

BOROUGH OF CONSHOHOCKEN AUTHORITY
RULES AND REGULATIONS
SECTION 7 - INSPECTION AND TESTING OF INSTALLED FACILITIES

7.1 INSPECTION OF SEWERAGE FACILITIES DISTRIBUTION SYSTEM
DURING COURSE OF CONSTRUCTION

7.1.1 All sewerage system construction (including sewer main connections) in the Borough of Conshohocken shall be monitored by the Authority Engineer/BCA personnel to enforce compliance with the approved plans and specifications

All systems (BCA owned and privately owned) are subject to the testing procedures specified herein.

7.1.2 A temporary plug shall be installed in the manhole furthest downstream in any sewer main under construction and shall remain intact and unloosened until written permission is received from the Authority Engineer to remove same. Applicant's representative shall maintain the manhole and upstream piping in a clean and dewatered condition.

7.1.3 Applicant shall provide all necessary labor, gas detectors, safety equipment, materials and other equipment to assist the Authority's Engineer during testing. Applicant shall provide for maintenance of traffic during testing.

7.2 AS-BUILT REQUIREMENTS

7.2.1 General: for facilities to be dedicated

The following procedure defines the minimum requirements imposed on the applicant when submitting as-built sewer main and force main drawings.

The applicant shall meet all the requirements listed under the preliminary submittal requirements section before commencing witnessed testing of any sewer main or force main.

7.2.2 Preliminary As-Built Submittal Requirements

7.2.2.1 General

a. New drawings for as-builts must be generated, the Authority will not accept hand marked-up copies of previously approved drawings.

b. Each submittal shall consist of two hard copies and one electronic file of each drawing included in the as-built transmittal. All drawings shall be signed and

sealed by a State of Pennsylvania licensed design professional.

- c. If the alignment of the sewer main or force main has been revised during construction the as-built alignment shall be shown.
- d. All titles to easements shall be based on the as-built alignment of the piping. All easements shall be recorded with Montgomery County Clerk by the applicant. Documentation substantiating that this has been accomplished shall be submitted to the Authority Solicitor.
- e. All easements and legal descriptions, and dedication documents and legal descriptions must be satisfactory to both the Authority Engineer and Solicitor.

7.2.2.2 Sewer Mains: As-builts shall comply with the following:

- a. As-built manhole rim elevations shall be provided.
- b. As-built invert elevation of all pipes penetrating each manhole shall be provided.
- c. As-built pipe lengths measured from manhole centerline to manhole centerline shall be provided.
- d. As-built pipe slopes shall be calculated by the applicant.
- e. As-built pipe diameter and pipe material shall be provided.
- f. The as-built length from each sewer main connection to the downstream manhole shall be provided. In addition, the as-built length from the last sewer main connection to the upstream manhole shall be provided.
- g. Any sewer main connection deviating from the standard wye connection shall be noted.
- h. Any sewer main connection left for a future connection shall have the pipe cover and three (3) tie dimensions taken at the end of the lateral (i.e. measurement from a permanent object; corner of house, inlet, manhole, hydrant, etc.).
- i. All as-built concrete encasements and concrete cradles shall be noted.
- j. The as-built profile of the sewer main.
- k. Any additional information the Authority deems necessary.
- l. All the above information shall be shown on a plan and profile. The profiles shall show the location of all crossing utilities and their invert elevation.

7.2.2.3 Force Mains: As-builts shall comply with the following:

- a) As-built invert elevation at each bend shall be provided. In addition the invert elevation at the force main as-built high point shall be provided.
- b) At each bend three (3) tie dimensions shall be taken.
- c) The dimensions for each thrust block shall be provided.
- d) Manufacturer's data on air relief valves, gauges and all valves shall be provided separately.
- e) As-built drawings of any air relief and blowoff chambers shall be provided.
- f) The as-built pipe length between bends shall be provided.

- g) As-built pipe diameter and pipe material shall be provided. References to ductile iron pipe being cement/non-cement lined shall be included.
- h) Any additional information the Authority deems necessary
- i) All the above information shall be shown on a plan and profile. The profiles shall show the location of all crossing utilities and their invert elevation.

7.2.2.4 Final As-Built Submittal Requirement

The final submittal is the record plan which consists of the entire project on one (1) 1" =30 feet scale plan view with the streets outlined and labeled, and the as-built sewer main and force main information shown. For smaller projects the record plan scale may be adjusted or the original drawings utilized as a background. The drawing size shall be twenty-four inches (24") by thirty-six inches (36").

7.3 TESTING OF COMPLETED SYSTEM

7.3.1

General: the following tests may be required by the Authority Engineer in its sole discretion. The Authority Engineer may require additional tests which are not listed in these rules and regulations. The Applicant shall provide all materials and equipment necessary for testing.

All gravity sewer mains and force mains are required to pass the following tests to insure there will be either exfiltration or infiltration:

Gravity Sewer Mains:

Exfiltration, Infiltration and Lamping Tests

Deflection Testing (PVC gravity sewer mains only.)

Video Taping

Gravity Sewer Main Connections:

Exfiltration Test

Force Mains:

Exfiltration

Manholes:

Vacuum

All testing of As-builts must be performed and the sewer facilities must pass the test(s) prior to the Authority accepting dedication and before the project is closed.

7.3.2 Gravity Sewer Main Testing

7.3.2.1 Method Of Testing-Exfiltration Test For Gravity Sanitary Sewer Mains

a. General Information: Applicant shall

1. Perform all tests in presence of the Authority's Engineer.
2. Conduct exfiltration test when all utilities (including gas, water, telephone, sewers, manholes, and laterals) have been installed.
3. Establish test section between consecutive manholes.
4. All testing requirements shall be met prior to acceptance of sewer facilities by the Authority.

b. Procedure for exfiltration test (low pressure air test, 3.5 lb.): ASTM F1417

1. Plug test section of sewer line at each end. Tap one (1) plug and provide air inlet connection for filling pipe from air compressor.
2. Cap or plug all service laterals, stubs and fittings connecting to sewer test section, brace same against internal pressure to prevent air leakage by slippage and blowouts.
3. Connect air hose to tapped plug selected for air inlet. Connect other end of air hose to portable air control equipment used for controlling air entry rate to sewer test section and monitoring air pressure in pipeline.
4. Air control equipment shall include shut-off valve, pressure regulating valve, pressure reduction valve and monitoring pressure gauge having pressure range from 0 to 10 psig and an accuracy of 1/2 percent.
5. Connect another air hose between air compressor (or other source of compressed air) and air control equipment. This completes test equipment set up.
6. Supply air to test section slowly, filling pipeline until constant pressure of 4.0 psig (greater than average groundwater back pressure) is maintained.
7. When constant pressure of 4.0 psig is reached, throttle air supply to maintain internal pressure above 4.0 psig for at least two (2) minutes, permitting temperature of entering air to equalize with temperature of pipe wall. During this stabilization period, check all capped and plugged fittings with a soap solution to detect leakage at connections.
8. If leakage is detected, release pressure in line and tighten all leaky caps and plugs. Start test operation again by supplying air. When necessary to bleed off air to tighten or repair faulty connection, a new two-minute interval shall be allowed after pipeline has been refilled.
9. After stabilization period, adjust air pressure to 4.0 psig (greater than average groundwater back pressure) and shut off or disconnect air supply.

Observe gauge until air pressure reaches 3.5 psig. At 3.5 psig commence timing with a stop watch which is allowed to run until the line pressure drops to 3.0 psig. The time

required, as shown on the stop watch, for a pressure loss of 0.5 psig is used to compute air loss.

10. If the time, in minutes and seconds, for the air pressure to drop from 3.5 to 3.0 psig is equal to or GREATER than that shown in Table 1 for designated pipe size, the section undergoing test shall have passed.
11. If the time, in minutes and seconds, for 0.5 psig drop is LESS than shown in Table 1 for designated pipe size, the section of pipe shall have failed the test. Necessary repairs shall be made by the Contractor and the line retested.

TABLE 1

TIME REQUIREMENTS FOR SEWER MAIN AIR TESTING MAIN

Sewer Main Diameter Inches*	Time. Minutes
4	2
6	3
8	5
	7
12	11
14	15.5
15	17
16	20
18	25
20	32
21	34
24	45
27	57
30	71

*Multi Pipe Sizes: When sewer line undergoing test is 8 inch or larger diameter pipe and includes different sized laterals, the test time shown for the sewer line shall be utilized and no time adjustments for the laterals shall be considered.

c. Procedure for air pressure correction due to groundwater:

1. Air pressure correction is required when prevailing groundwater is above sewer line being tested. Under this condition, air test pressure shall be increased 0.433 psig for each foot groundwater level is above invert of pipe.

2. Establish height of groundwater (in feet) above pipe invert:

- a) During Sewer And Manhole Construction, install one-half inch

diameter pipe nipple (threaded one or both ends, approximately ten inches long) through manhole wall directly on top of one of the sewer pipes entering manhole, with threaded end of nipple extending inside the manhole.

- b) Seal pipe nipple with a threaded one-half inch (1/2") cap.
 - c) Immediately before air testing, determine groundwater level by removing the threaded cap from nipple, blowing air through the pipe nipple to remove any obstructions, and connecting clear plastic tube to pipe nipple.
 - d) Hold plastic tube vertically permitting water to rise to groundwater to level.
 - e) After water level has stabilized in plastic tube, measure vertical height of water, in feet, above invert of sewer pipe.
3. Determine air pressure correction, which is added to 4.0 psig normal starting pressure of test, by dividing the vertical height in feet by 2.31. The result gives air pressure correction in pounds per square inch to be added:

Example: If the vertical height of water from the sewer invert to the top of the water column measures 11.55 feet, the additional air pressure required would be

$$\frac{(11.55)}{2.31} = 5 \text{ psig}$$

Starting pressure of the test would be 4.0 plus 5 or 9.0 psig, and the one-half pound drop becomes 8.5 psig. There is no change in the allowable drop (0.5 psig) or in the time requirements established for the basic air test.

7.3.2.2 Method Of Testing - Infiltration Test for Gravity Sanitary Sewer Mains

a. General:

- 1. All work relating to infiltration testing shall be performed in the presence of the Authority's Engineer.
- 2. All requirements of this specification shall be met prior to acceptance of sewer facilities.

b. Procedure for infiltration test:

- 1. Examine the sanitary sewer system for infiltration at the downstream

- end of the system after construction has been completed.
2. In the event that there is infiltration and water is flowing at the downstream end of the system, then the source and volume of flow shall be determined by an infiltration test.
 3. The test shall consist of isolating the source of infiltration by plugging the first upstream manhole and observing to see if the flow stops. This procedure is repeated one manhole at a time until each source has been isolated.
 4. When the infiltration has been isolated to a section or area, the volume of flow shall be determined using a ninety-degree (90°) v-notch weir inserted into the pipe.
 5. The actual infiltration rate will be determined by the Authority Engineer based on weir measurements. This rate will be compared with the allowable infiltration rate of 50 gallons/inch diameter/mile of pipe/per day (24 hours).
 6. If the allowable infiltration rate is greater than the actual infiltration rate, the infiltration test passes. If the actual infiltration is greater than the allowable infiltration rate then the infiltration test fails.
 7. In the event the infiltration test fails, the section of the pipe involved shall be repaired as necessary and the test repeated.

7.3.2.3 Method Of Testing - Lamping for Gravity Sanitary Sewer Mains

a. General: (ASTM D 3034 and ASTM D 2241 may be required in the Authority's sole discretion)

1. Lamping shall be performed on all gravity sanitary sewer mains.
2. Lamping will be witnessed by the Authority's Engineer. The applicant shall provide all necessary labor, gas detectors and safety equipment to assist the Engineer during the lamping inspection.

b. Procedure for Lamping:

1. Lamping consists of visually examining the inside of the pipe between two consecutive manholes using light and mirror.
2. The light is shown from one manhole towards the other manhole.
3. A mirror is held at the invert of pipe and adjusted so that light and barrel of pipe can be seen.

4. The barrel of the pipe shall have no vertical deflection and at least seventy-five percent (75 %) of the barrel shall be visible in the horizontal direction.
5. In the event that lamping shows the pipe not laid to line and grade within the acceptable limits specified above, then it shall be repaired and relamped as necessary until the lamping complies with the acceptance limits.
6. No lamping shall be performed until all gravity lines have been jet cleaned and vacuumed.

7.3.2.3 Method Of Testing - Deflection Test for Gravity Sanitary Sewer Mains

a. General:

For pipe conforming to the requirements of ASTM D 3034, F 679 and F 794 maximum allowable pipe deflection (reduction in vertical inside diameter) shall be 7 1/2%.

For pipe conforming to the requirements of ASTM D 2241, AWWA C-900 and AWWA C-905 maximum allowable pipe deflection (reduction in vertical inside diameter) shall be 5%.

b. Procedure for Deflection Testing:

Deflection tests shall be successfully performed on the complete installation by means of one of the following methods prior to the acceptance of construction.

1. "Go-No-Go" mandrel properly sized.
2. Calibrated television.

7.3.2.4 Method Of Testing - Video Taping Test for Gravity Sanitary Sewer Mains

a. General: All applicants will be required to conduct video tapping. The applicant can either have the Authority perform the video tapping or hire a PaCP-NASCO certified contractor to video tape the sewer main. All inspections of manholes and mains shall be performed in conformity with NASCO guidelines. If the Authority conducts the video tapping, the costs will be deducted from the escrow account.

1. Applicant to submit one original and one copy of the Inspection and Work Report specified in this Section.
2. Applicant to submit two (2) copies of the videotaping.
3. Reports and video tapes shall be reviewed and approved by the Authority Engineer prior to system activation.

b. Television Inspection:

1. Applicant's representative to perform closed circuit television inspection of pipe.
2. Authority Engineer or designated Authority staff shall have access to view television monitor screen at all times.
3. Applicant's representative to provide pulling cable or rod for camera with footage meter so point of observation will be known at all times.
4. Applicant's representative shall provide water to insure a minimum of 1/4" depth of water is flowing through the piping during the television inspection work to ensure slope the adequate.
5. The location of all laterals shall be determined during the television inspection, and included in the Inspection and Work Report to be furnished.
6. If videotaping and report indicate a deficiency in the installation of the sanitary sewer main in the Authority's sole discretion, the Applicant shall correct the deficiency and re-televis the new sanitary sewer main.

c. DVD/ Flashdrive, or other medium acceptable to the Authority:

1. Provide video which clearly shows conditions as they appeared on the television monitor screen.
2. Provide specific views as the Authority Engineer may request during television inspection and repair operations.
3. Coordinate all videos with the specified Inspection and Work Report.

d. Inspection and Work Report:

Submit bound, typewritten reports and digital copy to the Authority Engineer outlining all work accomplished. Reports shall include:

1. Results of television inspection, including a description of all noteworthy areas.
2. Listing of lateral locations. Coordinate report with the video showing other views as required by Authority Engineer.
3. Any additional information as required by Authority Engineer.
4. All noted items shall be identified by station. The centerline of the

downstream manhole in each section shall be considered Station 0+00.

7.4 SANITARY FORCE MAIN INSPECTION AND TESTING

7.4.1 General: for facilities to be dedicated to the Authority

Once construction has been completed on the force main and all its appurtenances, the Authority may request testing.

The Contractor will be responsible for supplying all equipment, tools, safety equipment and personnel to perform the necessary tests. He will also provide personnel, as required to assist the Engineer during his visual inspection. The Engineer shall be present at all times during pressure testing of a force main.

A visual inspection of all terminations and manholes will be performed to insure that construction on this force main system meets all the drawing and specifications requirements, and in addition, all clean-up work has been completed.

7.4.2 Method Of Exfiltration Test

7.4.2.1 General Requirements: the Applicant shall

- a. Perform all tests in presence of the Engineer.
- b. Conduct exfiltration test prior to backfilling trench.
- c. Establish test sections between valves, or as directed by the Authority Engineer.
- d. Sections of main shall be tested before connection to existing mains. At connections to existing mains, existing static pressure shall be applied for test. No joints shall be covered until tested in presence of Engineer.
- e. All visible leaks shall be repaired regardless of the amount of leakage. Defective joints, pipe and fittings shall be removed and replaced by the Contractor.
- f. All requirements of this specification shall be met prior to acceptance of force main by the Authority.
- g. Allowable leakage per pipe material based on the manufacturer specifications and engineer's approval must be referenced on as-builts (as materials and allowable leakage).

7.4.2.2 Procedure for exfiltration test:

- a. contractor shall supply all necessary equipment, tools, safety equipment and personnel for all required tests as determined by the Authority engineer based on the materials used.
- b. Acceptance shall be determined based on the amount of makeup water to be added to the pipe being tested. If any test of pipe has leakage greater than the specified amount the Applicant's contractor shall locate and make repairs as necessary until the leakage is within the specified allowance.

7.5 MANHOLE TESTING

7.5.1 General

- a. All gravity sewer and force main manholes shall be tested.
- b. Testing of "Live Doghouse" type manholes is waived
- c. Regardless of test results all visible leaks shall be eliminated.

7.5.2 Method of Test

- a. Each manhole shall be tested after assembly and after backfilling.
- b. All lift holes shall be plugged with an approved non-shrink grout.
- c. No grout will be placed in the horizontal joints before testing.
- d. All pipes entering the manhole shall be plugged, taking care to securely brace the plugs from being drawn into the manhole.
- e. 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.
- f. A vacuum of 10 inches 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 inches. The manhole shall pass if the time is greater than 60 seconds for a 48" diameter manhole, 75 seconds for 60", and 90 seconds for 72".
- g. If the manhole fails the initial test, necessary repairs shall be made from the manhole exterior with a non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

END OF SECTION