SECTION 16 RELATED TECHNICAL STANDARDS - GENERAL

The work shall conform in all respects to the requirements of Standard Specifications of the New Jersey Department of Transportation as amended and revised to date.

16.1 Cement

Cement used shall conform to the following requirements of the ASTM as amended and revised to date.

(a) Standard Portland Cement - ASTM Designation C-150, Type 1.

(b) High Early Strength Portland Cement - ASTM Designation C-150, Type 3.

(c) Air Entraining Portland Cement - ASTM Designation C-175, Type 1-A. Air Entraining Agent shall be Vinsol Resin or Darex A.E.A.

16.2 Aggregates

Aggregates, both fine and coarse, shall conform to the requirements therefore of the N.J. Department of Transportation Standard Specifications as amended and revised to date.

16.3 Water

Water shall be clean, fresh and free of oils, acids, salts, organic matter or other injurious substances.

16.4 Concrete

Unless otherwise provided, all concrete shall be air entrained having 4% to 7% of entrained air, and shall be produced by using Standard Portland Cement with additive or Air Entraining Portland Cement with or without additional additive as may be required.

Except where otherwise specifically provided, concrete shall be Class A, B, or C, as prescribed, proportioned as follows:

Class	Cement	Sand	Course Aggregate	Void Content	28 Day Verification Strength (PSI)
A	1	1.50	3.0	1.350	5000
B	1	1.75	3.5	1.575	4500
C	1	2.00	4.0	1.800	4000

When the coarse aggregate has a percentage of voids above or below 45, the volume of coarse aggregate or sand, respectively, shall be decreased so that the volume of said voids will equal 90 percent of the sand volume. The volumes shall be measured when the materials are dry and loose, not when they are rodded or shaken.

Class "C" concrete shall be used for the construction of concrete cradles and thrust blocks. Batching and mixing equipment shall be of a size and type suitable for work to be done and shall be subject to the approval of the Engineer. The Class of concrete required for the various items of work shall be as shown on the plans or in the specifications.

16.5 Reinforcement Steel

Reinforcement steel shall be Grade 40, conforming to the requirements of either ASTM Designation A-615 or ASTM Designation A- 617.

16.6 Wire Mesh or Fabric

Wire mesh or fabric shall conform to ASTM Designation A-185 as amended and revised to date.

16.7 Concrete Block

Concrete block for the construction of manholes, inlets and catch basins shall conform to the requirements of the American Society for Testing Materials Specifications therefore, as amended and revised to date. Concrete blocks for manholes shall have the required radius and batter.

16.8 Brick

Brick shall be Grade MA conforming to the American Society for Testing Materials Specifications therefore, as amended and revised to date.

16.9 Mortar

Mortar shall be 1 : 2 cement-sand mortar.

16.10 Iron Castings

Iron castings shall conform to the requirements of the American Society for Testing Materials Specifications for gray iron casting as amended and revised to date, supplemented as follows:

Castings shall be boldly filleted and risers shall be sharp and perfect. The castings shall be true to pattern in form and dimension, free of pouring faults, sponginess, cracks, blowholes and other defects which affect their strength and value for the service intended. The bearing surfaces of frames, covers and grates shall be fitted together so as to prevent rocking and the pieces match marked.

16.11 Ladder Rungs - Aluminum

Ladder rungs shall be fabricated of extruded aluminum alloy conforming to the current American Society for Testing Materials Specifications therefore and shall be subject to the approval of the Engineer.

16.12 Excavation and Earthwork

16.12.1 Limits of Excavation

Excavation shall be made to approved lines which shall be of sufficient width for forming the pipe joints. Trench widths shall be selected so that the backfill will not exceed the safe load on the pipe. In all cases, the trench sides shall be vertical from the bottom to twelve (12) inches above the top outside diameter of the pipe. In general, the widths of pipe trenches shall not be wider than the outsider diameter of the pipe barrel plus two (2') feet at the level of the top of the pipe, unless otherwise approved. Trench bottoms shall be trimmed by hand to provide firm bedding. The last three (3) inches of depth for all pipe trenches shall be removed with pick and shovel to the proper lines and grades before placing foundation material and pipe.

All excavation and earthwork activities shall be in full compliance with OSHA regulations. Blasting for rock excavation will be permitted only on approval of methods, and in compliance with applicable State and local regulations. The Mantua Township MUA is not responsible for onsite safety.

16.12.2 Sheeting and Bracing

Where excavations are made with sides at greater than natural slope, sheeting and bracing shall be used of sufficient strength to sustain the sides of the excavations and to prevent movement which could in any way injure the work, or diminish the work spaces sufficiently to delay the work. Sheeting and Bracing shall conform to the requirements of the "Construction Safety Code" of the Bureau of Engineering and Safety of the New Jersey Department of Labor and Industry.

16.12.3 Dewatering

The Contractor shall provide, operate and maintain satisfactory facilities and equipment including well points, with which to collect and pump all water entering excavations or other parts of the work to suitable places for disposal. All excavations shall be kept free of water until the work or structure to be built therein is completed. Water shall be discharged through pipe or gutters, or any other suitable artificial means to catch basins, watercourses, or ditches in such a manner as to avoid interference with business, pedestrian and vehicular traffic and so as to prevent damage to property. Dewatering shall continue on a 24 hour per day basis as required to avoid flotation danger to the structures until completed.

Contractors intending to divert more than 100,000 gallons of water per day for less than 31 days within a consecutive 365 day period may be authorized for such a diversion under a short term use permit rule provided that certain conditions are met. The contractor shall be responsible for meeting these conditions and submitting all required information to NJDEP for compliance. The Contractor shall be responsible for supplying any dewatering permits required in accordance with the New Jersey Administrative Code, Title 7, Chapter 19.

16.12.4 Backfill

All backfill shall consist of a suitable selected and approved earth generally from storage of approved excavated soil, free from rejected organic matter, boggy, peaty, humus or other unsuitable material such as silt, rubbish, waste, ashes or cinders. If sufficient suitable material for backfill is not available from the excavated material, as determined by the Engineer, the Contractor shall procure elsewhere a sufficient quantity of suitable material and shall furnish and place such material. No frozen earth shall be used for backfill, and all stones more than six (6) inches in the largest dimensions shall be removed from the acceptable earth or fill and backfill. Unsuitable or excess backfill material shall be promptly removed from the site.

16.12.5 Placing and Compacting Backfill

Backfill shall be made to the slopes, grades and elevations required. Backfill shall be compacted, in an approved manner to a density at least equal to that of the adjacent undisturbed soil, so as to avoid future unequal settlement.

No backfill shall be placed until the structure has been inspected in place and approved. Backfilling shall be carried out as soon as possible after such approval.

Trenches shall be backfilled from the top of the foundation material to a depth of not less than twelve (12”) inches over the pipes using only bank run sand and gravel. Such material shall be uniformly placed on each side of the pipe in six (6”) inch layers, wetted as required, and firmly compacted by approved tamping machines. Care shall be taken not to damage the pipe. After a compacted coverage of twelve (12”) inches has been made, the remainder of the trench shall be compactly filled in an approved manner.

The bank run sand or gravel must be compacted after sprinkling with water to obtain optimum moisture content. Final in-place density must be at least ninety (90%) percent of the maximum density obtainable with the material used, as determined by AASH0 Designation T 99 Compaction and Density Tests, using Method "C".

16.12.6 Foundation Material

Foundation material used for pipe bedding, from a distance below the pipe invert to the lower quarter point of the pipe, shall be bank run sand and gravel or crushed stone. Pipe embedment material from the lower quarter point to twelve (12”) inches above the top of the pipe shall be bank run sand and gravel.

Bank run sand and gravel shall conform to the requirements of the New Jersey Department of Transportation, 1989 Revisions, Standard Specifications for Type 1, Class A bank run sand and gravel, while crushed stone shall conform to the requirements of the New Jersey Department of Transportation Standard Specifications, Division 8, Subsection 900, Type 1, Class C. Frozen and lumpy material shall not be used.

All crushed stone shall be screened and prior to its placement with the trench. All foundation material shall be placed and compacted as directed and approved by the Engineer.

16.13 Pipe Laying and Installation

All pipe and fittings shall be installed to the lines and elevations shown or ordered, and in accordance with the manufacturer's recommendations.

Suitable tools and equipment shall be used for proper handling, storing, laying pipe and fittings. In order to avoid damage to the interior coatings of pipe, lifting hooks or bars shall not be inserted therein. Each pipe and fitting shall be checked for defects and injuries as laying proceeds. Imperfect pipe materials shall be rejected and removed from the work. Pipe found to be defective after laying shall be removed and replaced by undamaged material.

The interior of all pipe shall be cleaned of dirt, and other deleterious materials, and kept clean, as the next section of pipe is laid. During the progress of the work, the exposed ends of the pipe shall be provided with approved temporary covers fitted to the pipe, in order to prevent material from entering the pipe.

Where pipe must be cut to fit as closing pieces, such cuts shall be evenly and squarely made in a workmanlike manner with approved equipment. Injury to linings or coatings shall be satisfactorily repaired.

Where cast iron mechanical joint, Tyton or Ring-Tite fittings are used, the Contractor shall furnish and install concrete thrust blocks, tie rods, or other approved means for preventing movements at joints, bends, tees and other fittings as shown or directed. Joints must be thoroughly brushed with a wire to remove all loose rust or foreign materials, soapy water must be brushed over the joint surfaces and over the gasket. Bolts shall be tightened uniformly, using only torque-limiting wrenches to avoid over stressing the bolts. Bolt heads, nuts and other unpainted surfaces shall be coated with two (2) heavy applications of black asphaltum varnish.

All pipe shall be laid in accordance with approved details. All pipe shall be laid on top of a layer of foundation material and the same material shall be carried up to a level four (4”) inches from the bottom of the pipe. Where concrete cradles are used to support the pipe, foundation material will not be required. No solid blocking will be permitted under pipe. Joints shall be made in accordance with the recommendations of the manufacturer.