CONSTRUCTION SPECIFICATION

NV-45. PLASTIC PIPE CONDUITS

1. SCOPE

The work shall consist of furnishing and installing polyvinyl chloride (PVC), acrylonitrile-butadiene-styrene (ABS), and polyethylene (PE) plastic pipe and the necessary fittings as shown on the drawings. This specification does not apply to subsurface drainage systems.

2. MATERIALS

Polyvinyl chloride (PVC) pipe and fittings shall conform to the requirements of the following ASTM specifications unless otherwise stated on the drawings.

a. D 1785 PVC Plastic Pipe, Schedules 40, 80, and 120
b. D 2241 PVC Pressure-Rated Pipe (SDR Series)
c. D 2464 Threaded PVC Plastic Pipe Fittings, Schedule 80
d. D 2466 PVC Plastic Pipe Fittings, Schedule 40
e. D 2467 Socket-Type PVC Plastic Pipe Fittings, Schedule 80
f. D 3034 Type PSM PVC Sewer Pipe and Fittings
g. F 679 PVC Large-Diameter Plastic Gravity Sewer Pipe and Fittings
h. F 794 PVC Profile Gravity Sewer Pipe and Fittings, Based on Controlled Inside Diameter
i. F 949 PVC Corrugated Sewer Pipe with a Smooth Interior and Fittings

Acrylonitrile-butadiene-styrene (ABS) plastic pipe and fittings shall conform to the requirements of the following ASTM specifications unless otherwise stated on the drawings.

a. D 1527 ABS Plastic Pipe, Schedules 40 and 80
b. D 2282 ABS Plastic Pipe (SDR-PR)
c. D 2751 ABS Sewer Pipe and Fittings

Polyethylene (PE) plastic pipe and fittings shall conform to the requirements of the following ASTM specifications unless otherwise stated on the drawings.

a. D 2104 PE Plastic Pipe, Schedule 40
b. D 2239 PE Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
c. D 2447 PE Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
d. D 3035 PE Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
e. F 405 Corrugated PE Tubing and Fittings
f. F 667 Large Diameter Corrugated PE Tubing and Fittings
g. F 714 PE Plastic Pipe (SDR-PR) Based on outside Diameter
h. F 894 PE Large Diameter Profile Wall Sewer and Drain Pipe

The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign matter, or other defects. The pipe shall be as uniform in color, opacity, density, and other physical properties as is commercially practicable.

3. JOINTS AND FITTINGS

Joints and fittings shall be of the same or similar materials as the pipe and equal to or exceeding that specified for the pipe to which it is attached.

Joints may be bell and spigot type with elastomeric gaskets, coupling type with elastomeric gaskets on each end or solvent cemented. The joints shall be installed according to the manufacturer's recommendations unless otherwise specified.

When a lubricant is required to facilitate joint assembly, it shall be a type having no detrimental effect on the gasket or pipe material.

All pipe connections designed to be glued will use appropriate solvent cement. Allow glue to cure according to manufacturers guidelines prior to moving pipe and/or pressure testing. Gluing shall not be done at temperatures below freezing.

4. HANDLING AND STORAGE

Pipe shall be delivered to the job site and handled by means which provide adequate support to the pipe and does not subject it to undue stresses or damage. When handling and placing plastic pipe, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting. All special handling requirements of the manufacturer shall be strictly observed. Special care shall be taken to avoid impact when the pipe must be handled at temperatures of 40^0F or less.

Pipe shall be stored on a relatively flat surface so that the barrels are evenly supported. Unless the pipe is specifically coated to withstand exposure to ultraviolet radiation, it shall be covered with an opaque material when stored outdoors for a period of 15 days or longer.

5. LAYING AND BEDDING THE PIPE

The pipe shall be laid to the lines and grades as shown on the drawings and specified herein. The pipe shall be laid so that there is no reversal of grade between joints, unless otherwise shown on the drawings. The pipe shall not be dropped or dumped on the bedding or into the trench. The ground surface near the pipe trench shall be free of loose rocks and stones greater than one (1) inch in diameter.

Just before placement, each pipe section shall be inspected to ensure that all foreign material is removed from inside of pipe. The pipe ends and the couplings shall be free of foreign material when assembled. At the completion of a work shift, all open ends of the pipeline shall be temporarily closed off using suitable cover or plug.

Care shall be taken to prevent distortion and damage during unusually hot (over 90^0F) or cold weather (under 40^0F). After the pipe has been assembled in the trench, it shall be allowed to reach ground temperature before backfilling to prevent pull out of joints due to thermal contraction.

Bell and spigot pipe shall be laid with the bell pointed upstream. The pipe ends and couplings shall be free of foreign material when assembled.

Perforated pipe shall be laid with the perforations down and oriented symmetrically about the vertical centerline. Perforations shall be clear of any obstructions when the pipe is laid and before the pipe is approved for backfill.

Flexible plastic pipe shall be placed in a "snake like" position to provide expansion and contraction with temperature change.

Flexible plastic pipelines may be placed by plow-in equipment if soils are suitable and rocks and boulders will not damage the pipe material.

The pipe shall be firmly and uniformly bedded throughout its entire length. The bedding depth and materials to be used will be as shown on the drawings. For pipe with bell joints, the bedding material shall be excavated at the locations of the bells to prevent the pipe from being supported by the bells.

6. TESTING

Pipelines shall be pressure tested by one of the following methods:

a. Before backfilling, the pipe shall be filled with water and tested at design working head or a minimum head of 10 ft., whichever is greater. All leaks shall be repaired and the pipe shall be retested as described. The procedure shall be repeated until the pipe is watertight.

b. Pipelines shall be pressure tested at the working pressure for 2 hours. The allowable leakage shall not be greater than 1 gallon per diameter inch per mile. If the test exceeds this rate, the defect shall be repaired until retests show that the leakage is within allowable limits.

7. PIPE EMBEDMENT

Earth bedding – The pipe shall be firmly and uniformly placed on compacted Earthfill or an in-place earth material of ample bearing strength to support the pipe without noticeable settlement. The earth material on which the pipe is placed shall be of uniform density to prevent differential settlement.

Unless otherwise specified, a groove that closely conforms to the outside surface of the pipe shall be formed in the bedding. The depth of the groove shall be equal to or greater than 0.3 of the pipe diameter.

Earth bedding shall be compacted to a density not less than adjacent undisturbed in-place earth material or be compacted earth backfill. Earthfill material used for compacted earth bedding shall be free of rocks or stones greater than one (1) inch in diameter and earth clods greater than two (2) inches in diameter. The pipe shall be loaded sufficiently during the compaction of bedding under the haunches and around the sides of the pipe to prevent displacement from its final approved placement.

Sand, gravel, or crushed rock bedding – When sand, gravel, or crushed rock bedding is specified, the pipe shall be firmly and uniformly placed on the bedding material. Material for bedding shall not exceed one (1) in diameter. Unless otherwise shown on the drawings, the coarse-grained bedding material shall be carefully placed and compacted to a depth equal to or greater than 0.3 of the diameter of the pipe above the bottom of the pipe. The pipe shall be loaded sufficiently during backfilling and compaction around the sides to prevent displacement of the pipe from its final approved placement.

Pipe encased in drainfill - The pipe shall be firmly and uniformly placed on bedding of specified drainfill. Drainfill shall be placed and compacted as specified in Construction Specification 24, Drainfill, or as specified on the drawings. The pipe shall be loaded sufficiently during backfilling and compaction around the sides to prevent displacement of the pipe from its final approved placement.

Pipe encased in concrete – Concrete encasement shall be carefully placed to form a continuous uniform support around the entire circumference of the pipe or a shown on the drawings. Pipes encased in concrete shall be securely anchored to prevent movement of the pipe concrete placement. A clear distance of 1 ½ inches shall be maintained between the pipe and any reinforcing steel.

8. BACKFILL

Initial backfill – Unless otherwise specified or shown on the drawings, initial backfill to six (6) inches above the top of the conduit is required. Earth haunching and initial backfill material shall consist of soil materials that are free of rocks, stones, or hard clods more than one (1) inch in diameter. Coarse backfill material shall be the specified sand, gravel, crushed rock, or drainfill material.

Initial backfill shall be placed in two stages. In the first stage (haunching), backfill is placed to the pipe spring line (center of pipe). In the second stage, it is placed to six (6) inches above the top of the pipe.

The first stage material shall be worked carefully under the haunch of the pipe to provide continuous support throughout the entire pipe length. The haunching backfill material shall be placed in layers that have a maximum thickness of about six (6) inches and are compacted as shown on the drawings or as stated in the Construction Specification appropriate for the backfill material. During compaction operation, care shall be taken to ensure that the tamping or vibratory equipment does not come in contact with the pipe and the pipe is not deformed or displaced.

Final backfill – Final backfill shall consist of placing the remaining material required to complete the backfill from the top of the initial backfill to the ground surface, including mounding at the top of trench. Final backfill material within two (2) feet of the top of the pipe shall be free of debris or rocks larger than three (3) inches nominal diameter. Coarse backfill materials shall be the specified sand, gravel, crushed rock, or drainfill. Final backfill shall be placed in approximately uniform, compacted layers. Final backfill compaction and layer thickness requirements shall be shown on the drawing or as stated in the Construction Specification appropriate for the backfill material.

Plastic pipelines installed by the plow-in method require surface compaction and shaping in addition to the normal plowed-in operations.