

ORDINANCE NO. 70-2

ESTABLISHING STANDARDS AND SPECIFICATIONS FOR STREET IMPROVEMENTS, INCLUDING PAVING, CURBING, SEWERS AND SIDEWALKS, IN HILLTOWN TOWNSHIP, REQUIRING THE FILING AND APPROVAL OF PLANS, AND IMPOSING PENALTIES.

BE IT ENACTED AND ORDAINED by the Board of Supervisors of the Township of Hilltown, County of Bucks and State of Pennsylvania, and it is hereby enacted and ordained by the authority of the same as follows:

SECTION 1. Definitions.

- A. The term street shall include the word road.
- B. Township shall refer to Hilltown Township.
- C. Engineer shall refer to Hilltown Township Engineer.
- D. "As-built" drawings refers to the actual installed construction which may or may not have deviated in dimensions or otherwise from the original construction plans.
- E. Planning Commission shall refer to Hilltown Township Planning Commission.
- F. Cartway - the paved portion of a street between curbs or shoulders.
- G. Supervisors - The Hilltown Township Supervisors.

SECTION 2. Township Approval.

No person, partnership, association or corporation shall construct or open any road, street, alley, easement or right-of-way for public use or travel in Hilltown Township without first submitting plans thereof (whether or not a part of a subdivision application) and receiving approval of the Township, nor shall any street be constructed or opened except in conformity with approved plans and with the provisions of this ordinance.

SECTION 3. Drawings.

A. Construction Drawings. Such drawings shall be complete, showing existing topographic and physical features in detail, together with plans and profiles of the new work, including storm and sanitary sewers, gas and water lines, electric power and telephone conduits, and the structures thereof and, in the case of vehicular travel ways, shall show cross sections every fifty (50) feet and at closer stationing as required to show driveways and other details. Such drawings shall also include detailed plans of all structures such as manholes, inlets, vaults, endwalls and bridges.

B. Survey plans and descriptions. Survey plans and legal descriptions shall be furnished for any road, street, alley, easement or right-of-way to be dedicated or granted to the Township.

C. Number and size of drawings.

1. Four copies of construction drawings shall be submitted on paper twenty-four (24) by thirty-six (36) inches in size. (Township, Applicant, Engineer -2)

2. Four (4) copies of survey plans shall be submitted on paper (Township, Applicant, Engineer -2). In addition, two (2) plans shall be submitted on linen (Township, Recorder). All survey drawings shall be eighteen (18) by twenty-two (22) inches or thirty-six (36) by forty-four (44) inches in size. If drawings are a part of a subdivision application, see Subdivision Ordinance for number of drawings.

D. "As-built" Drawings. Reproducible tracings of the complete construction drawings shall be furnished the Township after completion of the construction, but prior to the

Township acceptance of the facilities, showing the construction in the "as-built" conditions.

.E. Endorsements.

1. Construction Drawings. Each construction drawing shall bear endorsements providing for the approval by the Engineer and Township Secretary, and an endorsement by the applicant stating his intent to construct the work in accordance with the plans and the requirements of this Ordinance.

2. Survey Plans. The survey plans shall provide endorsements as described in the Subdivision Ordinance.

SECTION 4. Construction.

A. General. Before placing any base material in a street, all underground work must first have been installed (including customer services and laterals) and tested for leaks, as applicable, in the presence of a representative of the Township. No backfilling of trenches or other backfilling shall be performed except in the presence of a representative of the Township.

B. Excavation and Backfilling.

1. Codes: All work shall be performed in accordance with the latest editions of the applicable parts of the following codes except as herein qualified:

a. Commonwealth of Pennsylvania

Department of Highways

(1) Specifications, Form 408

(2) Bulletin No. 43 - Specifications

for Control and Protection of Traffic on
Construction and Maintenance Projects.

b. Commonwealth of Pennsylvania

Department of Labor and Industry: Regulations
for Trenches and Excavations.

c. All local, state or other laws
and regulations governing blasting.

2. Dimensions: The sides of trenches and
other excavation shall be cut as nearly vertical as possible
and to the minimum dimension adequate to perform the work.

3. Rock: Rock excavation shall be accomplished
by drilling and wedging or blasting as permitted. Rock shall
be fully taken out at least twenty-five (25) feet in advance
of pipe laying and to a depth at least eight (8) inches
below the bottom of bedding for pipe. Rock excavation for
structures shall be removed to the bottom of concrete.

4. Blasting: Blasting for excavation will
be permitted only after securing the written permission of
the Township. The Township reserves the right to regulate
the time of blasting and all protective measures required
for safety. The type, strength of explosives used, and
storage facilities shall also be approved by the Township.
All handling of explosives and blasting operations shall be
done by a workman licensed for this work.

5. Shoring: Excavation for pipe and
structures shall be properly and adequately shored at all
times. When directed by the Township, tight wood sheeting,
(approved steel sheeting optional) shall be installed for
the protection of the workmen, property and the work. Voids
found behind sheeting shall be immediately filled with
granular material and compacted. Sheeting left in place,
if so permitted by the Township, shall be cut off approxi-
mately two (2) feet below ground surface.

6. Over Excavation: Should the excavation be inadvertently cut to depth greater than required by the plans or should the Township require greater depth to remove unsuitable material, backfilling to the proper grade shall be done with Form 408 #1 screenings.

7. Storage of Excavated Materials:

a. The Permittee shall classify, separate and store materials as may be required for re-use in backfilling, repaving or replacing topsoil. If the Permittee prefers not to separate surface materials, he shall furnish replacement materials to equal quantity and quality as directed to replace the displaced material.

b. Excavated material shall be placed so as not to interfere with traffic on the streets and driveways in an unreasonable manner. All surplus excavated material shall be removed from the site of the work and disposed of but none shall be deposited on private property until written consent of the Owner has been obtained and a copy filed with the Township.

8. Maintaining Traffic on Existing Streets:

Vehicular traffic lanes on existing streets shall be kept open at all times. Signs, barricades, fences, and other protective devices as may be required shall be installed.

9. Tracking mud: Only approved equipment shall be permitted for transporting loose or wet materials. Vehicle tires shall be cleaned as necessary to prevent the tracing of mud or dust in the existing public travel way.

10. Backfilling:

a. Materials for backfilling: Backfill

material in general shall include the materials of the excavation, except backfill material shall not include top soil, roots, or other organic material, cinders, trash, stone six (6) inches in largest dimension, frozen or excessively wet earth. Backfill material may include crushed stone. All backfill material shall meet the approval of the Township.

b. Placing and Compacting: All pipe including water, sanitary and storm sewer and driveway pipe shall be bedded in a minimum four (4) inches of Form 408 No. 2A stone. After the pipe is placed and tested as may be required and when approved by the Township, backfill material consisting to Form 408, No. 1 stone shall be placed to a height equal to half the outside diameter of pipe eight (8) inches or larger in outside diameter and to a height two (2) inches above the top of the smaller pipe. Thereafter, earth backfill shall be placed in loose layers not exceeding six (6) inches and thoroughly compacted with a mechanical tamper approved by the Township. Hyrdo-hammers may be used in trenches over six (6) feet in depth providing the backfill is first placed and compacted in six (6) inch layers to a height two (2) feet above the top of the pipe.

Backfilling around manholes, inlets, and other structures shall be performed and placing approved materials in loose eight (8) inch layers, and thoroughly mechanically compacting.

Hand compacting and compacting by driving vehicles over the fill areas will not be approved.

c. Restoration of Existing Streets: Backfilling of excavations within the road metal of an existing street shall proceed to the elevation of the bottom of the base material specified by the Township. Normally this elevation will be 10½ inches below the top of the finished road surface. Then the edges of the existing macadam surround the excavation shall be square cut to a straight line. Two inches of Form 408 No. 1 stone shall then be placed in the excavation and No. 4 stone to a compacted thickness of four (4) inches installed. This stone shall then have No. 1 stone broomed in. The balance of the #4 stone base shall then be placed and compacted and #1 stone broomed in. Thereafter Form 408 ID-2A macadam shall be placed - 1½ inches of binder and 1 inch wearing course.

In place of the #4 stone base the Township may required the placing of a concrete base eight (8") inches thick and two (2) feet wider than the trench. In certain cases deep strength asphalt may be placed. The thickness shall be determined by the Township.

In the case where the excavation is in the road shoulder, Form 408 "Stabilized" shoulders may be required. When the excavation is in the gutter line, the gutter shall be paved with ID-2A binder two (2) inches thick when required by the Township.

11. Tunneling and Jacking:

a. All methods of tunneling or jacking shall be approved by the Engineer. Tunnels shall be of sufficient size to allow proper pipe installation. Tunnels shall be timbered to the extent necessary as directed by the Engineer.

b. Where rock is encountered in a tunnel, it shall be removed to the lines prescribed by the Engineer.

c. Tunnel sections shall be backfilled with suitable material and compacted by ramming and tamping from each end.

12. De-watering:

a. All excavations shall be free of water during construction of structures, pipe laying and backfilling operations. Temporary flumes, channels or pipes shall be used to divert water from the excavation.

b. All water from any source shall be pumped or bailed to provide a dry trench and shall be discharged in such manner as not to cause injury to work completed, damage to property, health hazards or impediment to traffic. In no case shall water be permitted to rise into or flow through a completed sewer unless permitted by the Engineer.

13. Underground Utilities and Structures: All utility services encountered, shall be supported by timber struts or by other suitable means. Utilities or other structures located transversely across the trench will be protected from damage or displacement.

14. Cleanup: Upon the completion of any work described in this or other sections herein, the area shall be thoroughly cleaned and all dirt, debris, material, tools and equipment, shall be removed, hauled away, all to the satisfaction of the Township.

C. Storm Sewers.

1. Materials: Storm sewers shall be constructed of reinforced concrete and shall conform to ASTM Specifications C76 for Class III pipe.

2. Construction Methods:

a. Bedding - All pipe shall be laid on a 4 inch thick bed of PDH #2B stone in a trench not to exceed the pipe barrel plus two feet.

When rock or any unyielding material is encountered in the trench, it shall be excavated for the full trench width and to a minimum depth of 12 inches below the pipe invert. This extra depth shall be back-filled to the proper grade with Pennsylvania Department of Highways #1 or #2B stone.

Should soft or otherwise unstable material be encountered in the excavation, the Engineer may require that the material be removed and backfilled with Pennsylvania Department of Highways #1 stone or other suitable material.

b. Joints - All concrete pipe shall be laid with full mortared joints. Mortar shall consist of 2½ parts of PDH Type B sand and one part normal strength plain cement mixed with the minimum amount of water to produce a plastic mix. No lime shall be used in the mix. Before succeeding sections of pipe are placed, the lower half of the joint shall be mortared to assure a full joint and to assure even alignment between the two pipe sections. After placing the outside of the joint shall be mortared full circle. The inside of the joint shall be mortared full circle, wiped clean and finished smoothly. The foregoing applies to all sizes of pipe.

c. Backfilling - After the pipe is in place and the joints completely mortared, backfill material consisting of Pennsylvania Department of Highways #1 stone shall be placed to a height equal to half the outside diameter of the pipe and compacted. Thereafter, earth backfill shall be placed in loose layers not exceeding six inches and thoroughly compacted with a mechanical tamper approved by the Engineer. This backfilling shall continue to a height equal to the adjoining earth surface. Earth backfill shall be approved by the Engineer and shall not contain organic material, trash, rock over six inches in largest dimension. In lieu of earth backfill, the contractor may use Pennsylvania Department of Highways #2A modified stone placing and compacting in not more than 12 inch layers.

d. Structures

i. (1). Concrete

(a). Materials

i. Cement shall be type 1A conforming to "Tentative Specifications" for Air-Entrained Portland Cement C-175.

ii. Water shall be potable, clean and free from injurious amounts of oils, acids, alkalies, organic materials or other deleterious substances.

iii. Fine aggregate shall be natural sand conforming to ASTM C-33 having clean, hard, strong, durable grains and free from injurious amounts of dust, lumps, soft or flaky particles, shales, alkali, organic matter, loam or other deleterious substances.

iv.. Coarse aggregate shall consist of crushed stone conforming to the requirements of the Pennsylvania Department of Highways and shall be supplied from a currently approved source.

(b). Mix Design

i. The design of proportion of ingredients for concrete mix shall be made by the Contractor and be approved by the Engineer. The proportion of ingredients shall meet the minimum requirements of PDH Form 408 for the class of concrete specified. The minimum strength of each class of concrete after 28 days shall meet the requirements of the same section.

ii. The maximum allowable slump for all concrete is four (4") inches.

(c). Truck Mixing

i. Concrete shall be mixed and transported to the site in truck mixers as per A.S.T.M. C-94. All solid materials for the concrete shall be accurately measured and charged into the drum at the proportioning plant. Only the prescribed amount of water shall be placed in the truck water tank or the mixing water may be added directly to the batch. The truck may not carry excess water, thus assuring the design water-cement ratio.

ii. Mixing shall continue a minimum of 50 revolutions after all ingredients including water, are in the drum. The speed shall not be less than 4 rpm nor more than a peripheral velocity of 225 feet per minute. No more than 150 revolutions shall be at a speed in excess of 6 revolutions per minute.

iii. Concrete transported in the truck's mixer shall be discharged at the job within 1½ hours after the water has been added to the mixture.

(d). Placing Concrete

i. Concrete shall be handled from transporting vehicle to the place of final deposit as rapidly as practicable by methods which shall prevent the separation or loss of the ingredients. Under no circumstances shall concrete that has partially hardened be deposited in the work. Concrete shall be deposited in the forms nearly as practicable in its final position to avoid rehandling. It shall be so deposited as to maintain a plastic surface approximately horizontal.

ii. When concrete is conveyed by chutes the equipment shall be of such size and design as to insure a continuous flow in the chute. The individual chute sections shall have approximately the same slope. The slope shall be of such as to prevent the segregation of the ingredients. If the discharge end of the chute is more than five (5') feet above the surface of the concrete a spout shall be used, and the lower end maintained as near the surface of the concrete as practicable but never more than five (5') feet above.

iii. Other methods of depositing concrete shall have the approval of the Engineer.

iv. Before placing any concrete, the sub-grade shall be approved by the Engineer. Reinforcing shall be thoroughly clean and tied in place.

v. The Contractor shall not pour the concrete in weather below 40°F. unless by permission of the Engineer and shall furnish for approval by the Engineer his procedure for depositing concrete in such weather.

vi. No concrete shall contain any frozen material nor be deposited on any surface containing frost or frozen material.

(e). Finishing Concrete

i. The concrete shall be carefully screeded after depositing to assure a smooth surface.

ii. The surface shall then be hand floated to bring the surface to the correct grade without high spots or pockets. No excess mortar or water may be brought to the surface during this process.

(f). Curing

i. Concrete surfaces exposed to the atmosphere shall be protected against too rapid drying, by curing for a minimum period of seven (7) days. The curing period shall start immediately following the pouring of the concrete.

ii. Concrete shall be cured by the following specific applicable methods, subject to the Engineer's approval, and adherence thereto will be rigidly enforced:

Concrete surfaces shall be kept constantly wet during the period by ponding. Ponding shall start as soon after placing of the concrete as possible without damaging the finish.

Burlap may be laid and fastened so as to be constantly in direct contact with the concrete surfaces. It shall be wetted constantly during the period by sprinkling with fresh water.

Layers of reinforced, waterproof paper may be placed in direct contact with the concrete surfaces and fastened thereto in an approved manner. The paper shall be lapped in a minimum of two (2) inches with the seams and outer edges taped or glued. The paper shall consist of two (2) sheets of thirty (30) pound No. 1 Quality Kraft cemented together with asphalt, having a fiber reinforcement.

(g). Reinforcing

i. Reinforcing bars: Reinforcing bars shall have a minimum yield strength of 60,000 psi. They shall conform to ASTM - A432 or A 61 and be deformed as per ASTM A305. All bars to have rolled-in marks identifying the yield strengths or a certification from the manufacturer will be provided which gives assurance that the material conforms to ASTM Specifications and yield strength.

D. Sanitary Sewers

1. Materials: Materials shall conform with the requirements stated herein and the latest issued of the following specifications:

(The grade of pipe as determined using Table A shall be a guide only. When selecting the grade of pipe consideration should be given to the requirements for Leakage Tests for Sewers as outlined in Section VI, D 3.c.(2). of this Ordinance.)

- a. Asbestos-cement sewer pipe: Fed. Specifications SS-P-331b; ASTM specification C-428. For class of pipe see Table A.
- b. Asbestos-cement pressure pipe: AWWA specification C-400; Fed. Specification SS-P-351a; ASTM specification C-296
- c. Vitrified clay sewer pipe: ASTM specification C-200 (superseding sections of CSPA specification 3-66). For strength of pipe see Table A.
- d. Reinforced concrete Pipe: ASTM specification C-76. For class of pipe see Table A.
- e. Cast iron pipe: ASTM specification A-377
- f. Precast concrete manhole riser and top sections: ASTM specification C-478
- g. Bricks: ASTM specification C-62
- h. Manhole frames and covers: ASTM specification A-48
- i. Concrete shall have a minimum compressive strength of 3000 psi at 28 days and a maximum slump of 4 inches. Coarse aggregate shall be crushed stone (not gravel, unless crushed) maximum size = 1". Fine aggregate shall be natural or manufactured sand. All aggregate shall be from sources approved by the PDH. All concrete shall have air entrainment within the limits of 3% to 6%.

- j. Mortar shall be composed of 2½ parts sand and one part portland cement by volume. Lime shall not be used.
- k. Timber sheeting, bracing and shoring lumber shall be straight grained, free from cracks, shakes, and large loose knots with the minimum strength equal to E-1,760,000 and f-1200.
- l. Steel sheeting shall be the standard and generally accepted product of a recognized manufacturer and the AISC.

2. Construction Methods

a. General

- (1). All pipe shall be unloaded, handled and stored in conformance with the manufacturer's recommendations.
- (2). Pipes shall be laid true to the grades shown on the drawings. Each section of pipe shall rest upon the pipe bed for the full length of its barrel, with recesses excavated to accommodate bells and joints. Any pipe which has its grade or joints disturbed after laying shall be taken up and relaid. The pipe sections shall be inspected, and the interior and ends of all pipe shall be cleaned before lowering into the trench. During construction the Contractor shall use all precautions to keep the sewer clean and clear of debris and free from injury until finally inspected and accepted. The mouth of the completed sewer pipe will be properly closed, at all times, with an expanding rubber plug or approved device, except when pipe laying is in progress.
- (3). Pipe laying shall be done only in the presence of an inspector and the Contractor shall give ample notice of the time scheduled for the pipe laying and inspection.
- (4). If, in the opinion of the Engineer, the materials furnished or the methods of installation are not in accordance with the specifications or generally accepted practices for that type of work, he may order such work stopped.

b. Sewer Pipe

- (1). Asbestos-cement pipe and all necessary couplings, gaskets and fittings shall be of the same manufacturer. The couplings and gaskets shall be suitable for use with the particular size and class of pipe with which it is supplied.
- (2). Reinforced concrete pipe may be either bell and spigot or tongue and groove joint design. Either type must have reinforcement at the bell or groove of a type acceptable to the Engineer. The gaskets shall be suitable for use with the particular size and class of pipe which is supplied.
- (3). Vitrified clay pipe and fittings shall be of the bell and spigot type, first quality, sound, thoroughly and perfectly burned and shall be of full internal diameter. The laying length of pipe shall be for six inch (6") diameter-four feet (4'); and eight inch (8") diameter-five feet (5'). The laying length of tee and wye branch fittings shall be two feet. Pipe and fittings shall be provided with flexible, self locking, factory fabricated joint ends meeting with the approval of the Engineer. Joint material shall be natural rubber, synthetic rubber or plastic and shall conform to the applicable requirements specified in ASTM specification C-425.

(4). Asbestos cement pressure pipe and all necessary couplings, gaskets and fittings shall be suitable for use with the pipe which is supplied. Thrust blocks shall be constructed at the locations and of the sizes required to support the pipe in place.

(5). Cast iron pressure pipe shall be centrifugally cast iron pipe with bitumastic coating inside and outside and with mechanical type joints. Mechanical joints shall conform with ASA specification A-21.11 Class 150.

(6). Thrust blocks shall be constructed so their bearing surfaces are in direct line with the major force created by the pipe or fitting and shall be sized according to soil bearing capacity and force in the line. Calculations shall be approved by the Engineer.

c. Laying Pipe

(1). Bedding and laying of pipe shall be in accordance with the pipe manufacturer's recommendations. Pipe joints shall be made in accordance with the joint manufacturer's recommendations.

(2). Regardless of its material, all pipe, including laterals, shall be layed on a minimum six inch (6") thickness of PDH #2A modified (or better) stone.

d. Laterals: Connections to the sewer shall be by means of wye fittings, at the locations directed by the Engineer. The lateral pipe shall be laid on a $\frac{1}{4}$ inch per foot grade, to a point of right-of-way line, or as directed by the Engineer. The lateral pipe stub shall be capped with a water tight pressure type fitting capable of withstanding the exfiltration tests and to remain until future connection to the house sewer. The ends of all laterals shall be physically marked above ground to show location and depth of pipe end.

e. Installation of Manholes:

(1). The bases for manholes shall be constructed of concrete and cast in place. The minimum thickness shall be 8 inches, but may be thick enough to be above the O.D. of the sewer if the contractor desires. The inlet and outlet pipes shall be set to proper grade, with their ends flush with the inside of the manhole prior to placement of concrete. When casting the base, concrete shall be placed under the pipes for a minimum of three feet from the manhole wall or to within six inches of the pipe joint.

A metal ring for forming the groove to receive the first pre-cast riser section shall be used. A flow channel conforming to the inside diameter of the inlet and outlet pipes shall be formed as the base is cast.

(2). The lowest section may have a pre-cast bottom in which case it must be set on a leveling course, six inch (6") minimum thickness of #2B stone.

(3). All pre-cast sections of manholes shall be lifted and moved by use of suitable lifting slings and lugs to prevent damage to the pre-cast joint edge. If minor damage occurs to the pre-cast sections, such damage will be repaired in the presence of, and to the satisfaction of, the Engineer.

(4). Pipes entering pre-cast sections shall be set securely in the opening provided, to the correct line and grade shown on the drawings and then grouted to provide a watertight joint. The surfaces to be grouted shall be thoroughly cleaned before grouting. There shall be at least one-half inch clearance between outside of pipe and the manhole opening to provide for proper grouting.

(5). Leveling the manhole sections by use of wedging or placing shims will not be permitted. Manholes shall not be backfilled without the permission of the Engineer.

(6). Manholes shall be constructed as promptly as practical to coincide with the adjacent sewer pipe construction. If the construction of manholes is unnecessarily delayed, the Engineer shall have authority to stop trenching and pipe laying until manholes are constructed to complete sections of sewer.

(7). Pre-cast sections shall be laid in the full bed of portland cement mortar.

(8). The top of all pre-cast manholes shall be brought to proper grade, for receiving manhole frames, by brick construction. No less than two nor more than five courses of brick will be used for this purpose. All brick shall be laid in full beds of mortar and shoved into place with full joints no more than 1/2 inch in thickness.

(9). Brick construction shall be performed by experienced and qualified workmen. The brick walls shall be plastered on the inside and outside with portland cement mortar 1/2 inch thick.

(11). Brick work shall not be constructed during cold weather (where temperature is below 40° Fahrenheit) unless necessary precautions are observed as directed by the Engineer.

f. Manhole Rungs, Frames and Covers

(1). Manhole ladder rungs shall be cast in place in the pre-cast concrete manhole riser sections. The rungs are to be of gray cast iron as approved by the Engineer.

(2). Manhole frames and covers should be made accurately to the pattern and dimensions specified, and shall be furnished with flat true surfaces.

Covers shall fit the frames in any position. The type of frame and cover to be installed for each manhole shall be specified in the plans. Identification wording shall be cast into the cover. The frames shall be set to the correct elevation on a full bed of portland cement mortar.

3. Tests and Controls

a. Laboratory Tests

(1). The materials listed below shall required advance and periodic tests as indicated, and shall be sampled in accordance with the methods of ASTM and as required by the Engineer. All materials requiring laboratory tests shall be submitted to the

Engineer, at least two weeks prior to starting delivery of such materials to the Project Site, to be certified for submission to the testing laboratory. The laboratory conducting the tests shall furnish both the Engineer and the Contractor with two copies of the reports showing results of such tests, and the report shall be considered as sufficient evidence of the acceptance or rejection of the quality of materials tested. The specifications for, and the methods of testing will be found under the detailed specifications for the particular material involved. All samples shall be properly packed and clearly marked as to source and intended use.

<u>Material</u>	<u>Test Frequency</u>	<u>Sample Size</u>
Concrete (Tests for Job Concrete)	Advance, then each 50 cubic yards	4 cylinder per test, 2 broken at 7 days and 2 at 28 days
Manhole Frame Test Bar	One Tensile Test on machined bar for each 50 manhole frames	Size B Test Bar

b. Shop Tests

(1). The materials listed below shall be tested at the shop or plant of, and by, the producer. Each manufacturer of such materials shall be equipped to conduct the tests designated herein. The Engineer shall be furnished with certified records or reports of the results of all tests. These reports will include a sworn statement that the tests have been made as specified.

<u>Materials</u>	<u>Test Method</u>	<u>Number of Tests</u>
Cement	ASTM C114	Chemical Analysis One for each 500 bbls.
Asbestos Cement Pipe	ASTM C428	As specified, C428
Vitrified Clay Pipe	ASTM C301	As specified, C301
Reinforced Concrete Pipe	ASTM C76	As specified, C76
Cast Iron Pipe	ASTM A377	As specified, A377
Precast Rein. Concrete	ASTM C478	As specified, C478
Manhole Risers and Tops		

c. Field Tests

(1). The watertightness of all sewers shall be tested in the presence of the Engineer. The Engineer may also perform any other field tests which are necessary to determine compliance with contract requirements. The methods for conducting tests on the completed sewer are as follows:

(2). Leakage Tests for Sewers: All sewers shall be tested for leakage by the most practical and economical method for each section of sewer to be tested. The exfiltration method, or the low pressure air method shall be used, depending upon hydraulic conditions for each situation, as determined by the Engineer. All sewers shall be backfilled to a depth of not less than two feet above the sewer and all openings carefully plugged before start of a test.

(a). Exfiltration Method: The test will be made by plugging the lower manhole and filling the pipe section between manholes with water and determining the quantity of water leakage by measurement of the drop in the manhole.

The sewers shall sustain a maximum of 0.2 gallons per inch of diameter per hour per 100 feet of line. The sewers shall perform equally well except that an allowance for an additional 10% of gallonage shall be permitted for each additional two feet of head over a basic two feet minimal internal head over and above the top of the sewer at the low manhole.

(b). Air Method: This method will be used for sewers whose gradient is such that excessive pressures would develop from use of the water method. The air method may also be used for any test if so directed by the Engineer. These tests shall be conducted in accordance with the following: the air compressors to be used for the tests must be equipped to control the air entry rate and prevent the pressure from exceeding 5 psig; the test will be performed on pipe with a wet inside condition and all outlets, from the section to be tested, fitted with air-tight plugs and braced to withstand the applied pressure.

After the pipe has been wetted, the air will be slowly admitted to the test section until a constant pressure of approximately 4.0 psig is reached and maintained for at least two minutes to allow for temperature equalization. During this time all plugs shall be checked for tightness with a soap solution. If leaks are found, the pressure will be released and the plugs tightened to stop the leakage. This procedure will be repeated until all of the plugged openings are found to be tight.

When the air temperature has adjusted and the pressure is constant, at 4 psig, the air supply will be disconnected and gauge observed. When the pressure reaches a 3.5 psig a stop watch will be started and then stopped when the pressure has reached 2.5 psig. Due allowance shall be made for the various pipe sizes involved in the test section. The pipe line will be considered to have passed the air loss test successfully if the time shown on the stop watch is not less than the amounts shown in the following table for the respective pipe diameters.

<u>Pipe Diameter</u> (inches)	<u>Time</u>	
	(minutes)	(seconds)
6	2	15
8	3	57
10	4	44
12	5	40
14	6	46
15	7	5
16	7	33
18	8	30

(c). Leakage Tests for Force Mains: After the pipe has been laid and partially backfilled between joints, each section of pipe between valves shall receive the following hydrostatic test:

The pipe shall be slowly filled with water and tested to 300 psi based on the elevation of the lowest point of the line or section under test. The pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. A meter to measure make-up water shall be installed. The pump, pipe connections, taps into the pipe, all apparatus, and necessary labor shall be furnished by the Contractor.

Before applying the specified test pressure, all air shall be expelled from the pipe.

All exposed pipes, fittings, valves and joints shall be carefully examined during the open-trench test. Any cracked or defective pipes, fittings, or valves discovered in consequence of this pressure test shall be removed and replaced by the Contractor with sound material and the test shall be repeated until satisfactory to the Engineer.

Should the Contractor elect to backfill the entire trench, or any portion thereof, prior to testing, it shall be his responsibility to locate and repair any leaks which occur during this test.

While the test pressure is being maintained, all exposed pipes, fittings, valves, hydrants and joints shall be inspected for leaks which shall not exceed the ratio of two (2) gallons per hour per inch of pipe diameter per mile of pipe. The test pressure shall be maintained for a period of not less than one (1) hour if joints are exposed and four (4) hours when joints are covered.

(d). Leakage Tests for Manholes: All manholes shall be tested by the exfiltration method - The manhole to be tested shall have all sewer openings plugged and then filled with water. After the concrete has absorbed enough water for a stabilized condition, the water level in the manhole shall be maintained for one hour without addition of make-up water. If the excavation surrounding the manhole is full of water it shall be unwatered and maintained in a dry condition during the test. If the adjacent outlet section of sewer pipe is tested by the exfiltration method, the manhole may be tested simultaneously if permitted by the Engineer.

(e). Retests and Repairs: Sections of sewers failing to meet the above tests shall be repaired and retested until the same are acceptable by the above standards. The Engineer reserves the right to require TV inspection on any section of pipe.

TABLE A - ALLOWABLE PIPE LOADS

Asbestos Cement Pipe		Vitrified Clay Pipe			Reinforced Concrete Pipe				
Class	Allowable Load	Size Inches	Allowable Load		Size Inches	Allowable Load			
			Standard Strength	Extra Strength		Class II	Class III	Class IV	Class V
1500	2250	6	1800	3000	12	1500	2025	3000	4500
2400	3600	8	2100	3300	15	1875	2531	3750	5625
300	4950	10	2400	3600	18	2250	3037	4500	6750
4000	6000	12	2700	3900	21	2625	3544	5250	7875
5000	7500	15	3000	4350	24	3000	4050	6000	9000
		18	3300	4950					
		21	3600	5775					
		24	3900	6600					

Notes: 1. This table was determined assuming ordinary bedding of pipe which requires a minimum bottom segment of pipe equal to $\frac{1}{4}$ the outside diameter of pipe to be firmly bedded in hand-shaped unyielding material

2. Load factor for ordinary bedding = 1.5

References: Clay Pipe Engineering Manual
 Certain-teed K & M Pipe Catalog
 Concrete Pipe Handbook

TABLE B
 INCREASE TO BE APPLIED
 TO TABLE C WHEN PIPE IS
 SUBJECT TO HIGHWAY LOADS

Cover Over Pipe (Feet)	Inside Diameter of Pipe						
	8"	10"	12"	15"	18"	21"	24"
5	340	410	505	625	745	865	940
6	240	265	340	435	505	600	675
7	170	195	240	315	385	460	505
8	120	145	195	240	290	340	385

TABLE C - LOAD ON PIPE FOR VARIOUS TRENCH WIDTHS

LOAD ON PIPE (See Note No. 4)

Cover Over Pipe (ft.)	Trench Width (feet)									
	2'-0"	2'-3"	2'-6"	2'-9"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	6'-0"
			8"	10"	12"	15"	18"	21"	24"	
5	745	865	1010	1140	1250	1540	1805	2100	2345	
6	840	995	1160	1280	1430	1760	2055	2420	2695	3320
7	920	1090	1280	1415	1595	1960	2310	2715	3025	3785
8	975	1170	1380	1545	1735	2145	2530	3005	3355	4215
9	1030	1245	1465	1655	1870	2340	2760	3265	3675	4675
10	1080	1300	1535	1760	1990	2505	2970	3520	3980	5095
11	1115	1350	1595	1850	2100	2650	3170	3750	4300	5480
12	1155	1395	1655	1940	2200	2780	3345	3995	4620	5830
13	1175	1435	1705	2020	2275	2890	3525	4180	4860	6160
14	1195	1465	1750	2080	2350	3000	3660	4355	5095	6445
15	1215	1490	1790	2130	2415	3115	3805	4520	5300	6720
16	1240	1515	1825	2175	2475	3205	3915	4675	5480	6985
17	1250	1530	1865	2215	2530	3285	4050	4815	5645	7240
18	1260	1550	1890	2250	2580	3355	4120	4940	5810	7480
19	1270	1570	1915	2275	2625	3420	4210	5070	5950	7735
20	1280	1585	1940	2305	2660	3475	4280	5180	6085	7940
21	1290	1595	1960	2330	2695	3525	4365	5290	6215	8150
22	1295	1610	1975	2350	2725	3575	4440	5395	6370	8395
23	1300	1625	1990	2365	2750	3620	4510	5500	6490	8590
24	1305	1635	2010	2380	2780	3660	4570	5585	6590	8780
25	1310	1645	2015	2395	2805	3695	4630	5665	6690	8965
26	1320	1650	2025	2410	2825	3735	4685	5740	6795	9140
27	1325	1650	2030	2420	2845	3760	4740	5810	6905	9295
28	1325	1655	2035	2430	2860	3785	4795	5880	6995	9440
29	1330	1655	2035	2435	2875	3805	4850	5940	7095	9570
30	1330	1660	2040	2440	2895	3835	4905	5995	7170	9690

-6T-19-

- Notes:
1. Loads are based on Marston Formula
 2. Assumed weight of backfill material = 110 lbs. per cubic foot
 3. Trench width
 - a. This width shall be considered as the maximum width of trench for a depth of trench from 1.0' above the top of pipe to the bottom of pipe bed.
 - b. The thickness of sheeting shall be included in the width of trench when sheeting is used.
 4. WHEN THE COVER OVER PIPE IS LESS THAN 8.0 FEET AND NORMAL HIGHWAY LOAD WILL PASS OVER THE PIPE, THE PIPE LOADS IN TABLE C SHALL BE INCREASED BY THE AMOUNTS SHOWN IN TABLE B.
 5. Figure to the left of the vertical step line for each pipe size indicates maximum load for that particular pipe size regardless of the trench width for that cover depth over the pipe.

F. Curbs

1. Materials

- a. Concrete shall conform to Section C 2.d.(1).
- b. Premolded expansion joint materials shall conform to the requirements of P.D.H. Form 408
- c. Covers for curing and protecting concrete shall conform to the requirements of P.D.H. Form 408.

2. Construction Methods

- a. Preparation of Foundation - The material upon which the curb is to be constructed shall be compacted to a firm, even surface.
- b. Forms - Forms for the curb shall be set to the lines and grades shown on the plans; staked to resist the pressure of the concrete without springing and in a manner to resist settlement or displacement. These forms shall be of a depth equal to the depth of the curb, designed to permit secure fastening of the face and back forms at the top. These fastenings shall be constructed in a manner that will not obstruct satisfactory finishing and edging of the top of the curb, but will permit removal of the inside face of forms. The outside or back forms shall be straight from top to bottom. The inside of the face forms shall have a batter from the top to bottom of curb as indicated on the drawings. Steel template 1/8 inch in thickness, or the width of the curb, and not less than 24 inches long shall be used to separate adjacent sections. All forms and templates will be thoroughly cleaned and treated with an approved material, before each use, to prevent concrete from adhering thereto.
- c. Placing and finishing concrete - the concrete shall be placed in the forms in horizontal layers not to exceed five (5") inches, and spaded sufficiently to eliminate all voids. The curb shall be depressed as indicated or directed. The top surface of the curb shall be finished true to line and grade in a smooth, neat even manner by means of wood floats. The edges of the face and back shall be rounded to a radius of one (1") inch and 1/4 inch respectively, while the concrete is still plastic.
- d. Joints - the curb shall be constructed in uniform lengths or sections of 10 feet, except where shorter sections are necessary for closures or curbs, but no section will be less than four (4') feet. Premolded expansion joints 1/4 of an inch in thickness and cut to conform to the cross-section of the curb, shall be placed at the ends of sections of curbed curb and at intervals of not more than one hundred twenty (120) feet. Intermediate joints between sections shall be formed of two (2) thicknesses of 1-ply bituminous paper, cut neatly to the cross-section of the curb and one (1) paper placed on each side of the template. If the method of handling the work is such that the templates cannot be removed satisfactorily, the curb shall be constructed in alternate sections.
- e. Removal of forms - The forms shall not be removed within 48 hours after the concrete has been placed. No rubbing to correct irregularities will be permitted until the full curing time has elapsed. Any irregular surface shall be corrected by rubbing with a carborundum stone. Brush finishing or plastering will not be permitted and all rejected curb shall be promptly removed and replaced at no expense to the owner. All joints in the curb shall be opened from top to bottom immediately after the forms are removed, and the edges adjacent to the joints shall be sharp and clean cut. After the forms are removed, any defects shall be filled with mortar composed of one part cement and two parts fine aggregate.

f. Curing - the curb shall be protected and cured by methods approved by the Engineer.

g. Curb at driveways shall be barricaded from any vehicular traffic for seven (7) days after placing concrete.

F. Sidewalks

1. Materials

a. Concrete shall conform to Section C2.d.(1).

b. Premolded expansion joint material shall conform to the requirements of P.D.H. Form 408.

c. Covers for curing and protecting concrete shall conform to the requirements of P.D.H. Form 408.

2. Construction Methods

a. Preparation of foundation - the foundation shall be formed at a depth of eight (8") inches below and parallel with the finished surface of the sidewalk and at a depth of twelve (12") inches below and parallel with the finished surface of the driveway, unless otherwise indicated on the drawings or specified. Unsuitable material shall be removed and replaced with acceptable material, and the final prepared sub-base shall be thoroughly compacted and finished to a firm even surface. 2B stone to a compacted thickness of four (4") inches shall be placed under all walks and driveways.

b. Forms - Forms shall be of wood or metal, straight and of sufficient strength when staked to resist the pressure of the concrete without springing. If of wood, they may be 2" x 4" or 2" x 8" (nominal size) for sidewalk and driveway respectively, surfaced on the inside and the top; or if metal, they shall be of approved sections. Forms shall be thoroughly cleaned and oiled before concrete is placed against them.

c. Joints - Sidewalks shall be constructed in separate slabs thirty (30') feet in length except for closures. These slabs shall be separated by transverse premolded expansion joints, $\frac{1}{4}$ inch in thickness, for the full depth of the concrete. Transverse premolded expansion joints shall also be placed adjacent to driveways and structures where directed. The slabs between expansion joints shall be divided into blocks five (5') feet in length, by scoring transversely. Driveway apron joints shall conform to the detail shown on the drawings. All scoring shall extend to a depth of at least $\frac{1}{4}$ the thickness of the concrete slabs.

d. Placing Concrete - Before any concrete is placed, each section of the sub-grade shall be checked and approved by the Engineer. Concrete shall be placed only on a moist sub-grade. Concrete shall be deposited on the sub-grade without segregation of materials, coarse aggregate and shall be spread by approved methods to the required depth. The concrete along the forms and transverse joints shall be thoroughly spaded. Driveways shall be eight (8") inches thick from the curb to the back of the sidewalk.

e. Finishing - The concrete, as soon as placed, shall be accurately struck off and screeded to the cross-section shown on the drawings. Necessary hand finishing of joints and surface irregularities shall be performed from approved bridges which shall not rest on any concrete that has not attained the required strength. The surface shall be given a granular finish by rubbing with a wooden float, and without adding cement to the surface. An edge having a $\frac{1}{4}$ inch radius shall be used for edging all joints. The concrete shall be protected and cured by methods approved by the Engineer.

f. Removal of forms - Side forms shall not be removed within 24 hours after the concrete has been placed. After removal of the forms, minor honey-combed areas shall be filled with mortar composed of one part cement and two parts fine aggregate. Major honey-combed areas will be considered as defective work and shall be removed and replaced at no expense to the owner.

g. Driveways shall be barricaded from any vehicular traffic for seven (7) days after pouring the concrete.

G. Streets

1. Code: All work shall be performed as per Pennsylvania Department of Highways Specifications - Form 408, latest edition.

2. Construction Methods:

a. The work shall consist in first grading of the excavated sub-base and the thorough compacting of same with a three wheel roller having a minimum metal weight of 10 tons.

Any soft spots or other defective area will be corrected as described under "Excavation and Backfilling."

b. Two inches of screenings shall be placed, followed by #4 stone placed to a compacted thickness as determined by the Engineer.

The stone shall be compacted by use of the three wheel roller (metal weight minimum 10' tons) and screenings broomed in.

Stone and screenings shall be water bound, all surface voids filled.

c. After approval of the stone surface for crown, thickness and smoothness by the Engineer, ID-2A binder shall be placed and compacted to a minimum thickness as required by the Engineer. Compaction shall be by the aforementioned three wheel roller.

d. A final wearing course of ID-2A shall be placed and compacted to a minimum thickness required by the Engineer. Compaction shall be only by a tandem wheel - 10 ton roller. Care shall be given to completely fill and compact the center seam.

e. All curbs shall be sealed as well as manhole rims and other similar structures.

f. The joint between new and old pavement shall be straight cut and sealed.

g. All trench work required in existing pavement shall be straight and neatly cut and finally sealed.

3. Underdrains.

a. Materials: Porous cement concrete pipe for underdrains shall conform with the requirements of PDH Form 408.

b. Construction Methods: Trenches for drain pipes will be constructed as specified in Excavation and Backfilling.

c. Construction of underdrains: Underdrains shall be constructed at locations as directed by the Engineer in the field. Underdrains shall be constructed to conform with the requirements of PDH Form 408 and the detail shown on Standard Drawing SD-14, Sheet 1 of the Pennsylvania Department of Highways.

4. Alternate Base Material

a. The base foundation for streets shall in general be constructed of crushed stone. Alternate materials may be approved, but their thickness shall be related to the comparable thickness of stone base. In general, secondary streets in single family residential areas shall have stone base with a compacted thickness of eight (8) inches and primary streets in a single family residential area shall have stone base with a compacted thickness of ten (10") inches. Other type residential areas, commercial and industrial areas shall have stone base to a compacted thickness determined for the specific conditions. Alleys, marginal access streets, and collector streets shall have a stone base thickness determined by the Township.

b. Other type base material may be lime-Pazzolan and bituminous.

SECTION 5. Penalty.

Any person violating any provision of this Ordinance shall be subject to a fine not exceeding Three Hundred Dollars (\$300.00) which shall be collected by summary proceedings in the name of the Township before any justice of the peace. In default of the payment of said fine and costs, such person may be sentenced and committed to the County Jail for a period not exceeding thirty (30) days.

ENACTED AND ORDAINED into Ordinance this 2 day
of May, A.D., 1970.

HILLTOWN TOWNSHIP SUPERVISORS

Elmer S. Hockman
Paul S. K. Field
Arthur Meyer