as cones, hazard markers, and drums shall be highly visible. They shall also be protected by adequate advance warning devices and by suitable lighting or reflectorization at night (between the hours of sunset and sunrise).
- C. Equipment and material stored on the street shall be marked at all times. At night, any such material or equipment stored between the side ditches, or between lines five (5) feet behind any raised curbs, shall be clearly outlined with lighted pot torches or other dependable devices that are approved by Municipality, State or Authority. In addition, the Developer shall provide any other lights, barricades, etc., that may be needed for the protection of pedestrian traffic.

5. Lane Closed

- A. When a traffic lane is closed to traffic, the Developer shall provide, erect, and maintain approved barricades, suitable and sufficient red lights and such other lights or reflecting material.
- B. Throughout construction, the Developer shall furnish, erect and maintain all signs, lights, barricades, watchmen, etc. for maintenance of local traffic.
- C. The Developer shall, if required, furnish, erect, and maintain such additional traffic control devices as are required on public streets which

are used as detours, including the one way traffic signs upon the barricades at the point where the lane is closed. Should the Developer find it necessary to completely close any street during the progress of the project, he shall make such requests in writing to the Municipality at least twenty-four (24) hours previous to such closing.

6. Traffic Maintained

- A. Where construction is along a street or roadway being used by through traffic, including periods of suspension of the work, the Developer shall furnish and maintain lights, warning signs, road construction traffic maintained signs and end construction signs, barricades, temporary guard rail, and such other traffic control devices, and watchmen and flagmen as may be necessary to maintain safe traffic conditions within the work limits.
- B. The Developer shall furnish, erect, and maintain regulatory signs, route guide signs, and the pavement markings within the work limits on all traffic maintained sections. The erection and removal of all regulatory signs shall be approved by the Municipality.
- C. When it is necessary for the Developer to relocate signs of other traffic controls to carry out provisions of the work, he shall supply suitable supports and relocate and re-erect the signs so the traffic control is not out of service to the motorists using the facility.
- D. Whenever it is necessary for the Developer to divert the flow of traffic from its normal channel into another channel, the channel for such diverted traffic shall be clearly marked by the Developer with the cones, drums, barricades, or temporary hazard markers. This method of marking shall also be used where work is being done adjacent to the part of the highway in use by the public or where work is being used by the public. At night, cones, drums, barricades, or temporary hazard markers shall be delineated by pot torches or other suitable devices.

7. Flagmen

- A. Whenever one-way traffic is established, at least two flagmen shall be used and signs, cones, barricades, and other traffic control devices shall be erected by the Developer in accordance with the Pennsylvania Manual. The signs, barricades, hazard markers, or cones shall be properly reflectorized or lighted at night. The Developer shall maintain positive and quick lines of communication between the flagmen at the opposite ends of the restricted area.
- B. All watchmen and flagmen shall be equipped and perform their duties according to the standards for flagging traffic contained in the

Pennsylvania Manual. The red flag or Stop-and-Slow sign may be used. At night, the flagmen shall use a red lantern or red light, or the flagman may use the red flag if his station is adequately illuminated.

- C. The Developer may, in lieu of watchmen and flagman or supplementing them, furnish, install, and operate a traffic signal or signals, for the purpose of regulating traffic.
8. Performance: In the event of the Developer's failure to comply with these provisions, the Authority may cease the Developer's work until all provisions are in compliance. The Authority's decision to cease the Developer's work, in no way releases the Developer from his general or particular liability for the safety of the public or of the work.
9. Specific Maintenance of Traffic
- A. Unless otherwise permitted, directed, or ordered by the Municipality or State, traffic shall be specifically maintained as follows:
 - i. All trenches and openings shall be backfilled as soon as possible as specified, and the pavement restored.
 - ii. The Developer shall confer with others who may be affected by the project before starting any work at certain locations and the carrying out of this work shall be covered by agreements reached at such conferences.
 - iii. Street intersections may be blocked by one-half (1/2) at a time.

II. CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

- 1. Comply with all applicable laws and regulations of authorities having jurisdiction, including, but not limited to, building codes, health and safety regulations, utility company regulations, and environmental protection regulations.
- 2. Provide electrical equipment which is UL listed.
- 3. Remove temporary above-grade or buried utilities, equipment, facilities, materials, prior to project closeout.
- 4. Clean and repair damage caused by installation or use of temporary work.
- 5. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

6. Developer shall provide connections to existing facilities, size to provide service required for power and lighting and be responsible for associated items including but not limited to the following.
 - A. Install circuit and branch wiring, with area distribution boxes located to that power and lighting is available throughout the construction site by the use of construction-type power cords.
 - B. Provide adequate artificial lighting for all areas of work when natural light is not adequate for work and for areas accessible to the public.
7. Developer shall provide water for construction purposes.
8. Developer shall provide sanitary facilities in compliance with local and state laws and regulations. Service, clean, and maintain facilities and enclosures.
9. Furnish, post, maintain, and remove guardrails, barricades, and construction warning signs in sufficient number and at appropriate locations to protect and safeguard Developer personnel, property, and operations during construction.