APPENDIX A

Township of Pequannock Sanitary Sewer System Construction Standards and Testing Requirements

TOWNSHIP OF PEQUANNOCK

SANITARY SEWER SYSTEM CONSTRUCTION STANDARDS AND TESTING REQUIREMENTS

Prepared for:

Township of Pequannock
530 Newark-Pompton Turnpike
Pompton Plains, NJ 07444

February 1, 2020

CREW | Water Wastewater Environmental Civil Engineering

Crew Engineers, Inc.
1250 Route 23 North
Butler, NJ 07405
(973) 492-3300
(973) 492-1123 (fax)

NJ Certificate of Authorization 24GA27920500

Table of Contents

DRAWINGS

1.0 INTRODUCTION

1.1 Summary

These Standards outline procedures, materials, installation, and testing requirements for the approval and acceptance of sanitary sewerage facilities instituted by developers and other applicants to be installed in the Township of Pequannock, Morris County, New Jersey.

These Standards do not provide an exhaustive list of required permits for every project, which may include New Jersey Department of Environmental Protection (NJDEP) Treatment Works Approval (TWA), Morris County Road Opening Permit, Township of Pequannock Road Opening Permit, and Township of Pequannock Construction Permit, all of which may have additional requirements to those listed herein. All permitting is the responsibility of the Developer/Applicant.

When used in this document or the corresponding drawings, references to “Engineer” shall mean the Township Engineer or the Township’s appointed Sewer Engineer.

When used in this document or the corresponding drawings, references to “contractor” shall mean the Developer/Applicant or his contractor.

2.0 INFORMATION TO BE SUBMITTED FOR REVIEW

2.1 Preliminary Submission

Preliminary plans for projects within the Township of Pequannock shall be submitted by Developer (or his representative) through the Planning Board to the Engineer after approval of the street plan. Projects that do not require Planning Board approval or that are outside the Township of Pequannock but connected to the Pequannock sewer system shall be submitted by Developer/Applicant through the Department of Public Works to the Engineer. All submitted plans shall include the following:

1. Two (2) hard copies and one (1) PDF set of Plans showing preliminary layout of the sanitary sewers and appurtenances.
2. Plans shall be prepared on a sheet size of at least 22" x 34".
3. All Plans shall be consecutively numbered, and the total number of Drawings submitted shall be indicated on each Drawing.
4. Plans shall show at least the following:
    a. Existing topography.
    b. Proposed topography.
    c. Existing pavement grades.
    d. Proposed pavement grades.
    e. Existing lot lines.
    f. Proposed lot lines.
    g. Location of existing water, sewer, gas, underground telephone, and electric utilities.
    h. Location of proposed sanitary sewers, size, material, and class.
    i. Location of proposed manholes.
    j. Location of proposed water, gas, underground telephone and electric utilities.
    k. First-floor and basement floor elevations of proposed buildings.
5. Existing conditions survey shall be prepared by a Professional Land Surveyor licensed to practice in the State of New Jersey.
6. All elevations shall be based on NAVD88 Datum, US Survey Feet. All horizontal control shall be based on New Jersey State Plane Coordinate System NAD83.
7. Plans shall be drawn to a scale of 1" = 40' or larger.
8. Profiles shall be drawn to a vertical scale of 1" = 4´, and a horizontal scale of 1" = 40' or larger.

9. Plans shall be prepared by a Professional Engineer licensed to practice in the State of New Jersey.
10. The Developer/Applicant's engineer is responsible for the design of the sanitary sewerage facilities to ensure the proper depth and location of the sanitary sewers to serve the lowest elevation of the residence or building.
11. The sanitary sewerage facilities shall be designed in accordance with the Township's Sewer Master Plan to ensure the proper depth and location of the sanitary sewers to serve additional properties in the future as shown on the Conceptual Future Sewers plan.
12. One permanent benchmark should be shown within the construction area for every 1,000 feet of proposed sanitary sewer. Benchmark tie sheets shall be submitted to the Planning Department.

2.2 Preliminary Review

The Engineer will review the preliminary plans for conformance with Section 3.0 - DESIGN CRITERIA and make recommendations on the preliminary submission to the Township. The Township will review the recommendations and, if it concurs with the Engineer's findings, will approve the preliminary Plans.

2.3 Final Submission

Upon approval of the preliminary Plans, all corrections shall be made and the following shall be submitted to the Engineer:

1. Two (2) hard copies and one (1) PDF set of plans marked "Final for Sanitary Sewers".
2. Two (2) copies of NJDEP TWA application (including TWA-1 Form, WQM-003 Form, WQM-006 Form, notifications, and check for Plan review). For sanitary sewer systems that are to be owned and operated by the Township, the application shall be prepared on behalf of the Township for signature by an authorized representative of the Township.
3. Final Plans shall include the following in addition to the items required for preliminary submission:
    a. Plans and Profiles showing sanitary sewer grades, stationing between manholes, manhole identifying numbers. Elevations of inverts and top of manholes.
    b. Location of all sewer laterals, including cleanouts, plumbing elevations and slopes.
    c. Engineer's Report (NJDEP Form WQM-006).
4. The Engineer's Specifications required by the NJDEP to be submitted with the application will meet these Sanitary Sewer System Construction Standards and Testing Requirements.
5. Structural computations and loads for all pipes greater than 20 feet in depth (as measured from invert to ground surface).

6. Design computations for all special structures.
7. Hydraulic computations substantiating the size of all sewer pipes and wastewater facilities.
8. A note indicating that the sanitary sewer shall be constructed in conformance with the Township of Pequannock Sanitary Sewer System Construction Standards and Testing Requirements, dated February 1, 2020, as may be amended from time to time.
9. Other information pertinent to the design, such as soil boring samples that have been collected or that are required.
10. Final Plans and other supporting information shall bear the signature and seal of the Professional Land Surveyor who prepared the survey and the Professional Engineer who prepared the design, and shall show the date of the preparation.

2.4 Final Review

Subject to the satisfactory completion of all final data, the Engineer will recommend approval of the data by the Township.

The Township will review the recommendations and, if it concurs with the Engineer's findings, will approve the Final Plans, execute the application to the NJDEP, and return it to the Developer/Applicant's engineer for transmittal to the Two Bridges Sewerage Authority (TBSA), if applicable, and the NJDEP for approval. All correspondence to or from the TBSA and NJDEP shall be copied to the Township Engineer and the Engineer. Construction of sewerage facilities shall be subject to the approval of the Plans and application by the NJDEP.

3.0 DESIGN CRITERIA

3.1 General

The design shall comply with the latest regulations of the NJDEP Pollutant Discharge Elimination System, NJAC 7:14A 1 through 4, 6 through 23 promulgated pursuant to NJSA 58:10A 1, et seq; 58:11A 1, et seq; 58:11 49, et seq; 58:10 23.11, et seq; 58:11 64, et seq; ; 13:1D 1, et seq; 13:1E 1, et seq; and 58:12A 1, et seq; 13:1B 3, et seq and 26:2C 1, et seq , except as otherwise indicated or modified in these Standards. In addition, where appropriate, the sanitary sewer facilities shall comply with the Residential Site Improvement Standards, NJAC 5:21 6, Sanitary Sewers; and Chapter 152, Sewers, of the Code of the Township of Pequannock, as amended.

The slope of the upper portions of all dead-end sewers, where possible, shall be 0.008 feet per foot to minimize maintenance problems.

The sewer lateral shall provide for sewer service to the basement of the house or building, if applicable. The first-floor elevation should be consistent with the topography of the lot and the requirements of the Township with respect to the elevation above the road surface.

3.2 Manholes

Manhole spacing for sanitary sewers with a diameter of 12 inches or smaller shall be 300 feet, but may be exceeded to avoid spacing closer than 200 feet on a straight run. Maximum manhole spacing shall be 400 feet.

Except where otherwise specified by the Township, sanitary sewer manholes that are located within the right-of-way shall be at or near the center line of the paved cartway, but at a minimum of 5 feet from the edge of the pavement. Additionally, sanitary sewer mains shall be a minimum of 10 feet from the right-of-way line.

3.3 Sewer Laterals

Sewer laterals shall be constructed from the sanitary sewer in the street to the property line of each lot, and shall meet the following requirements:

1. Minimum diameter shall be 4 inches.
2. Minimum slope shall be 1/4 inch per foot.
3. Watertight plugs or caps shall be provided at all dead ends.
4. A cleanout shall be provided as shown on the Details under Section 3.4.

When in the opinion of the Engineer, the sanitary sewers will be deep, deep sewer lateral connections, as shown on Construction Detail Drawing 10, shall be constructed by the contractor to eliminate excessive depth of the sewer lateral.

All existing sewer laterals on a site that are permanently taken out of service as a result of the building being demolished, new sewer lateral being constructed, or for any other reason must be abandoned. Sewer laterals must be abandoned by removing the entire sewer lateral in the right of way including the cleanout. The sewer lateral connection tee or tee-wye to the sanitary sewer must be plugged with a cap or plug. Other methods of abandonment may be approved at the discretion of the Engineer.

3.4 Construction Details

The following construction details are appended hereto as part of these Standards:

Drawing	Title
1	Sewer Bedding Details
2	Standard Sanitary Manhole Detail
3	Interior Drop Connection Detail
4	Shallow Manhole Detail
5	Connection to Existing Manhole Joint Detail
6	Flexible Compression Joint Detail
7	Manhole Frame and Cover Detail
8	Standard Sewer Lateral Connection Detail
9	Sewer Lateral Cleanout Detail
10	Deep Sewer Lateral Connection Detail
11	Concrete Encasement Detail

4.0 MATERIAL SPECIFICATIONS

4.1 Pipe

All sewer pipe shall meet the following specifications. Two (2) copies of Certificates of Compliance with these specifications shall be furnished by the pipe manufacturer for the Engineer's approval with each shipment of pipe.

1. Polyvinyl Chloride Sewer Pipe

   Polyvinyl chloride sewer pipe shall conform to Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Plastic Piping Systems ASTM D-3034. Minimum Class SDR35 shall be used for depths up to 14 feet (as measured from invert to ground surface). Minimum Class SDR26 is required where trench depths are greater than 14 feet (as measured from invert to ground surface). Pipe with a diameter larger than 12 inches will be evaluated on a case-by-case basis. Joints shall be sealed with rubber gasket so assembly will remain watertight under all conditions of service, including movement resulting from expansion, contraction, settlement, and deformation of pipe. Gaskets shall be elastomeric and conform to ASTM F477.

2. Ductile Iron Pipe

   Ductile iron pipe, shall conform to "Ductile Iron Pipe Centrifugally Cast in Metal or Sand-Lined Molds for Water or Other Liquids", AWWA C151. Joints for ductile iron pipe shall be the "push-on" type. Ductile iron pipe shall be asphaltic-coated, minimum Class 52, and lined with Protecto 401 ceramic epoxy lining, as manufactured by Induron Protective Coatings. Gaskets shall conform to AWWA C111.

3. Sewer Laterals

   See Construction Detail Drawings 8, 9, and 10 of these Standards. Sewer laterals shall be constructed of the same material as the sanitary sewer. Cleanout risers and tee wyes shall be the same material as the sanitary sewer.

   Provide wye-type building sewer saddles, as manufactured Harrington Corporation, or approved equal for connecting sewer laterals to existing sanitary sewers. Saddle base shall be molded and be suitable for SDR35 PVC pipe connection. All bolts and straps shall be stainless steel.

4.2 Manholes

All manholes shall be precast concrete constructed in accordance with Construction Detail Drawings 2, 3, 4, 5, 6, and 7 of these Standards.

Cast-in, push-fit, compression pipe to manhole connectors shall be A-LOK X-CEL as manufactured by A-Lok Products, Inc., Tylox WT+ as manufactured by Hamilton Kent, or approved equal. Boots and other connectors that rely on clamps and bands will not be acceptable.

Preformed flexible joint sealants shall be butyl rubber or flexible plastic. Butyl rubber joint sealant shall be Kent Seal (as manufactured by Hamilton-Kent, Inc.), Rubr-Nek (as manufactured by Henry Company), Butly-Lok (as manufactured by A-Lok Products, Inc.), or approved equal. Flexible plastic joint sealant shall be Ram-Nek, as manufactured by Henry Company, or approved equal.

Coal tar epoxy for exterior coating shall be Targuard or approved equal. Trowel grade bituminous coating for exterior coating shall be 793 Premium Foundation Coating, as manufactured by Henry Company, or approved equal.

Manhole steps shall be made out of solid aluminum or plastic-coated steel. Embedded portion of steps shall be deformed and grouted to withstand specified live loading.

1. Solid aluminum steps shall be manufactured of extruded aluminum. Hollow steps will not be permitted. Steps shall be 7/8-in. riser x 13/16 in. tread, and project into manhole wall 4 3/4 in.
2. Plastic-coated steel manhole steps shall be manufactured of gray iron in accordance with ASTM Specification A48 83, Class 30B or ASTM A615 Gr 60 steel rebar and coated with copolymer polypropylene plastic. Solid plastic steps will not be permitted.

Heat shrinkable sleeve for encapsulation of upper portion of manhole shall be WrapidSeal as manufactured by CCI Pipeline Systems, Riser-Wrap as manufactured by Pipeline Seal and Insulator, Inc., or approved equal.

Drop manholes will be constructed in accordance with Construction Detail Drawing 3 where the difference between the inlet and outlet pipe elevations is 2 feet or greater.

If a force main will connect to a manhole, the interior of the manhole shall be lined with Dura Plate 100 Liner System, as manufactured by A-Lok Products, Inc., or approved equal. Any areas of concrete not covered by the liner shall be coated with epoxy as manufactured by NeoPoxy International, Dura-Plate 235 epoxy as manufactured by Sherwin Williams, or approved equal.

4.3 Miscellaneous

1. Flexible Connectors

   Synthetic rubber base compound formulated to resist acids, alkalis, solvents, and greases encountered in sanitary or storm sewers and contain no reclaimed rubber, as

manufactured by FERNCO, Inc., Clow, or approved equal. All hardware shall be stainless steel.

Material specifications for other special sewerage system facilities, such as pump stations and force mains, will be furnished by the Engineer when necessary.

5.0 INSTALLATION

5.1 General

See Trench Detail Drawing 1 of these Standards.

No facilities shall be constructed until the Township has received the approved TWA Permit for the Construction of the Facilities from the NJDEP, the applicable road opening permit has been secured, and approval to begin construction has been granted to the Developer/Applicant by the Township of Pequannock.

Prior to the ordering and delivery of materials required for construction of the sanitary sewer facilities, the Developer/Applicant or his contractor shall submit to the Engineer one copy (either hard copy or PDF) of shop drawings for the various components for review and approval. Materials that do not comply with these Standards will be rejected and revised shop drawings shall be submitted. Any materials ordered by the contractor prior to receiving approval from the Engineer, will be at the contractor's risk.

For large projects (as determined by the Township), prior to commencement of the construction of the sanitary sewers, the Developer/Applicant and his contractor will be required to attend a pre-construction meeting to review and discuss the various aspects for the construction of the sanitary sewers. The contractor will be required to furnish a detailed schedule showing the proposed sequence of construction for the sanitary sewers with time table of dates.

All manholes and sewer lateral cleanouts shall be properly staked in the field by the Developer/Applicant's licensed land surveyor. The Developer/Applicant's licensed land surveyor is responsible for furnishing and installing grade stakes for the construction of the facilities. Submit surveyor's grade calculation sheets for proposed construction of sanitary sewer to the Engineer prior to beginning sewer construction.

The Developer/Applicant shall notify the Township Engineer and the Engineer at least 72 hours prior to the start of construction.

The Engineer will perform full-time observation of the construction performed by the Developer/Applicant or the Developer/Applicant's contractor (see Section 6.0 of these Standards). All construction work performed on private property for installation of the house service connection is under the jurisdiction of the Township of Pequannock Construction Official. The Developer/Applicant shall be responsible to secure the necessary permit and provide notice to the Construction Official as required.

The Developer/Applicant's contractor that performs the work shall be experienced in the construction of sewerage facilities. It is the responsibility of the Developer/Applicant to engage qualified contractors and subcontractors to perform the work whose workers have received training in construction site safety and are familiar with Federal, State, and local regulations applicable to the project. The contractor is responsible for the complete safety of his workers,

pedestrians, travelling public, Township representatives, and others at the construction site, and shall comply with applicable provisions of the Federal Occupational Safety and Health Act (OSHA) and applicable provisions of State, County, and local safety regulations. When on site, the Engineer and Township representatives will comply with the Health and Safety Plan established by the contractor for the project site. The Developer/Applicant's contractor is responsible to furnish a copy of the Health and Safety Plan to the Engineer and Township prior to beginning construction.

If the Engineer or Township determines that the contractor's safety plans, programs, and procedures do not provide adequate protection for the Engineer or Township representatives, the Engineer or Township may direct its employees or representatives to leave the project site or implement additional safeguards for his employees' or representatives' protection. If taken, these actions will be in furtherance of the Engineer's or Township's responsibility to its employees and representatives only, and neither the Engineer nor Township will assume responsibility for protection of any other persons affected by the work.

If the Engineer or representative of the Township observes situations which appear to have potential for immediate and serious injury to persons, Engineer or representative of the Township may warn persons who appear to be affected by such situations. Such warnings, if issued, shall be given based on general humanitarian concerns, and Engineer or representative of Township will not, by issuance of any such warning, assume any responsibility to issue future warnings or any general responsibility for protection of persons affected by work.

5.2 Pipe

All pipe shall be laid in a dry trench with the trench bottom providing proper support.

Where the bottom of the trench at subgrade is found to be unstable or to include ashes, cinders, all types of refuse, vegetable or other organic material or large pieces of inorganic material, the contractor shall excavate and remove such unsuitable material to the depth required and replace it with a thoroughly compacted foundation of 1 1/2 –inch stone.

In areas where rock or boulders occur, the trench shall be excavated so that no rock or boulder is closer than 8 inches to the outside barrel of the pipe.

Where groundwater conditions exist, the contractor shall provide dewatering operations as necessary to dewater the trench a minimum of 12 inches below the invert of the sewer pipe. The Developer/Applicant will be responsible to obtain any required permits for dewatering operations.

Lateral Pipe connection to existing sewers shall be made by carefully cutting, coring, or drilling an opening in the existing pipe wall, dimensionally equal to that recommended by the manufacturer of the sewer saddle.

The bedding and initial backfill shall be granular material free from frozen earth and stones larger than 1 inch in diameter, and shall be thoroughly tamped on each side and under the pipe and, insofar as practicable, in layers not exceeding 6 inches in thickness.

Backfill in the upper portion of the trench shall be free from wet or frozen earth, unsuitable material or refuse, and stones larger than 6 inches in diameter. The backfill shall be compacted to eliminate any subsequent settlement of the pavement, sidewalk, or lawns to be constructed over the pipe. Where sufficient satisfactory backfill material is unavailable on the site, or where excavated material has been determined by the Engineer to be unsuitable, the contractor is required to provide select fill material.

1. Under Existing or Future Roadways, Sidewalks, and Driveways

   All backfill more than 1 foot above the top of pipe in roadways or where sidewalks, driveways, utilities, fences, or curbing exist or will be constructed over the area to be backfilled, shall be compacted as follows:

   a. By approved vibratory soil compactors if the backfill material is preponderantly sand or sand and gravel and contains less than 12 percent by weight of materials that will pass a 200 mesh sieve.
   b. By approved flat-faced mechanical tampers, if the backfill material is preponderantly cohesive.

   In (a) above, approved flat-faced mechanical tampers may be substituted for the vibratory soil compactors where the sheeting and bracing of trenches or other special conditions make the use of vibratory compactors impractical.

   The backfill shall be placed and compacted in layers not more than 6 inches thick when using mechanical tampers and not more than 12 inches thick when using vibratory compactors, loose measurement, unless the contractor can demonstrate through soil compaction testing that the required compaction can be achieved when backfilling in greater thickness layers.

   Jetting, flooding, puddling, or vibroflotation of trench materials to achieve compaction or trench settlement will not be permitted.

2. In Open Areas That Will Remain as Open Areas

   Backfilling trenches more than 1 foot above the top of pipe in areas where roadways, sidewalks, driveways, utilities, fences, or curbing do not exist or will not be constructed, may be done with bulldozer or power shovel if recommended by Developer/Applicant's engineer. Where backfilling is permitted with bulldozer or power shovel, the contractor shall provide supervision in addition to the machine operator at the point of backfilling to carefully supervise this operation. Backfill material must not be dropped directly in the

open trench, but the trench shall be backfilled by sliding the backfill down the inclined face of the material in the trench.

5.3 Manholes

Manholes shall be installed in a dry trench in a plumb position and properly supported by a layer of thoroughly tamped bedding, as shown on Construction Detail Drawing 2 of these Standards.

The joints and preformed flexible joint sealants of the precast sections to be placed together shall be thoroughly cleaned prior to jointing, and shall be checked for proper jointing subsequent to placing the sections together. The manhole steps in each section shall be aligned to form a continuous ladder to the top of the manhole. Lift holes in precast sections shall be plugged with a rubber stopper, and then filled with mortar and made watertight. The pipe connections to the manholes shall utilize flexible joints, as shown on Construction Detail Drawing 6 of these Standards.

Backfill around manholes shall be placed in 6 inch layers and thoroughly compacted to eliminate settlement. Backfill within 2 feet of the structure walls shall be free of stones larger than 3 inches in diameter.

5.4 Miscellaneous

Installation requirements for other special sewerage system facilities, such as pump stations and force mains, will be established by the Engineer when necessary.

6.0 INSPECTION AND TESTING

6.1 General

All proposed sewerage facilities shall be subject to the approval of the Engineer. The Engineer is responsible for observing the construction of the sanitary sewers and appurtenances for conformance with the Township Standards, inspecting the constructed sanitary sewer, and witnessing the testing of the sanitary sewer.

6.2 Full-time Observation

The Engineer will perform full-time observation of the construction performed by the Developer/Applicant or the Developer/Applicant's contractor. The detailed observation of construction by the Engineer will include observation of the excavation of the trench, the trench prior to pipelaying, the installation of all sewerage facilities, the backfilling and compacting of all trenches, and paving of all trenches. This observation will be performed by a responsible, qualified representative of the Engineer.

6.3 Final Inspection

Following installation of the sanitary sewerage facilities by the Developer/Applicant, he shall clean out all of the sewers and manholes and notify the Engineer that the facilities are ready for a final inspection. The Developer/Applicant shall notify the Township Engineer and the Engineer, at least 72 hours prior to the start of final inspection and testing.

The Developer/Applicant will be responsible to perform a televised video inspection of the constructed sewers upon their completion. The televised inspection must be witnessed by the Engineer. In conjunction with the televised video inspection, the Developer/Applicant shall aid the Engineer or his designated representative in making an internal visual inspection of each section of the constructed sewer from manhole to manhole. A copy of the digital recording for the televised inspection shall be furnished to the Engineer.

The pipe shall be true to line and grade, shall show no leaks, shall be free from cracks and protruding materials, and shall contain no deposits of sand, dirt, or other materials which will reduce the full cross-sectional area of the pipe and reduce the flow.

6.4 Testing

After a satisfactory visual inspection of the facilities, pipes shall be tested by deflection testing and either air testing or infiltration testing, and manholes shall be tested by either exfiltration testing or vacuum testing. The testing shall be made by the Developer/Applicant's contractor and the tests must be observed by the Engineer or his designated representative. The Engineer will prepare a written report on the results of the testing.

1. Deflection Testing

   Deflection testing will be required for 8 inches or greater PVC pipe but not DIP pipe. Deflection testing shall be performed by the contractor using a cylindrical mandrel. For testing pipelines having an inside nominal diameter of 8 inches, the test mandrel shall have 8 evenly spaced arms or runners. For testing pipelines having an inside nominal diameter of 10 inches or greater, the test mandrel shall have 12 evenly spaced arms or runners. Such mandrels shall be a manufactured product approved by the Engineer. The allowable deflection limit shall be 5 percent. The deflection testing shall not begin until the sewer pipe has been installed for at least 30 days, or as approved by the Engineer.

   The contractor shall thoroughly clean the pipeline by a high-velocity water jet stream or an inflatable sewer cleaning ball prior to pulling the test mandrel through the pipeline. If the mandrel cannot pass through the pipe section being tested, the contractor shall replace said pipeline at the point of blockage. Upon completion of the replacement or repair, the pipe section shall be retested (including televised video inspection) until a satisfactory result is obtained.

   The initial deflection testing shall be completed and approved prior to commencement of low-pressure air testing or infiltration testing.

2. Air Testing of Sewer Pipe

   Furnish all labor, materials, and equipment necessary to perform the test as follows:

   a. Clean pipe to be tested with water or by high-pressure water jet.
   b. Plug all pipe outlets with suitable test plugs. Brace each plug securely.
   c. At no time shall the test pressure exceed 5 psig. A regulator or relief valve set no higher than 5 psi shall be included on all pressurizing equipment.
   d. Add air slowly to the portion of the pipe installation under test until the internal air pressure is raised to 4.0 psig (5.0 psig if groundwater is present above top of pipe).
   e. If any failures are observed, bleed off air and make necessary repairs.
   f. After an internal pressure of 4.0 psig (5.0 psig if groundwater is present above top of pipe) is obtained, allow at least 2 minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
   g. After the 2 minute period, disconnect air supply.
   h. When pressure decreases to 3.5 psig (4.5 psig if groundwater is present above top of pipe), start stopwatch. Determine the time in seconds that is required for the internal air pressure to reach 2.5 psig (3.5 psig if groundwater is present above top of pipe). This time interval should then be compared with the time required below.

TABLE 1 Minimum Specified Time Required for a 1.0 psig Pressure Drop for Size and Length of Pipe Indicated for $Q = 0.0015$

NOTE 1—See Practice UNI-B-6-90.
NOTE 2—Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 30 in. in diameter.

Pipe Diameter, in.	Minimum Time, mins	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) Shown, mins							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

Sewer laterals shall be included in the test.

3. Infiltration Testing of Sewer Pipes

   As an alternative to air testing, infiltration testing of sewer pipes can be performed by the contractor. The maximum allowance for infiltration shall be 50 gallons per 24 hours per inch internal diameter per mile of sanitary sewer, including all sewer lateral connections and manholes.

   Sanitary sewers shall not be tested for infiltration until at least 2 weeks after all backfilling over the sewers has been completed. The Developer/Applicant's contractor shall furnish all weirs, labor, and apparatus necessary to perform the tests. The duration of the tests shall be a minimum of 24 hours.

   Infiltration tests shall only be performed when the groundwater is more than 2 feet above the top of the sanitary sewer pipe as determined by water level measurement. Developer/Applicant will be responsible for installing piezometers for water level measurement and removing same after successful testing.

4. Exfiltration Test for Manholes

   Supply all water, plugs, and all labor and equipment for the test. The exfiltration test shall be made by filling the manhole with water to the bottom of the cone section. After sufficient allowance for absorption of the water in the concrete walls, the amount of exfiltration will be obtained by observing the water level in the manhole for a minimum period of 4 hours. The allowable drop in water level in 4 hours for a 4 foot diameter manhole is 1/8 inch per foot of water depth and for a 5-foot-diameter manhole is 3/16 inch per foot of water depth.

5. Vacuum Testing for Manholes

   As an alternative to exfiltration testing, vacuum testing of manholes can be performed by the contractor.

   a. Test manhole immediately after assembly and prior to backfilling.

   b. Plug all lift holes with an approved nonshrink grout.

   c. All pipes entering the manhole shall be plugged, taking care to securely brace the plugs from being drawn into the manhole.

   d. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendation.

   e. A vacuum of 10 in. of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9 in. The manhole will pass if the time is greater than 60 sec for 48-in.-dia, 75 sec for 60-in.-dia, and 90 sec for 72-in.-dia manholes.

      i. A vacuum test will be disallowed on manholes greater than 72 in. in dia.

   f. If the manhole fails the initial test, necessary repairs shall be made with a nonshrink grout. Retesting shall proceed until a satisfactory test is obtained.

7.0 RECORD DRAWINGS

Prior to acceptance of the facilities by the Township, the Developer/Applicant shall submit Record Drawings of the completed facilities to the Engineer for review and approval and, once approved, file with the Township Engineer one hard copy and one PDF of the approved Record Drawings of the sewerage facilities installed. The Record Drawings shall be revisions of the Final Plan submission with Profiles, and they shall accurately show the following information:

1. Location, size, class, and type of all sanitary sewers and sewer laterals; data will be furnished by the Engineer.
2. Location of all manholes and sewer lateral connections by stationing along the sewers which are installed; data will be furnished by the Engineer.
3. Tie-in measurements from the ends of every sewer lateral (cleanout) at the property line to permanent physical features so that the sewer laterals may be located at any time subsequent to their installation; data will be furnished by the Engineer.
4. The depth of the sewer lateral below the surface of the finished ground at the property line, and depth of deep sewer lateral connections below the surface of the road; data will be furnished by the Engineer.
5. Pipe invert and rim elevations of each manhole to within 0.01 feet of their true elevation; data shall be furnished by the Developer/Applicant's engineer or licensed surveyor.
6. Distance between manholes measured to within 0.10 feet of their true distance together with the pipe slope calculated to within 0.01%; data shall be furnished by Developer/Applicant's engineer or licensed surveyor.
7. The location and extent of any concrete encasement or other special construction used in the construction of the facilities; data will be furnished by the Engineer.
8. Each Plan and Profile sheet of the Record Drawings shall bear the following certification by the Developer/Applicant's engineer:

"The undersigned certifies that the sewers were designed and constructed to serve the lowest elevation of the structures to be connected to the facilities, and that the record elevations, and the distances between manholes are accurate and correct."

_____
Firm Name

By_____
Name (Signature)

P.E. License No._____

Date_____

8.0 APPROVAL OF SEWERAGE FACILITIES

Subject to the satisfactory completion of all of the sewerage system facilities and the performance of all required tests, and filing of test reports and Record Drawings, the Engineer will issue a letter of recommendation of approval; and the Township, if it concurs, will approve and accept the facilities. The approval and acceptance of the facilities will be subject to all special terms and conditions for the specific installation. Upon acceptance of the facilities and prior to the activation of the sanitary sewers, the Developer/Applicant's engineer shall make the required certification submission to the Township, the TBSA, and the NJDEP.

9.0 ENGINEERING SERVICES

The cost of all services provided by the Engineer for reviewing Plans, for full-time observation of construction, and for inspections and approvals shall be paid by the Developer/Applicant. The cost of all engineering expenses incurred by the TBSA for review of plans, and inspection or final testing of the sanitary sewers shall be paid for by the Developer/Applicant. The TBSA and NJDEP application fees shall be paid by the Developer/Applicant.

10.0 SEWER CONNECTION FEES

The Developer/Applicant will be responsible to pay for all sewer connection fees to the Township of Pequannock and must contact the Tax Collector during the application period to determine the appropriate charges.

11.0 GUARANTEE

The constructed sanitary sewer facilities shall be guaranteed to the Township of Pequannock against all defects in materials and workmanship for the specified period established in the executed Developers' Agreement. Where such agreement has not been created, the Developer/Applicant shall furnish a Maintenance Bond in the amount of 100% of the value of the constructed sanitary sewer facilities, as approved by the Township of Pequannock, guaranteeing the constructed sewers against defects in materials and workmanship for a period of two years.

Prior to expiration of the guarantee period, an anniversary inspection of the constructed sanitary sewer facilities will be made by the Engineer together with the Developer/Applicant's contractor. This will include the following:

- Visual inspection of all manholes.
- Observation of all exposed sewer lateral cleanouts caps.
- Visual inspection of each section of sanitary sewer pipe, manhole to manhole, by televised video. Provide one digital copy of the televised video to the Engineer.

The Developer/Applicant will be responsible to coordinate the inspection work with the Engineer and the Township of Pequannock one week in advance, and pay for all related contractor and subcontractor costs, including the televised inspection.