SECTION 33 40 00

SITE DRAINAGE

PART I -- GENERAL

1.01 SUMMARY

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 DESCRIPTION

Work in This Section: Contractor shall furnish and install site drainage systems as indicated on the drawings and as required to make the system completely operational. Work in this section includes, but is not limited to:

1. Furnishing and laying storm drain piping and fittings.
2. Bedding
3. Drainage, structures
4. Related Work: Documents affecting work of this Section include, but are not necessarily limited to, Special Conditions, and Sections in Division 1 of these Specifications

1.03 QUALITY ASSURANCE

Comply with all requirements of the Governing Agency.

1.04 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.05 SUBMITTALS

A. Provide in accordance with Section 01 33 00.

B. Product Data: Submit manufacturers technical data and installation instructions for the following:

   1. Pipe materials.
   2. Frames, grates, and covers.
   3. Pre-cast concrete drainage structures.
   4. Cleanouts and other miscellaneous drainage structures.

C. Record Drawings: Submit record drawings of installed storm drain system.

D. If either spiral ribbed or corrugated metal pipe is to be used, submit test results certifying a minimum 50-year service life for the pipe in accordance with the requirements of this section.

1.06 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility location. Verify that storm drain piping may be installed in accordance with original designs and proposed standards.

B. Verify and coordinate installation locations to assure clearance from all other utilities and from footings and foundations. Pay particular attention to structural details pertaining to piping installations with respect to foundations. Where utilities fall within the zone of influence of footings or foundations as shown on these details, deepen footings, relocate piping, or, if approved by the Soil Engineer, modify trench/backfill conditions, materials or methods, all at no additional cost.

PART 2 -- PRODUCTS

2.01 PIPE MATERIALS: Unless a specific pipe option is indicated on the Plans, the following pipe options may be used:

A. Reinforced Concrete Pipe (RCP): Conform to ASTM C76 Class III and the applicable provisions of the PWC Specifications.

1. Polyvinyl Chloride (PVC) Plastic Piping:

2. Pipe and Fittings shall conform to ASTM D3034, shall have a Standard Dimension Ratio (SDR) of 35, and shall have ends suitable for elastomeric gasket joints.

3. Joints and Jointing Material: Joints shall conform to ASTM D3212. Gaskets shall conform to ASTM F477.

B. Corrugated Metal Pipe (CMP): CMP shall conform to section 207-11 PWC Specifications. It shall have 2-2/3" x 1/2" helical corrugations, with coupling bands of same material as pipe. All pipes shall be fully lined with an asphalt or concrete lining. Coupling bands, bolts and nuts shall be galvanized, t = 0.064".

C. Spiral Ribbed Galvanized Steel Pipe: t = 0.064" PWC Specifications, Section 207-11 except for corrugation and fabrication requirements. Ribbed steel pipe shall have a continuous helical rib and a continuous helical lock seam with the rib spaced midway between seams. The rib shall be 3/4" wide by 1" high projecting outward from the surface of the pipe. Rib pitch along the spiral shall not be greater than 11-1/2". The continuous helical lock seam shall be fabricated in accordance with the requirements in Section 207-11.3.3, PWC Specifications. All pipes shall be fully lined with an asphalt or concrete lining. Couplings bands for ribbed steel pipe shall conform to the requirements in Section 207-11.2.2.

D. If either spiral ribbed or corrugated metal pipe is to be used, the contractor shall obtain and pay for services of a licensed testing laboratory which shall obtain soil samples from the site and perform chemical and resistivity tests to determine the projected service life of the pipe. The contractor shall submit test results, for Architect's approval, certifying a minimum 50-year service life for the pipe.

E. Cast Iron Pipe: Hub and spigot cast iron soil pipe and fittings, ASTM A74 for compression gasket joints. Service Class, extra heavy with gaskets, ASTM C564.

2.02 DRAINAGE STRUCTURES

A. Concrete for catch basins, culverts and other drainage structures shall be 560-C-3250 or 56G-3-3250, unless otherwise specified.

B. Forms for concrete drainage structures shall be rigid and substantial. Plywood or tongue and grooved lumber shall be used for forming the exposed faces of all concrete drainage structures.

C. Pre-cast concrete catch basins: As manufactured by Brooks Products, Inc., or an approved equal.

D. Planter drains and small-diameter cleanouts (up to 8") shall be cast iron with black paint all exposed surfaces, as detailed. Acceptable manufacturers include Alhambra, Smith, Josam, Wade, and Zurn.

2.03 MISCELLANEOUS

A. Frames and Gates: Conform to the drawings and to the requirements of ASTM A48, Class 3.

B. Marker Tape: Manufacturers standard bright green continuous-printed detectable plastic tape intended for direct burial; not less than 6" wide x 4-mil thickness. Black print shall read, "CAUTION-STORM DRAIN BURIED BELOW'.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

3.02 BEDDING

A. Excavate trenches as indicated on the drawings and/or specified elsewhere. Keep trenches clean until installed work has been approved.

B. Bedding material shall normally extend from 3" below the pipe invert to a point 1 foot above the top of pipe. Bedding material shall be a mixture of sand, gravel, crushed aggregate or approved native material. Bedding material shall have a sand equivalent of not less than 30 or have a coefficient of permeability greater than 0.001 centimeters per second. Bedding material shall be sized within the following range:

Sieve Size:	Percent Passing:
3/4"	100
No. 4	35 - 65
No. 200	0-10

C. Bedding shall be compacted to 90 percent of the Maximum Relative Density, unless otherwise specified.

3.03 PIPE INSTALLATION

A. Install pipe in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.

B. Inspect pipe before installation to detect apparent defects. Mark defective materials and promptly remove from site.

C. Lay bell, hub or groove ends upgrade, accurately centering adjoining spigots in them so as to provide an unbroken continuity of invert.

D. Install gaskets in accordance with manufacturers recommendations for use of lubricants, cements, and other special installation requirements.

E. Unless otherwise indicated, lateral connections to main lines and angles in lines shall be made with the use of 45-degree wyes.

F. Reinforced Concrete Pipe: Lay and bed in accordance with the applicable provisions of the American Concrete Pipe Association's "Concrete Pipe Field Manual", unless otherwise indicated.

G. Polyvinyl Chloride Pipe: Install in accordance with manufacturers instructions.

H. Corrugated Metal Pipe or Spiral Ribbed Galvanized Steel Pipe: Install in accordance with manufacturers instructions, unless otherwise indicated.

I. Unless otherwise shown, match soffits at all storm drain connections, laterals, cleanouts, etc.

J. Bury marker tape 6" to 12" below finished grade, directly above pipe. Only required on 8" and larger lines.

3.04 DRAINAGE STRUCTURES

A. Construct catch basins, cleanouts, and other drainage structures at locations, and to the design and dimensions indicated. Exposed concrete work shall have a smooth troweled finish with rounded comers and edges finished plumb and true. Provide grates, frames and covers as required on the plans and specified in this section.

B. Forms shall be kept in place not less than five days after placing, unless otherwise directed or approved. Concrete mark shall be cured in accordance with Division 3.

C. Pre-cast concrete catch basins shall be installed to the dimensions and elevations indicated or, the drawings.

3.05 PROTECTION

Drain lines, including trenches, shall be protected from damage during the entire construction period. It shall be the responsibility of the Contractor to replace or remark any damaged portion of the work at his own expense until such time as the project is accepted.

3.06 CLEAN-UP

A. Upon completion of the work, all storm drain systems shall be left free from silt, debris and obstructions.

B. Clear dirt and other superfluous material from interior of pipe as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. In large, accessible conduit, brushes and brooms may be used ford cleaning.

C. Place plugs in ends if uncompleted conduit at end of day, or whenever work stops.

D. Flush lines clean with water after installation is complete.

E. Remove and dispose of existing storm drain facilities as required.

3.07 OPERATIONAL TESTING

A. Perform all testing required by public agencies having jurisdiction for all or part of the work.

B. Perform all testing required by these specifications and drawings, to the satisfaction of the Architect.

C. In addition to other tests, perform the following tests to the satisfaction of the Inspector, and, if requested, the Architect and Owner:

1. Flow-Test roof drain connecting lines with a 3/4" water hose connected to a hose bibb or garden valve; run water at full force for a minimum of 5 minutes. The roof drain receptor and building drain line will be tested in the same manner as the plumbing system.

2. Flow-Test all other drains using the following criteria:

   a. Flow-test gutters and area drains with a 3/4" water hose connected to a hose bibb or garden valve. Run water for a minimum of 5 minutes.

   b. Flow-test all catch basins connected to a line 6 inches or larger with a minimum 500gallon deluge of water over a five-minute period.

***** END OF SECTION *****