

## SECTION 02520

### STORM DRAINAGE UTILITIES

#### 1.00 GENERAL

1.01 Scope. Work under this section includes furnishing, installing, cleaning and testing drainage pipe (including culverts) underdrains, trench drains, bands, collars, inlet section, outlet sections and all other items appurtenant to drainage pipe.

#### 1.02 Related Work Specified Elsewhere.

Section 02200 - Excavation and Embankment  
Section 02201 - Excavation and Backfill for Structures  
Section 02222 - Embedment and Base Course Aggregate  
Section 02560 - Sanitary Sewerlines

#### 1.03 Reference Standards.

A. State Department of Highways, Division of Highways, State of Colorado, "Standard Specifications for Road and Bridge Construction," latest edition.

1.04 Submittals. Product data including catalogue cut sheets and descriptive literature.

1.05 Protection of Work. All pipe and appurtenances shall be carefully handled, stored and protected in such a manner as to prevent damage to materials and protective coatings and linings. At no time shall such materials be dropped or dumped into trench.

Precaution shall be taken to prevent foreign matter from entering the pipe and appurtenances prior to and during installation. Place no debris, tools, clothing or other materials in the pipe during installation.

#### 2.00 MATERIALS

This item covers the types of material that will be required for the construction and installation of drainage pipe. All materials used shall be new and the best quality available. All material used shall be in accordance with applicable standards of the American National Standards Institute (ANSI), the American Standards Association (ASA), the American Society of Testing and Materials (ASTM) and the American Association of State Highway Transportation Officials (AASHTO).

#### 2.01 Corrugated Steel and Aluminum Pipe and Pipe Arches.

A. Pipe and Bands.

1. Conform to AASHTO M-36, M-274 and M-196 as applicable.
2. Steel Pipe and connecting bands shall be Aluminized Corrugated Steel Pipe, Type 2 (ALT2)

3. Size, length and shape as shown on Drawings.
4. Corrugations to be 2-2/3" x 1/2" or 3" x 1" unless shown otherwise.
5. Gauge to be minimum 16 gauge (0.064") for pipe smaller than 36" diameter and 14 gage (0.079") for arch pipe and pipe 36" diameter and larger
6. Bands to be "Hugger" type with forged steel bars secured to connecting bar with tension straps. The use of channel bands as described in 9.1 of AASHTO M 36 will not be allowed. Connecting bands shall be at least 10-1/2 inches wide.
7. Gasket use rubber O-ring, two for each joint.
8. Pipe seams shall be continuous weld type.

B. End Sections.

1. Conform to M-603-CA.

2.02 Smooth Interior Corrugated Polyethylene Pipe (CPP).

- A. Pipe. This specification applies to high density polyethylene corrugated pipe with an integrally formed smooth waterway. Pipe shall be Advanced Drainage Systems N-12 Watertight Pipe (ADS N-12 WT) or engineer approved equal.

Nominal Sizes: 4" to 36" diameter

CPP to have a full circular cross-section, with an outer corrugated pipe wall and an essentially smooth inner wall (waterway). Corrugations for sizes listed may be either annular or spiral. Corrugation type must compliment the bands and fittings supplied with the pipe.

Sizes 42 and 48 inch (ADS N-12 WT HC) shall consist of an essentially smooth waterway braced circumferentially with circular ribs which are formed simultaneously with an essentially smooth outer wall.

All sizes shall conform to the AASHTO classification "Type D".

Pipe manufactured for this specification shall comply with the requirements for test methods, dimensions, and markings found in AASHTO Designations M252 and M294.

Pipe and fittings shall be made from virgin PE compounds which conform with the requirements of cell class 324420C as defined and described in ASTM D3350.

Minimum parallel plate stiffness values when tested in accordance with ASTM D2412 shall be as follows:

<u>Diameter</u>	<u>Pipe Stiffness</u>	<u>Diameter</u>	<u>Pipe Stiffness</u>
4"	50 psi	18"	40 psi
6"	50 psi	24"	34 psi
8"	50 psi	30"	28 psi
10"	50 psi	36"	22psi
12"	50 psi	42"	19 psi
15"	42 psi	48"	17psi

- B. Fittings. The fittings shall not reduce or impair the overall integrity or function of the pipe. Fittings may be either molded or fabricated. Common corrugated fittings include inline joint fittings, such as couplers and reducers, and branch or complimentary assembly fittings such as tees, wyes, and end caps. These fittings may be installed by various methods, such as snap-on, screw-on, bell and spigot, and wrap around. Couplings shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Only fittings supplied or recommended by the pipe manufacturer shall be used. A neoprene or rubber gasket shall be supplied.
- C. Curb Inlets, Inline Drains, Drain Basins and Manholes.
- a. Nyloplast-**Advanced Drainage Systems, Inc.**
  - b. Nyloplast Snout or BMP, Inc. 'NP' Snout structures
  - c. BMP, Inc. oil skirt OB-2116
  - d. The cast iron grates
  - e. Manholes: In conformance with Section 02560-Sanitary Sewerlines
  - f. Water tight flexible elastomeric seals
  - g. Capable of supporting H-20 wheel loading
  - h. Grates shall be hinged to the frame using pins.
  - i. Installed per manufacturer's recommendations and guidelines.
- D. Installation. Installation of the pipe specified above shall be in accordance with ASTM Recommended Practice D2321 as covered elsewhere in these specifications.

### 2.03 Reinforced Concrete Pipe (RCP).

- A. This pipe shall conform to the requirements of AASHTO M 170 for the specified diameters and strength classes. Unless otherwise specified, pipe wall design and use of elliptical reinforcement in circular pipe are optional. Reinforced concrete pipe being jacked shall be Class V and shall be furnished with grouting nipples spaced not more than 8 feet apart. Joints for this pipe shall come equipped with steel rings and rubber gaskets conforming to ASTM C 361 and as described in Bureau of Reclamation Specifications for Type R-2 joints.
- B. Elliptical pipe conforming to AASHTO M 207 shall be furnished when required on the plans. Arch pipe conforming to AASHTO M 206 shall be furnished when required on the plans.
- C. Precast reinforced concrete end sections shall have at least one line of reinforcement

conforming to the requirements of AASHTO M 170 equivalent to the square inches per linear foot for elliptical reinforcement in circular pipe, Class II, Wall B.

- D. Pipe shall be obtained from a manufacturer that is a current plant quality certified member of the American Concrete Pipe Association (ACPA), meeting all current ACPA requirements for this certification. A copy of the ACPA certification shall be submitted to the Engineer prior to delivery of the pipe.

### 3.00 METHODS AND PROCEDURES

3.01 Cleaning and Inspection. Clean all pipe and appurtenances thoroughly of all foreign material and inspect for cracks, flaws or other defects prior to installation. Mark all defective, damaged or unsound materials with bright marking crayon or paint and remove from job site.

3.02 Pipe Installation. Pipe shall be laid in straight sections except as noted on the plans. Jointing of the pipe shall be made in accordance with the directions of the manufacturer of the pipe and the manufacturer of the coupling and shall have rubber gaskets or joint sealing compound as approved. All pipe to be installed with minimum cover of 12 inches.

The pipe laying shall begin at the downstream end of the pipe line. The lower segment of the pipe shall be in contact with the prepared bedding throughout its full length. Bell or groove ends of concrete pipes and outside circumferential laps of metal or plastic pipes shall be placed facing upstream.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical shaped pipe and circular pipe with elliptical reinforcement shall have the top clearly marked with paint or with imprinted letters and with lifting eye holes in which laying pins can be used. Holes shall be finished smooth with grout or with plugs. Pipes shall be placed with the vertical axis within five degrees of a vertical plane through the longitudinal axis of the pipe.

### 3.03 Joining Pipe.

A. Concrete Pipe. Conduit sections shall be joined in such manner that the ends are fully entered and the inner surfaces are reasonably flush and even. Rubber gaskets shall be used for concrete pipe joints.

B. Metal Conduit. Corrugated metal pipe sections shall be placed and aligned to within  $\frac{3}{4}$  inch of the adjacent section and shall be firmly joined with either one-piece or two-piece coupling bands. Pipe with helical corrugations shall be joined with the corrugations matched across the joints and with all corrugations of the pipe completely engaged by the corrugations or dimples of the coupling band.

Where existing corrugated metal pipe culverts are to be extended, damaged ends shall be cut off or repaired in an approved manner. All ends of pipes requiring extensions shall be cleaned within the area necessary for proper installation of connecting bands.

Arch culverts shall be extended with pipe having a compatible arch shape. When special joint treatment is called for on the plans to prevent infiltration or exfiltration, the joints shall be made using a sealing compound conforming to manufacturer's recommendations for use with the connecting band.

- C. Plastic Conduit. Couplings shall be as recommended by the conduit manufacturer. Rubber gaskets shall be used for plastic conduit pipe joints.

3.03 Pipe Embedment. Pipe shall be embedded according to applicable details on the Drawings.

3.04 Apron Endwalls. Apron endwalls (end sections) shall be constructed at the ends of all drainage pipe as shown on the plans. All entrance endwalls shall have toe plates. Excavation for endwalls shall be such that the endwall rests on undisturbed soil in its final position. Excavation for toe plates shall be such that the inside of the toe plate rests on undisturbed soil in its final position. Backfill shall be done as in Part 3.03 of this section.

3.05 Flared End Sections. Flared end sections shall be installed on all surface culverts with a minimum of 4'W x 6'L of 9" nominal angular rock riprap at all outlets less than 30" diameter and a minimum of 24" wider than the pipe diameter x 10'L of 12" nominal angular rock riprap at all outlets 30" diameter and larger. Riprap shall be extended down past the toe of all outlet slopes steeper than 6H:1V.

3.06 Construction Traffic. Pipe base subgrade shall be prepared prior to placement of pipe. Mulch and organic matter shall be removed and replaced with 3" maximum granular material with low silt or clay contents. Pipe shall be backfilled with granular material in 6" lifts or flowable concrete as specific on the details.

#### 4.00 QUALITY CONTROL - FIELD

4.01 Inspection and Testing. Inspection and testing to be performed at direction of the Engineer. Contractor to cooperate fully with all testing procedures.

Any pipe section which has been damaged in any way which, in the opinion of the Engineer, may affect the structural integrity of the pipe or reduce the expected corrosion resistance of the pipe, shall be removed and replaced. At the option of the Engineer, re-coating of minor dents and deformities with an approved fluid applied galvanized material may be allowed.

#### 5.00 MEASUREMENT AND BASIS OF PAYMENT

Payment will be made at the unit price given on the bid schedule for each item of work and will be full compensation for that item complete in place.

END OF SECTION