SECTION 2B

FOUNDATION DRAINAGE SYSTEM

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

Federal Specifications (Fed. Spec.):

WW-P-402C and Notice 1 and Am-1	Pipe, Corrugated (Aluminum Alloy)
WW-P-405B and Am-1	Pipe, Corrugated (Iron or Steel, Zinc Coated)

American Society for Testing and Materials (ASTM) Publications:

A 74-82	Cast Iron Soil Pipe and Fittings
C 4-62 (R 1981)	Clay Drain Tile
C 14-82	Concrete Sewer, Storm Drain, and Culvert Pipe
C 412-83	Concrete Drain Tile
C 444-80	Perforated Concrete Pipe
C 498-65 (R 1981)	Perforated Clay Drain Tile
C 508-83	Asbestos Cement Underdrain Pipe
C 700-78a (R 1983)	Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
D 2311-77 (R 1981)	Perforated, Homogeneous Bituminized Fiber Pipe for General Drainage
D 2417-77 (R 1981)	Perforated, Laminated-Wall Bituminized Fiber Pipe for General Drainage
D 2751-83a	Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
D 3034-83	Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
D 3212-81	Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

F 405-82a	Corrugated Polyethylene (PE) Tubing and Fittings

1.3 American Association of State Highway and Transportaion Officials (AASHTO) Specification:

M 36-83I	Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains

2. SUBMITTALS:

2.1 Certifications: Certifications from the manufacturers attesting that materials meet specification requirements shall be submitted in accordance with the SPECIAL CLAUSES.

2.2 Samples: Two randomly selected samples of each type of pipe and fitting shall be submitted for approval prior to delivery of materials to the site.

3. DELIVERY AND STORAGE OF MATERIALS: Materials shall be delivered and stored in a manner that protects them from damage. Materials shall be stockpiled and stored so as not to be buried or damaged. Damaged materials shall be replaced at no additional cost to the Government.

4. MATERIALS shall conform to the respective specifications and other requirements specified herein. Any of the listed types of pipe may be used, however, the same type pipe and fittings shall be used throughout the drainage system.

4.1 Pipe: Pipe for foundation drainage system shall be of the type and size indicated.

4.1.1 Clay Pipe: ASTM C 700, standard strength.

Perforated Clay Pipe: ASTM C 700, standard strength.

Concrete Pipe: ASTM C 14, Class 1.

4.1.4 Perforated Concrete Pipe: ASTM C 14, Class 1 with perforations conforming to ASTM C 444, Type I.

4.1.5 Clay Drain Tile: ASTM C 4, standard class.

4.1.6 Perforated Clay Drain Tile: ASTM C 498, standard class.

4.1.7 Concrete Drain Tile: ASTM C 412, standard-quality.

4.1.8 Cast Iron Soil Pipe: ASTM A 74.

4.1.9 Perforated Corrugated Steel Pipe: Federal Specification WW-P-405, Class I or II, Shape 1, Coating A; or AASHTO M 36, Type III.

4.1.10 Perforated Corrugated Aluminum Alloy Pipe: Federal Specification WW-P-402, Class I or II, Shape 1, Coating A.

4.1.11 Perforated Asbestos-Cement Underdrain Pipe: ASTM C 508.

4.1.12 Perforated Bituminized-Fiber Pipe: ASTM D 2311 or D 2417.

4.1.13 Plastic Pipe:

4.1.13.1 Perforated Corrugated Polyethylene Drainage Tubing: ASTM F 405, heavy duty type for 6 inch pipe. Fittings shall be buting manufacturer's standard type.

4.1.13.2 Acrylonitrile-Butadiene-Styrene (ABS) Pipe: ASTM D 2751, with a maximum SDR of 35.

4.1.13.3 Polyvinyl Chloride (PVC) Pipe: ASTM D 3034, with maximum SDR of 35, and with flexible elastomeric seal joint.

4.1.13.4 Perforations: Perforations in ABS and PVC pipe shall be circular, not more than 5/16-inch or less than 3/16-inch in diameter, and arranged in rows parallel to the longitudinal axis of the pipe. Perforations shall be approximately 3 inches, center-to-center, along rows. The rows shall be approximately 1-1/2 inches apart and arranged in a staggered pattern so that all perforations lie at the midpoint between perforation in adjacent rows. The rows shall be spaced over not more than 90 degrees of circumference. The spigot or tongue end of the pipe shall not be perforated for a length equal to the depth of the socket and perforations shall continue at uniform spacing over the entire length of the pipe. Manufacturers' standard perforation ABS or PVC pipe which essentially meets these requirements may be substituted when approved.

4.2 Fittings: Fittings shall be of compatible materials for pipe of corresponding weight and quality, and as specified herein.

4.3 Cover and Wrapping Materials for Open Joints in Drain Tile: Tar paper, roofing paper, reinforced building paper, glass fiber fabric, or other similar type material. Wrapping material shall be 18-14 mesh, 0.01-inch-diameter-nonferrous wire cloth.

4.4 Bedding for Outlet Pipes: Bedding for outlet pipes shall be filter material as specified in SECTION: EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS.

5. GENERAL REQUIREMENTS:

5.1 Extent: Foundation drainage shall be furnished and installed as a complete system as shown.

5.2 Outlet Connections: Foundation pipe shall be terminated as shown.

5.3 Drain Lines: Drainage lines shall be constructed of drain tile, perforated pipe, or porous pipe.

5.4 Outlet Lines: Outlet lines shall be constructed of closed joint, nonperforated, nonporous pipe.

6. INSTALLATION:

6.1 Trenching and Excavation: Trenching and excavation required shall be in accordance with SECTION: EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS. Trenches shall be kept dry during installation of drainage system. Changes in direction of drain lines shall be made with 1/8 bends. "Wye" fittings shall be used at intersections.

6.2 Bedding: Bedding, minimum 6 inches in depth, shall be placed in the bottom of trench for its full width and length and compacted as specified prior to laying of outlet pipe. Drain lines shall be bedded on gravel filter material as shown. Each section shall be rest firmly upon bedding through the entire length, with recesses formed for bell joints. Except for recesses for bell joints, the bedding shall fully support the lower quadrant of the pipe.

6.3 Pipe Laying: Drain lines and outlet lines shall be laid to true grades and alinement with a continuous fall in the direction of flow. Bells of pipe sections shall face upgrade. Interior of pipe shall be cleaned thoroughly before being laid. When drain lines are left open for connection to discharge line, the open ends shall be temporarily closed and the location marked with wooden stakes. Perforated pipe shall be laid with perforations facing down. Any length that has had its grade or joints disturbed shall be removed and relaid at no additional cost to the Government.

6.4 Jointing:

6.4.1 Perforated and porous types of drain pipes shall be laid with closed joints.

6.4.2 Non-perforated and plain end drain tile shall be laid with 1/8-inch to 1/4-inch open joints. Open joints shall be covered or wrapped. Joints which are covered shall have one thickness of the cover material placed over the open joint. Material shall overlap the joint not less than 4 inches on each side and cover the tile for not less than the upper half or more than the upper two-thirds of the circumference of the tile. Strips of wire cloth wrapping material 3 inches wide shall be used for wrapped joints, with ends locked together.

6.4.3 Perforated corrugated metal pipe sections shall be joined with standard connecting bands and bolts furnished by the pipe manufacturer.

6.4.4 Joints of concrete or clay sewer pipe shall be calked with oakum and filled solid with cement mortar.

6.4.5 Joints of cast iron pipe or connections between cast iron and porous concrete pipelines shall be calked with oakum gasket and filled with lead.

6.4.6 Perforated corrugated polyethylene drainage tubing and plastic piping shall be installed in accordance with manufacturer's specifications and as specified herein. Tubing and pipe with physical imperfections shall not be installed. No more than 5 percent stretch in a section will be permitted.

6.4.7 Perforated bituminized-fiber pipe joints in which pipe ends and couplings are tapered shall have a tight-driven fit. Approved split-collar couplings may be used with square-end-pipe.

6.4.8 Perforated asbestos-cement pipe joints shall be made with tapered couplings or with sleeve-type couplings suitable for holding the pipe firmly in alinement without use of sealing compound or gaskets.

6.4.9 Plain-end perforated clay drain tile joints shall be made with spring-wire clips, coated with a rust preventive, that will maintain a taut but elastic joint between sections when laid.

6.4.10 Acrylonitrile-butadiene-styrene (ABS) pipe shall be jointed using solvent cement or elastomeric joints and shall be in accordance with ASTM D 2751, with dimensions and tolerances in accordance with Table II therein.

6.4.11 Polyvinyl chloride (PVC) pipe joints shall be in accordance with ASTM D 3212.

6.5 Outlet Lines: The outlet end of drain lines connecting with an open gutter or outfall shall be (covered with a removable wire basket of 16 mesh copper or bronze wire cloth fastened with brass or wire straps) (finished as shown).

6.6 Backfilling: After joints and connections have been inspected and approved, the specified backfill material shall be placed and compacted as specified in SECTION: EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS. When placing the backfill, care shall be taken to prevent displacement of or injury to the pipe or tile.

7. FIELD TESTS: Drain lines shall be tested by a method approved by the Contracting Officer before being covered. Obstructions shall be removed and the test repeated until the system is satisfactory. The entire system shall again be tested after all backfill is placed. Portions of the lines which restrict the flow shall be repaired or removed and replaced, as directed, until the entire system is satisfactory.

8. PROTECTION FROM EXPOSURE TO SUN: Prior to and during installation plastic pipe shall not be exposed to direct sunlight for more than 14 days.