

## SECTION 12 93 00 – SITE FURNISHINGS

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Bench
  - 2. Litter and Recycling Receptacle
  - 3. Bicycle Rack
  - 4. Bollard
- B. Related Requirements:
  - 1. Section 033000 "Cast-in-Place Concrete" for concrete footings.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

### PART 2 – PRODUCTS

#### 2.1 BENCH

- A. Basis of Design Model: "Austin" Bench
  - 1. Style: Exterior use, 72" length, backed, with end arms
  - 2. Mounting: Four-legged surface mounted with corrosion resistant anchor bolts per manufacturer's recommendation.
  - 3. Material:
    - a. Wood: IPE
      - 1) Color: Unfinished
    - b. Metal: Powder coated
      - 1) Color: Metallic Silver
  - 4. Manufacturer: Landscape Forms or approved equal
    - a. Phone: 1-800-430-6209
    - b. Web: <http://www.landscapiforms.com>

#### 2.2 LITTER RECEPTACLE

- A. Basis of Design Model: "Austin" Litter Receptacle

1. Style: Side opening with lid
2. Mounting: Surface mounted with corrosion resistant anchor bolts per manufacturer's recommendation.
3. Material:
  - a. Liner:
    - 1) Color: Black
    - 2) Capacity: 34 gallons
  - b. Metal: Powder coated
    - 1) Color: Metallic Silver
4. Manufacturer: Landscape Forms or approved equal
  - a. Phone: 1-800-430-6209
  - b. Web: <http://www.landscapeforms.com>

### 2.3 BICYCLE RACK

- A. Basis of Design Model: "U24 'U'" Bicycle Rack
  1. Mounting: Surface mounted with corrosion resistant anchor bolts per manufacturer's recommendation.
  2. Material:
    - a. Metal: Powder coated
      - 1) Color: Grey
  3. Manufacturer: MadRax or approved equal
    - a. Phone: 1-800-448-7931
    - b. Web: <http://www.madrax.com>

### 2.4 BOLLARD

- A. Basis of Design Model: "Stop" Bollard
  1. Style: Standard
  2. Mounting: Permanently Embedded
  3. Material:
    - a. Liner:
      - 1) Tube Color: Metallic Silver
      - 2) Casting Color: Metallic Silver
    - b. Metal: Powder coated
      - 1) Color: Metallic Silver
  4. Manufacturer: Landscape Forms or approved equal
    - a. Phone: 1-800-430-6209
    - b. Web: <http://www.landscapeforms.com>

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Except for bollards and unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings

**END OF SECTION**

## SECTION 13120 - PRE-ENGINEERED METAL BUILDING SYSTEMS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Metal Building System:
  - 1. Structural steel framing system.
  - 2. Secondary structural framing members.
  - 3. Metal roof systems.
  - 4. Metal wall systems.
  - 5. Flashings, closures and trims.
  - 6. Eave gutters and downspouts.
  - 7. Roof and wall materials.
  - 8. Roof and wall coating systems.
  - 9. Light transmitting panels.
  - 10. Fasteners.
  - 11. Roof and wall insulation systems.
  - 12. Roof curbs.

#### 1.2 REFERENCE STANDARDS

- A. American Institute of Steel Construction (AISC):
  - 1. AISC S326 Specifications for the Design, Fabrication and Erection of Structural Steel Buildings. (Allowable Stress Design)
- B. International Accreditation service (IAS):
  - 1. AC472 Accreditation Criteria for Inspection Programs for Manufacturer of Metal Building Systems, latest edition.
- C. American Welding Society (AWS):
  - 1. AWS D1.1 Structural Welding Code-Steel (Latest Edition Unless Noted)
- D. ASTM International (ASTM):
  - 1. ASTM A36/A572/A992 Structural Steel Shapes
  - 2. ASTM A653 Steel Sheet, Zinc-Coated (G-90 Galvanized) by Hot-Dip Process, Structural (Physical) Quality.
  - 3. ASTM A475 Extra High Strength Grade Cable.
  - 4. ASTM A529 High-Strength Structural Steel Flat Bars
  - 5. ASTM A1011 SS/HSLAS Cold-Formed Structural Shapes
  - 6. ASTM A792 SS Steel Sheet (For Cladding Panels), Aluminum-Zinc Alloy Coated by Hot-Dip Process
  - 7. ASTM A53/A500, Gr B Hollow Structural Shapes
  - 8. ASTM A307 Common Bolts
  - 9. ASTM A325/A490 High Strength Bolts
  - 10. ASTM B117 Salt Spray (Fog) Testing

11. ASTM C1371 Measuring Thermal Emittance of Exterior Coatings
  12. ASTM C1549 Measuring Solar Reflectance of Exterior Coatings.
  13. ASTM D523 Specular Gloss
  14. ASTM D659 Measuring Degree of Fade of Exterior Coatings.
  15. ASTM D4214 Evaporating Degree of Chalking of Exterior Paints
  16. ASTM D968 Abrasion Resistance of Organic Coatings by Falling Abrasive
  17. ASTM D2244 Calculation of Color Differences from Instrumentally Measured Color Coordinates
  18. ASTM D2247 Testing Water Resistance of Coatings in 100% Relative Humidity.
  19. ASTM D2794 Testing Impact resistance of Coating with Direct Impact.
- E. Metal Building Manufacturers Association (MBMA)
1. MBMA-01 Metal Buildings System Manual, 2012 edition.
- F. Underwriters Laboratories, Inc. (UL)
1. UL 580 Test for Uplift Resistance of Roof Assemblies
  2. UL 790 Standard Test Methods for Fire Tests Of Roof Coverings.
  3. UL 2218 Impact Resistance of Prepared Roof Covering Materials.
- G. Federal Specifications (FS)
1. FS TT-P-664 Protective Coatings for Fabricated Structural Members.
- H. Steel Structures Painting Council (SSPC)
1. SP-2 Hand Tool Cleaning
- I. FM Global:
1. FM 4471 Approval Standard For Class 1 Panel Roofs.
- J. Cool Roof Rating Council (CRRC):
1. CRRC-1 Product Rating Program Manual, November 2013

### **1.3 SUBMITTALS**

- A. Product Data: Submit metal building system manufacturer's product information, specifications, and installation instructions for building components and accessories.
- B. Erection Drawings: Submit metal building system manufacturer's erection drawings, including plans, elevations, sections, and details, indicating roof framing, transverse cross-sections, covering and trim details, and accessory installation details to clearly indicate proper assembly of building components.
- C. Certification: Submit written "Letter of Certification" prepared and signed by a Professional Engineer, registered to practice in Texas verifying that the metal building system design and metal roof system design (including panels, clips, and support system components) meet indicated loading requirements and codes of authorities having jurisdiction.
  1. Certification shall reference specific dead loads, live loads, snow loads, wind loads/speeds, tributary area load reductions (if applicable), concentrated loads, collateral loads, seismic loads, end-use categories, governing code bodies, including year, and load applications.

- D. Submit certification verifying that the metal roof system has been tested and approved by Underwriter's Laboratory as UL 580 Class 90 or;
- E. Warranty Documentation: Submit manufacturer's standard warranties.

#### **1.4 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications:
  - 1. Manufacturer regularly engaged, for a minimum of 20 years, in the manufacture of metal building systems of similar type and scope of that specified.
  - 2. Accredited based on IAS Accreditation Criteria AC472 and requirements in International Building Code (IBC), Chapter 17.
- B. Installer's Qualifications:
  - 1. Installer regularly engaged, for a minimum of 5 years, in installation of metal building systems of similar type and scope of that specified.
  - 2. Employ persons trained by the manufacturer for installation of metal building systems.
- C. Certificate of design and manufacturing conformance:
  - 1. Refer to Submittals article of this specification section.
- D. Material Test Reports:
  - 1. In addition to material certifications of structural steel, metal building system manufacturer shall provide, upon request at time of order, evidence of compliance with specifications through testing.
  - 2. This quality assurance testing shall include testing of structural bolts, nuts, screw fasteners, mastics, and metal coatings (primers, metallic coated products, and painted coil products).

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
  - 1. Store and handle materials in accordance with manufacturer's instructions.
  - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
  - 3. Do not store materials directly on ground.
  - 4. Store materials on flat, level surface, raised above ground, with adequate support to prevent sagging.
  - 5. Protect materials and finish during storage, handling, and installation to prevent damage.

#### **1.6 WARRANTY**

- A. Alliance 1 Weathertightness Warranty (Available only on Standing Seam Roof Systems)
  - 1. This is Alliance's standard single source 5, 10, 15 or 20 year limited weathertightness warranty which covers the entire roofing system. It is prorated and includes flashings.

- The warranty includes three (3) inspection visits.
2. Liability, as combined to Alliance and our customer is limited to 2X the original cost of the metal roofing system (square foot of roofing, not building footprint).
- B. One Year Workmanship Warranty
1. This warranty provides additional reassurance that Alliance stands behind our products warranting the workmanship of the materials manufactured by Alliance for a period of one year from date of substantial completion.
  2. This warranty is supplied at no cost to our customer.
- C. Finish Warranties
1. Bare Acrylic-Coated Galvalume™:
    - a. Warrant that products will not rupture, fail structurally or perforate within 25 years due to normal atmospheric corrosion.
  2. WeatherXL Modified silicone-Polyester Two-Coat System (SMP):
    - a. 2,000 hours salt spray resistance per ASTM B117.
    - b. Thermal emittance per ASTM C1371 (varies by color).
    - c. Solar reflectance per ASTM C1544 (varies by color).
    - d. SRI values calculated per ASTM 1980 for LEED cool roof credits.
    - e. Specular gloss of 20 to 80 at 60-degree viewing per ASTM D523.
    - f. 35 liters abrasion resistance per ASTM D968.
    - g. Color fading in excess of five (5) Hunter units per ASTM D2244, for vertical applications for 30 years.
    - h. 2,000 hours humidity resistance per ASTM D2247.
    - i. Reverse impact resistance of 1.5X per ASTM D2794.
    - j. Chalking in excess of a No. 8 rating per ASTM D4214, for vertical applications for 30 years.
    - k. Failure of adhesion, peeling, checking or cracking for 40 years.
  3. Fluoropolymer Two-Coat System (PVDF/Kynar-500):
    - a. 3,000 hours salt spray resistance per ASTM B117.
    - b. Thermal emittance per ASTM C1371 (varies by color).
    - c. Solar reflectance per ASTM C1544 (varies by color).
    - d. SRI values calculated per ASTM 1980 for LEED cool roof credits.
    - e. Specular gloss of 20 to 35 at 60-degree viewing per ASTM D523.
    - f. 65 liters abrasion resistance per ASTM D968.
    - g. Color fading in excess of five (5) Hunter units per ASTM D2244, for vertical applications for 20 years.
    - h. 3,000 hours humidity resistance per ASTM D2247.
    - i. Reverse impact resistance of 1.5X per ASTM D2794.
    - j. Chalking in excess of a No. 8 rating per ASTM D4214, for vertical applications for 20 years.
    - k. Failure of adhesion, peeling, checking or cracking for 35 years.
  4. These warranties are “pass through” warranties in that Alliance is only able to supply because the raw material manufacturer (steel mill) or coil paint manufacturer (Valspar) is willing to warrant their product to this extent.

5. Alliance does not typically extend these warranties beyond what the steel mill or coil paint manufacturer allows as Alliance cannot accept sole liability beyond their standard limits.
6. These warranties are supplied at no cost to our customer.

## 1.7 MANUFACTURER

### BASIS OF DESIGN MANUFACTURER:

Alliance Steel, Inc.

3333 S. Council Road, Oklahoma City, OK, 73179. Phone (800) 624-1579

Equal Manufacturers acceptable

## 1.8 BUILDING DESCRIPTION

- A. Building Dimensions: Indicated on the Drawings.
  1. Horizontal Dimensions: Measure to inside face of wall sheets.
  2. Eave Height: Measure from top of finished floor to intersection of insides of roof and sidewall sheets.
  3. Clear Height Between Finished Floor and Bottom of Roof Steel: Indicated on the Drawings.
- B. Primary Structural Members:
  1. Primary Framing System: Alliance Steel, Inc. framing system as specified in this specification section.
  2. Frames: Welded-up plate section or structural wide flange columns and roof beams, complete with necessary splice plates for bolted field assembly as specified in this specification section.
  3. Bolts for Field Assembly of Primary Steel: High-strength A-325 plain (black) bolts as indicated on erection drawings of metal building system manufacturer.
  4. Beam and Post Endwall Frames: Endwall corner posts, endwall roof beams, and endwall posts as required by design criteria.
  5. Exterior Columns: Welded-up "H" sections or cold-formed "CEE" sections.
  6. Interior Columns: "H" sections, pipe or tube columns.
  7. Connection of Primary Structural Members: ASTM A-325 plain (black) bolts through factory-punched holes.
  8. Primary Structural Members: Factory painted with metal building system manufacturer's standard red oxide primer with surface preparation as specified in this specification section.
- C. Secondary Structural Members:
  1. Secondary Framing System: Alliance Steel, Inc. framing system as specified in this section.
  2. CEE / ZEE Purlins and Girts: Factory painted with metal building system manufacturer's standard red oxide primer with surface preparation as specified in this specification section.
- D. Metal Roof System: Alliance Steel, Inc. metal roof system as specified in this section.



- E. Metal Wall System: Alliance Steel, Inc. metal wall system as specified in this section.
- F. Where metal panels must be painted, use coating system as specified in this section.

### 1.9 DESIGN LOADS

- A. Governing Design Code:
  - 1. Structural design for the building structural system shall be provided by the metal building system manufacturer for the following design criteria:
    - a. Governing Building Code: IBC.
    - b. Year/Version: 2015.
    - c. Occupancy Category: Storage
- B. Roof Live Load:
  - 1. Roof live loads are loads produced during the life of the structure by moveable objects.
  - 2. Wind, snow, seismic, or dead loads are not live loads.
  - 3. Refer to structural drawings, sheet 2S0.01, for roof live load requirements.
- C. Wind Load:
  - 1. Wind load used for designing the structure shall be as per wind load parameters noted on structural drawings, sheet 2S0.01.
  - 2. Wind Pressure Coefficients and the design pressures shall be applied in accordance with the governing code.
- D. Dead Load: Dead load shall consist of the weight of building system construction, such as roof, framing, and covering members.
- E. Collateral Load:
  - 1. Collateral load in pounds per square foot shall be applied to the entire structure to account for the weight of additional permanent materials other than the building system, such as sprinklers, mechanical systems, electrical systems, hung partitions, and ceilings.
  - 2. This allowance does not include the weight of hung equipment weighing 50 pounds or more.
  - 3. Equipment loads of 50 pounds or more shall be indicated on the Drawings and the structure shall be strengthened as required.
  - 4. Architect will provide the metal building system manufacturer with the magnitude and approximate location of concentrated loads greater than 50 pounds before design of the building starts.
- F. Auxiliary Loads: Auxiliary loads shall include dynamic loads, such as cranes and material handling systems, and will be defined in the Contract Documents.
- G. Load Combinations: Load combinations used to design primary and secondary structural members shall be in accordance with the governing code.

### 1.10 DEFLECTIONS

- A. Structural Members:
  - 1. Maximum deflection of main framing members shall not exceed  $1/240$  of their respective spans.
  - 2. Maximum deflection due to snow load in roof panels and purlins shall not exceed  $1/360$

3. . of their respective spans.
3. Maximum deflection due to wind load in wall panels and girts shall not exceed  $1/180$  of their respective spans.
- B. Lateral deflections, or drift, at the roof level of the structure in relation to the floor or slab on grade, caused by deflection of horizontal force resisting elements, shall not exceed  $H/400$ .
- C. Calculations for deflections shall be done using only the bare frame method.
  1. Reductions based on engineering judgment using the assumed composite stiffness of the building envelope shall not be allowed.
  2. Drift shall be in accordance with AISC Serviceability Design Considerations for Low-Rise Buildings.
  3. Use of composite stiffness for deflection calculations is permitted only when actual calculations for the stiffness are included with the design for the specific project.
  4. When maximum deflections are specified, calculations shall be included in the design data.

## **PART 2 PRODUCTS**

### **2.1 STRUCTURAL STEEL FRAMING SYSTEM**

- A. General:
  1. Design of Structural System: Clear or multi-span rigid frame with tapered or straight columns and roof beams, with gable or single-slope roof.
  2. Actual Building Length:
    - a. Structural line to structural line.
    - b. Same as nominal; i.e., number of bays times the length of the bays.
    - c. Structural Line: Defined as inside face of wall sheets.
  3. Actual Building Width:
    - a. Structural line to structural line.
    - b. Nominal building width.
  4. Minimum Roof Slope: 1 inch in 12 inches.
  5. Maximum Roof Slope: 1 inch in 12 inches.
  6. Components and Parts of Structural System:
    - a. Indicated on the Drawings or the Specifications.
    - b. Clearly marked.
    - c. Erection Drawings: Supply for identification and assembly of parts.
    - d. Drawings: Carry stamp of a registered professional engineer.
  7. Foundations:
    - a. Foundations, Including Anchor Bolt Embedment Length: Properly designed by qualified engineer, retained by other than metal building system manufacturer, in accordance with specific soil conditions for building site.
    - b. Reactions for Proper Design of Foundations: Supplied by metal building system manufacturer.
    - c. Anchor Bolts:
      - 1) Anchor Bolt Diameter: Indicated on anchor bolt layout drawings furnished by metal building system manufacturer.
      - 2) Anchor Bolts: Supplied by Contractor, not metal building system

- 3) Anchor Bolts on Moment-Resisting Column Bases: Nuts above and below base plates.
- B. Structural Steel Design:
  - 1. Structural Mill Sections or Welded-up Plate Sections: Design in accordance with AISC Specification for Structural Steel Buildings.
  - 2. Cold-Formed Steel Structural Members: Design in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
  - 3. Structural System: Design in accordance with specified building code (Refer to Design Loads and Building Codes).
- C. Primary Framing:
  - 1. Rigid Frames:
    - a. Frames: Welded-up plate section columns and roof beams, complete with necessary splice plates for bolted field assembly.
      - 1) Base Plates, Cap Plates, Compression Splice Plates, and Stiffener Plates: Factory welded into place and connection holes factory fabricated.
      - 2) Columns and Roof Beams: Fabricated complete with holes in webs and flanges for attachment of secondary structural members and bracing, except for fieldwork as noted on erection drawings furnished by metal building system manufacturer.
    - b. Bolts for Field Assembly of Frame Members: ASTM A-325 high-strength bolts as indicated on erection drawings furnished by metal building system manufacturer.
  - 2. Endwall Structural Members: Cold-formed channel members designed in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members or welded-up plate sections designed in accordance with AISC Specification for Structural Steel Buildings.
    - a. Endwall Frames: Endwall corner posts, endwall roof beams, and endwall posts as required by design criteria.
      - 1) Splice Plates and Base Clips: Shop fabricated complete with bolt connection holes.
      - 2) Base Plates, Cap Plates, Compression Splice Plates, and Stiffener Plates: Factory welded into place and connection holes shop fabricated.
      - 3) Beams and Posts: Factory fabricated complete with holes for attachment of secondary structural members, except for field work as noted on erection drawings furnished by metal building system manufacturer.
    - b. Intermediate Frames: Substituted for end-wall roof beams, when specified.
      - 1) Factory fabricate necessary endwall posts and holes for connection to intermediate frame used in endwall.
- D. Secondary Structural Framing Members:
  - 1. Purlins, Girts and Eave Members: ASTM A 1011 Grade 55 (380), or ASTM A 653 Grade 55 (380).
  - 2. Recycled Content: post-consumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
  - 3. Finish: red oxide primed (G-90 galvanized available at extra cost).
  - 4. Thickness
    - a. 16 gauge: 0.056 inch (1.421 mm) minimum uncoated thickness.
    - b. 14 gauge: 0.067 inch (1.689 mm) minimum uncoated thickness.
    - c. 13 gauge: 0.081 inch (2.051 mm) minimum uncoated thickness.

- d. 12 gauge: 0.100 inch (2.534 mm) minimum uncoated thickness.
5. Purlins:
  - a. Purlins:
    - 1) “ZEE”-shaped, precision-roll-formed, in different gauges to meet specified loading conditions.
    - 2) 8-inch, 10-inch, or 12-inch-deep “ZEE” sections.
  - b. Attach purlins to main frames and endwalls with ½-inch-diameter bolts.
  - c. Brace purlins at intervals indicated on erection drawings furnished by metal building system manufacturer.
  - d. Concentrated Loads: Hung at purlin panel points.
6. Eave Members:
  - a. Eave Struts: Factory punched, 8-inch, 10-inch, or 12-inch-deep “CEE” sections, precision-roll-formed, in different gauges to meet specified loading conditions.
7. Girts:
  - a. “ZEE” or “CEE”-shaped, precision-roll-formed, in different gauges to meet specified loading conditions.
  - b. 8-inch, 10-inch, or 12-inch-deep “ZEE” or “CEE” sections.
8. Bracing:
  - a. Locate bracing as indicated on the Drawings.
  - b. Diagonal Bracing:
    - 1) Cable Bracing conforming to ASTM A475-78 for extra high strength grade or
    - 2) Structural Angle Bracing or
    - 3) Hot-rolled rods of sizes indicated on the Drawings.
    - 4) Attach to columns and roof beams as indicated on the Drawings.
  - c. Optional fixed-base wind posts or pinned-base portal frames may be substituted as required.
  - d. Flange Braces and Purlin Braces: Cold formed and installed as indicated on the Drawings.
- E. Welding:
  1. Welding Procedures, Operator Qualifications, and Welding Quality Standards: AWS D1.1 - Structural Welding Code – Steel and AWS D1.3 - Structural Welding Code – Sheet Steel.
  2. Welding inspection, other than visual inspection as defined by AWS D1.1, paragraph 6.9, shall be identified and negotiated before bidding.
  3. Certification of Welder Qualification: Supply when requested.
- F. Priming of Structural Steel Framing System:
  1. General:
    - a. Structural Steel: Prime paint as temporary protection against ordinary atmospheric conditions.
    - b. Perform subsequent finish painting, if required, in field as specified in the painting section.
    - c. Before priming, clean steel of loose rust, loose mill scale, dirt, and other foreign materials.
    - d. Steel Fabricator: Not required to sand blast, flame clean, or pickle steel before painting, unless otherwise specified.
  2. Primary Frames:
    - a. Clean steel in accordance with SSPC-SP2.

- b. Factory cover steel with 1 coat of Alliance Steel's standard Red oxide primer formulated to equal or exceed Federal Specification TTP-664
  - c. Minimum Dry Film Thickness: 1.0 mil.
3. Secondary Structural Framing Members – Roll-Formed:
- a. Pre-coated cold form material, red oxide primed, by commercial coater using a preparation process equal to SSPC-SP10.
  - b. Minimum Dry Film Thickness: 0.5 mil.
  - c. G-90 Galvanized available for extra cost.

## 2.2 METAL ROOF SYSTEMS

- A. Roof covering shall consist of the roof panels, their attachments, trim and sealants for use on the exterior of the roof.
1. Alliance "AS-24" shall be a system of standing seam roof panels with either a fixed clip system for rigid construction or a floating clip system to provide for thermal movement of the panel and have a roof slope of ¼:12 or greater. The 24" wide net coverage has 3" high major ribs at 24" centers, and three minor ribs between the major ribs. The AS-24 roof system shall be installed utilizing concealed steel clips, snap-locked at the side joints and weatherproofed by factory applied sealant and is field seamed with either a TripleLok or QuadLok seam. AS-24 panels shall be continuous from ridge to eave until the panel length exceeds 40' and/or the panels become prohibitive for handling, in which case endlaps are provided. Endlaps shall be 3" and occur 7" above a supporting member, utilizing 16 gage back-up plates. The AS-24 standing seam roof system shall be available for 3 different insulation conditions. The "UTILITY" system (fixed condition only) shall be for buildings without insulation up to 2" of blanket insulation and does not provide for clearance over the purlins. The "LOW" system shall be for buildings with no more than 4" of blanket insulation, but not requiring thermal blocks and will provide 3/8" of clearance over the purlins. The "HIGH" system shall be for buildings with more than 4" of blanket insulation that require thermal blocks and will provide 1 3/8" of clearance over the purlins. Roof panels shall be UL 580 Class 90 uplift and UL 2218 Class 4 impact resistant rated.
  2. Alliance Steel's roof covering systems (except for NFS-16) are designed for 6" maximum blanket insulation thickness over the purlin. Alliance acknowledges that there are proprietary methods of insulating where insulation of greater than 4" between the purlins may be utilized.

## 2.3 METAL WALL SYSTEMS

- A. Wall covering shall consist of the wall panels, their attachments, trim and sealants for use on the exterior of the walls or as interior liner walls.
1. Alliance "PBR" shall be a system of exposed fastener wall panels providing a 36" wide net coverage having 1 ¼" high major ribs at 12" centers and two minor ribs between the major ribs. Sidelaps shall be one full major rib and shall utilize the bearing edge of the underlying major rib for support. Panels shall be continuous from eave to sill until panel length exceeds 35' and/or the panel becomes prohibitive of handling, in which case endlaps are provided. Endlaps shall be 4" and occur over a supporting member.

2. Alliance "A-12" shall be a system of concealed fastener soffit panels providing 12" wide net coverage and 1" deep ribs. Panel ribs are positively connected to the framework with concealed self-drilling screws spaced 24" on center. Panels shall be continuous from wall out to eave or gable.
3. Interior Liner Panel: Provide light gauge interior metal liner panel up to 10'-0" along interior face of Exterior Walls.

## **2.4 FLASHINGS, CLOSURES AND SEALANTS:**

### **A. Flashings**

1. Flashing and/or trim shall be furnished at the rake, corners, eaves, framed openings and wherever necessary to provide weathertightness and a finished appearance.
2. A die-formed ridge cap panel, matching the adjoining roof panels, shall be provided along the building for roof slopes up through 6:12.
3. Colors of flashings/trims are to match the adjoining panel unless noted otherwise.
4. Eave gutters shall be sized and provided to remove the volume of water emanating from the roof. The face of the gutter will match the profile of the rake trim. All gutter sections will be securely fastened and contain sealed endlaps and terminations.
5. Downspouts shall be sized and spaced to remove the volume of water emanating from the roof. The color of the downspouts will match the adjoining panels unless otherwise noted. Downspouts shall be securely attached to the building. Water kick outs shall be provided at the bottom of each downspout.

B. Profiled panel closures: closures shall be an interlocking closed cell foam material of a gray or neutral color, and shall be die cut to the profile shape. Profile panel closures shall have a minimum service temperature of -100 to +180-degrees Fahrenheit.

C. Field-applied roof panel sealants shall normally be pre-formed roll-tape mastic sealants, tube sealants, and closures as required for weathertightness of the roof.

D. Mastic tape sealants for exposed fastener side lapped panels shall be of preformed butyl rubber base, and shall normally be supplied as a 3/32" x 1/2" extruded shape. 3/32" x 3/4" and 3/16" x 1" sizes are also available. The sealant shall be non-shrinking, non-drying, non-toxic and non-curing. The sealant shall adhere to roof surfaces from -40 to +200-degrees Fahrenheit.

E. Field-applied gunnable sealants shall be TiteBond clear polymer sealant for non-exposed (non-curing) applications and Sonneborne NP-1 Urethane sealant for exposed (curing) applications.

## **2.5 ROOF AND WALL PANEL MATERIALS:**

A. Panel Materials: ASTM A 792.

B. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

C. Thickness and Yield strength:

- a. 24 gauge: 0.212 inch (0.538 mm) minimum uncoated thickness, 50 ksi (340 MPa)

yield strength.

- D. Panel profiles shall be provided in accordance with the specifications below:
  - 1. ALok-16", and NFS-16" roof panels: 24 gauge steel, AZ-55 bare Galvalume, WeatherXL (SMP) and Kynar-500 painted. 22 gauge steel is available for an additional cost.
  - 2. A-12 Soffit panels: 24 gauge steel, AZ-55 bare Galvalume, WeatherXL (SMP) and Kynar-500 painted. 22 gauge steel is available for an additional cost.

## **2.6 ROOF AND WALL COATING SYSTEMS**

- A. Galvalume™: Aluminum-Zinc Alloy Coating, 55% Aluminum, 50% Zinc coated steel per ASTM A 792 AZ55.
- B. Galvalume-Plus™: Acrylic-Coated Aluminum-Zinc Alloy Coating, 55% Aluminum, 50% Zinc coated steel per ASTM A 792 AZ55 with acrylic finish.
- C. Exterior Paint Finishes:
  - 1. Fluoropolymer Two-Coat System (PVDF/Kynar-500): 0.2 – 0.3 mil primer with 0.7 – 0.8 mil 70 percent PVDF fluoropolymer color coat.
  - 2. Interior (backer side) paint: 0.5 mil total dry film thickness consisting of a primer coat and wash coat of manufacturer's standard light-colored acrylic or polyester backer finish.
- D. Roof panels shall normally be unfinished Galvalume™ or Acrylic-coated Galvalume™ zinc-aluminum alloy coated steel or provided prefinished with an exterior paint finish over zinc-aluminum alloy coated steel.
- E. Wall panels shall normally be provided prefinished with an exterior paint finish over zinc-aluminum alloy coated steel.
- F. Flashings shall normally be of 26 or 24 gauge Grade D steel and shall be provided in the same exterior paint finish as the adjoining roof or wall panel profile unless noted otherwise.

## **2.7 FASTENERS**

- A. Exposed fastener roof panels: fasteners shall be self-drilling and self-tapping long life ZAC alloy coated with integral molded washers, painted to match the material when necessary.
- B. Exposed fastener wall panels: fasteners shall be self-drilling and self-tapping cadmium/zinc plated with integral molded washers, painted to match the wall panels when necessary.
- C. Standing seam roof panels: fasteners shall be self-drilling and self-tapping long life ZAC alloy coated with integral molded washers, painted to match the material when necessary.

- D. Ridge: self-drilling and self-tapping long life ZAC alloy coated with integral molded washers, painted to match the material when necessary.
- E. Clips to purlin or bar joists: self-drilling and self-tapping cadmium/zinc plated with integral molded washers.
- F. Rivets for connecting light gauge flashings shall be stainless steel, painted to match the material when necessary.

## **2.8 ROOF AND WALL INSULATION**

- A. Laminated fiberglass insulation shall have a density of 0.75 pounds per cubic foot and shall be available in thickness from 2” to 6”. Fiberglass facings shall be laminated on one side, solar reflective laminates are available. Fiberglass insulation shall have a flame spread rating of 25 or less when tested per ASTM E 84.

## **2.9 ROOF CURBS**

- A. Engineered and custom fabricated roof curbs shall be constructed from #3003 aluminum with continuously welded seams and integral water diverters. Minimum curb sidewall height is 12” and is insulated with foil-faced insulated sidewalls.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Examine area to receive metal building system.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use.
- C. Do not begin installation until unacceptable conditions are corrected.

### **3.2 ERECTION – STRUCTURAL STEEL FRAMING SYSTEM**

- A. Erect structural steel framing system in accordance with the Drawings and metal building system manufacturer’s erection drawings.
- B. Field Modifications:
  - 1. Require approval of metal building system manufacturer.
  - 2. Responsibility of building erector.
  - 3. Field Modifications to Truss Purlins: Not allowed, unless indicated on erection drawings furnished by metal building system manufacturer.
- C. Fixed Column Bases: Grout flush with floor line after structural steel erection is complete.

### **3.3 INSTALLATION – METAL ROOF SYSTEM**



- A. Metal Roof System Installation:
  - 1. Install roof system in accordance with metal building system manufacturer's instructions at locations indicated on the Drawings.
  - 2. Install roof system weathertight.

### **3.4 INSTALLATION – METAL WALL SYSTEM**

- A. Metal Wall System Installation:
  - 1. Install wall system in accordance with metal building system manufacturer's instructions at locations indicated on the Drawings.
  - 2. Install wall system weathertight.
  - 3. Verify structural system is plumb before wall panels are attached.
  - 4. Align and attach wall panels in accordance with erection drawings furnished by metal building system manufacturer.
  - 5. Install side laps with minimum of 1 full corrugation.
  - 6. Flashings, Trim, Closures, and Similar Items: Install as indicated on erection drawings furnished by metal building system manufacturer.

### **3.5 INSTALLATION – INSULATION**

- A. Insulation Installation: Install insulation in accordance with manufacturer's instructions at locations indicated on the Drawings.

### **3.6 PROTECTION**

- A. Protect installed metal building system to ensure that, except for normal weathering, metal building system will be without damage or deterioration at time of Substantial Completion.

**END OF SECTION**

SECTION 270528

PATHWAY FOR COMMUNICATIONS SYSTEM

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General [and Supplementary] Conditions and Division 1 Specification Sections, apply to this Section.
- B. Architectural, mechanical, electrical, and all technology drawings.

**1.2 SUMMARY**

- A. Provides specifications optical fiber cable pathways.
- B. Section Includes:
  - 1. Textile Fabric Inner-Duct
  - 2. Flexible raceway (inner-duct) and fittings

**1.3 REFERENCES**

- A. Abbreviations and Acronyms:
  - 1. A/E: Architect / Engineer (designer)
  - 2. AHJ: Authority Having Jurisdiction
  - 3. ANSI: American National Standards Institute
  - 4. BICSI: Building Industry Consulting Service International
  - 5. IDF: Intermediate Distribution Facility
  - 6. ISP: Inside Plant
  - 7. ITSIMM: Information Transport Systems Installation Methods Manual
  - 8. MDF: Main Distribution Facility
  - 9. MPOE: Minimum Point of Entry
  - 10. OSP: Outside Plant
  - 11. RCDD: Registered Communications Distribution Designer
  - 12. RoHS: Restriction of Hazardous Substances

13. TSER: Telecommunications Service Entry Room
  14. UL: Underwriters Laboratory
- B. Codes and Regulations: (Note: Reference Division One for specific code versions governing the work in addition to the information noted below.) Refer to the most recent version:
1. National Electric Code, (NEC) - 2011
  2. National Electric Safety Code (NESC) –
  3. National Fire Protection Association (NFPA) –
- C. Reference Material: Refer to the most recent version, update or addenda:
1. Telecommunications Industry Association/Electronics Industries Alliance (TIA/EIA) standards and specifications:
    - a. TIA-568-D.0: Generic Telecommunications Cabling for Customer Premises, 2015
    - b. TIA-568-D.1: Commercial Building Telecommunications Cabling Standard, 2015
    - c. TIA-568-C.2: Balanced Twisted-Pair Telecommunications Cabling and Components Standards, 2009
    - d. TIA-568-D.3: Optical Fiber Cabling Components Standard, 2016
    - e. TIA-568-C.4: Broadband Coaxial Cabling and Components Standard, 2011
    - f. TIA-569-D: Telecommunications Pathways and Spaces, 2015
    - g. ANSI/TIA-570-C: Residential Telecommunications Infrastructure Standard, 2012
    - h. TIA-598-D: Optical Fiber Color Coding, 2014
    - i. TIA-606-B: Administration Standard for Telecommunications Infrastructure, 2012
    - j. TIA-607-C: Generic Telecommunications Bonding and Grounding (Earthing) For Customer Premises, 2015
    - k. TIA-758-B: Customer-owned Outside Plant Telecommunications Infrastructure Standard, 2012
  2. Building Industry Consulting Services International (BICSI) Manuals:

- a. Telecommunications Distribution Methods Manual (TDMM), 12th Edition.
  - b. Information Transport Systems Installation Methods Manual (ITSIMM), 6th Edition
  - c. Wireless Design Reference Manual (WDRM), 3rd Edition
  - d. Network Design Reference Manual (NDRM), 6th Edition
  - e. OSP Design Reference Manual (OSPRDM), 4th Edition.
3. ASTM International (ASTM):
- a. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
  - b. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
  - c. ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750C.
  - d. ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop Systems.
  - e. ASTM E1966 Standard Test Method for Fire-Resistive Joint Systems.
  - f. ASTM E1399 Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.
4. Underwriters Laboratories, Inc. (UL)
- a. UL 263 Standard for Fire Tests of Building Construction and Materials.
  - b. UL 723 Tests for Surface Burning Characteristics of Building Materials.
  - c. UL 1479 Standard for Fire Tests of Through-Penetration Firestops.
  - d. UL 2079 Tests for Fire Resistance of Building Joint Systems.: Wire Connectors -2003.

#### **1.4 ADMINISTRATIVE REQUIREMENTS**

##### **A. Coordination:**

1. Install and coordinate the telecommunications cabling work in cooperation with other trades installing interrelated work. Before installation, make proper provisions to avoid interference in a manner accepted by the architect. Any repairs or changes made necessary in the contract work, caused by the contractors neglect, shall be made by the contractor at their own expense.

B. Scheduling:

1. Contract Documents and the overall construction schedule must be carefully reviewed to determine all required interfacing and timing of the work. All such documents shall be available through the General Contractor or Construction Manager.

**1.5 ACTION SUBMITTALS**

A. Product Data:

1. Submit all product data in accordance with general requirements of the construction documents.
2. Submit product cut sheets and a detailed list of components a minimum of six (6) weeks prior to commencement of Division-27 work for A/E review and action.
3. Alternate and "Or Equal" designated products must be submitted for review and judgment to the A/E prior to installation. The contractor-proposed alternate products or components must be verified by two (2) independent sources within the past 6 months. This request shall include the two (2) independent sources, the original product's specification sheet, the proposed substitute product cut sheet, and a written request to review the substitute product.
4. Any request of an alternate or substitution must be submitted to the A/E for action no later than fourteen (14) calendar days after release of the original telecommunications bid documents.

B. Shop Drawings:

1. Submit all shop drawings in accordance with the general requirements of the construction documents.
2. Submit shop drawings a minimum of six (6) weeks prior to commencement of Division-27 work for A/E review and action.
3. Shop drawings shall include evidence of cable tray system components are coordinated with field conditions and the work of other trades.
4. This submittal may have a written component and a visual component for review and action by the A/E prior to installation.

**1.6 INFORMATIONAL SUBMITTALS**

A. Certificates:

1. Submit management and installation team reference documentation verifying that:
  - a. The project manager is a RCDD in good standing with BICSI and is qualified to manage the scope of work described in the contract documents and has five (5) years of experience managing similar projects in size and scope. The documentation shall include the RCDD registration number.

- b. The field supervisor is a BICSI trained technician that is qualified to perform and oversee the work described in the contract documents.

B. Qualification Statements:

1. The contractor shall submit documentation that within the past 12 months, a minimum of 75% of all installation personnel have been trained or certified by the manufacturer of the products they are installing.

**1.7 CLOSEOUT SUBMITTALS**

A. As-Built Drawings:

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit as-built drawings a minimum of two (2) weeks after completion of all Division-27 work for A/E and Owner reference.

**1.8 QUALITY ASSURANCE**

A. Qualifications:

1. Installer: Acceptable to manufacturer, experienced in performing work of this section and has specialized in installation of work similar to that required for this project.

**1.9 PRODUCTS**

**1.10 TEXTILE FABRIC INNER-DUCT**

A. Manufacturer List:

1. MaxCell
2. CableGuide.

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirements.

C. Description:

1. All optical fiber cabling shall be installed in inner-duct.
2. Multiple optical fiber shall not occupy the same inner-duct.
3. Provide textile fabric inner-duct as indicated on drawings.
4. Textile fabric inner-duct shall be available in various sizes.

5. Pathways shall be UL rated for the application in which pathway is installed.
6. Each textile fabric inner-duct pathway shall be color coded when installing multiple pathways into a conduit, each cell of each pathway shall be color coded.
7. Textile fabric inner-duct shall be available in multiple sizes and configurations including 2" 1-cell, 2" 2-cell, 2" 3-cell, 3" 3-cell and 4" 3-cell.
8. MaxCell shall be color coded per cell.
9. Contractor shall use Max Lube cable lubricator for all MaxCell runs.

D. Product Accessories:

1. Provide any accessory products related to the textile fabric inner-duct pathways required to provide a complete and functional infrastructure system.

**1.11 FLEXIBLE RACEWAY AND FITTINGS**

A. Manufacturer List:

1. AD Technologies / Arnco / Dura-Line
2. Carlon
3. Endot Industries

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirements.

C. Description:

1. All optical fiber cabling shall be installed in flexible raceways.
2. Multiple optical fibers shall not occupy the same flexible raceways, provide one segment per cable.
3. Flexible raceways shall be UL Listed with Flame Propagation compliant with UL 2024.
4. Pathways shall be UL rated for the application in which pathway is installed.
5. Only manufacturer's fittings, couplings, transition adapters, terminators and fixed bends shall be used.
6. Flexible raceways shall be available in multiple sizes and configurations including 1/2", 3/4", 1", 1-1/4", 1-1/2" and 2".
7. Flexible raceways shall be equipped with minimum 900lb pull lines.

8. Flexible raceway shall be black.
9. All components and assemblies shall be UL listed and rated for the environment in which they are installed.

**PART 2 - EXECUTION**

**PART 3 - EXAMINATION**

- A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:
  1. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications system.
  2. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

**PART 4 - TEXTILE FABRIC INNERDUCT AND FLEXIBLE RACEWAYS**

- A. Process:
  1. Provide textile inner-duct in conduit using continuous un-spliced lengths of textile inner-duct between maintenance holes, pull boxes, and/or termination points as indicated on the drawings.
  2. Allow for sufficient slack at termination points to allow securing of the inner-duct to structure maintaining minimum required bend radius
  3. Adhere to manufacturer's installation instructions.
  4. Seal all conduit and textile inner-ducts entering structures at the first box or outlet to prevent entrance into the structure of gases and liquids.
  5. Provide minimum 1" flexible raceways from multi-cell fabric inner-ducts to termination equipment within communications rooms.

**PART 5 - RE-INSTALLATION**

- A. No additional burden to the owner regarding costs, network down-time and/or end user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning the work.

**PART 6 - CLOSEOUT ACTIVITIES**

- A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.



- B. Contractor to submit all as-built drawings and documentation required prior to acceptance by the Owner.

**6.2** END OF SECTION

SECTION 31 11 00  
**CLEARING AND GRUBBING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section governs the furnishing of all labor, equipment, tools, and materials, and the performance of all work for clearing, grubbing, and disposal of material within the work site required for construction of a site in accordance with specification requirements.

**1.2 DEFINITIONS**

- A. Clearing consists of cutting off trees and brush vegetative growth to not more than a specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- B. Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- C. Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees and disposing of felled trees and debris.
- D. Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of all fallen timber and surface debris.
- E. Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than a specified depth below existing ground surface.

**1.3 MEASUREMENT AND PAYMENT**

- A. This item will be measured by the acre unless otherwise shown on the bid documents.
- B. For “acre” measurement, the work performed in accordance with this item and measured as provided under “measurement” will be paid for at the unit price bid for “Clearing and Grubbing.” This price is full compensation for pruning of designated trees, and shrubs; removal and disposal of structures and obstruction; backfilling of holes: furnishing and placing concrete for plugs; and equipment, labor, tools and incidentals.

**1.4 SUBMITTALS**

- A. Burn permits shall be submitted to the owner prior to burning of vegetation.
- B. Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWPPP) or cause for exemption.
- C. Proof of legal disposal of all hazardous material shall be required when hazardous material is involved.

## **1.5 STORAGE AND PROTECTION**

- A. Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, root systems of trees which are to remain.
- B. Repair any damaged items to approval of Engineer/Architect. Replace any trees designated to remain, if damaged, as directed by Engineer /Architect.
- C. When shown on the plans, treat cuts on trees with an approved tree wound dressing within 20 minutes of making a pruning cut or otherwise causing damage to the tree.

## **1.6 WASTE MANAGEMENT AND DISPOSAL**

- A. Follow all local and state regulations when burning, if burning of brush is approved, pile and burn at approved locations.
- B. Testing, removal and disposal of hazardous materials will be in accordance with the contract.

## **PART 2 – PRODUCTS**

N/A

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Inspect site and verify with Engineer/Architect, items designated to remain.
- B. Locate and protect utility lines. Preserve in operating condition active utilities traversing site:
  - 1. Notify Engineer/Architect immediately of damage to or when unknown existing utility lines are encountered.
  - 2. When utility lines which are to be removed are encountered within area of operations, notify Engineer/Architect in ample time to minimize interruption of service.
- C. Notify utility authorities before starting clearing and grubbing.
- D. Keep roads and walks free of dirt and debris.

### **3.2 CLEARING**

- A. Clear areas shown on the plans of all obstructions, except those landscape features that are to be preserved. Such obstructions include but are not limited to remains of houses and other structures, foundations, floor slabs, concrete, brick, lumber, plaster, septic tank drain fields, basements, abandoned utility pipes or conduits, equipment, fences, retaining walls, and other items as specified on the plans. Remove vegetation and other landscape features not designated for preservation, curb and gutter, driveways, paved parking areas, miscellaneous stone, sidewalks, drainage structures, manholes, inlets, abandoned railroad tracks, scrap iron, and debris, whether above or below ground. Removal of live utility facilities is not included in this item. Remove culverts, storm sewers, manholes and inlets in proper sequence to maintain

traffic and drainage.

- B. In areas receiving embankment, remove obstructions not designated for preservation to 2 ft. below natural ground. In areas to be excavated, remove obstruction to 2 ft. below the excavation level. In all other areas, remove obstruction to 1 ft. below natural ground. When allowed by the plans or directed, cut trees and stumps off to ground level. Plug the remaining ends of abandoned underground structures over 3 inches in diameter with concrete to form a tight closure. Backfill, compact, and restore areas where obstructions have been removed, unless otherwise directed. Use approved material for backfilling. Accept ownership, unless otherwise directed, and dispose of removed materials and debris at location off the site in accordance with local, state and federal requirements.

**END OF SECTION**

SECTION 31 23 33

**EXCAVATING, TRENCHING, AND BACKFILLING**

**All excavation will meet the most current OSHA Regulations. See SECTION 31 50 50 – TRENCH SAFETY for trench safety requirements.**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The work to be performed under this Specification shall consist of furnishing all labor, equipment and materials and performing all operations in connection with the excavating, trenching, and backfilling for pipelines as shown on the plans and as specified herein.

**1.2 MEASUREMENT AND PAYMENT**

- A. All trench excavation, backfill and compaction are not considered pay items. Payment for these items shall be included in the unit price laid in the Proposal for each size of pipe at their respective depths. This unit price shall be full remuneration for performing the trench and backfill complete including grading, bell holes, sheeting, dewatering, tamping, and water soaking; and including the furnishing of sewer pipe, all equipment, labor, materials, power, teams, tools, and transportation necessary or incidental thereto; but not including tunneling, or boring, all of which will be paid for extra.

**PART 2 – PRODUCTS**

**2.1 MATERIALS**

- A. Materials for pipe embedment will meet TCEQ Regulations for depth of bury and class of pipe and City of Bryan/City of College Station Unified Embedment Details as shown on the Plans.
- B. Concrete (For encasement or blocking) See SECTION 03 30 00 - CONCRETE.  
Material shall conform to ASTM C94. The compressive strength of the concrete shall be at least 2,000 psi and shall contain at least four (4) sacks of cement per cubic yard.
- C. Cement stabilized sand. See SECTION 31 23 23.53 – CEMENT STABILIZED SAND BACKFILL.

**2.2 TESTING REQUIREMENTS**

- A. Compaction tests for all backfill may be required for every 200 linear feet of trench and for each twelve-inches (12”) vertically. Density tests, shall be measured as one unit for each test. The Owner shall pay for Geotechnical tests ordered that meet the requirements of the plans and specifications. Failed tests shall be charged to the Contractor. Refer to City Standard Trench Detail for compaction effort requirements.

## **PART 3 – EXECUTION**

### **3.1 CONSTRUCTION METHODS**

#### **A. CONTROL OF WATER**

Provide sufficient pumping equipment, in good working order, available at all times to remove any water that accumulates in excavations. When the excavation crosses a drainage pathway, the contractor shall provide for means of alternate drainage. The discharge of dewatering equipment shall not cause damage to private or public property.

#### **B. SHEETING, SHORING, AND BRACING**

See SECTION 31 50 50 – TRENCH SAFETY.

In caving ground, or in wet, saturated, or flowing materials, the contractor shall sheet, shore, or brace the sides of the trench so as to maintain the excavation properly in place. When excavations are made adjacent to existing building or other structures or in paved streets, particular care must be taken to adequately sheet, shore, and brace the sides of the excavation to prevent undermining of, or settlement beneath, the structures or pavement. Underpinning of adjacent structures or pavement shall be done by the Contractor at his own cost and expense, in a manner satisfactory to the Engineer and when required by the Engineer. The pavement shall be removed, the void satisfactorily refilled and compacted, and the pavement replaced by the Contractor. The entire expense of such removal and subsequent replacement thereof shall be borne by the Contractor. Sheeting, shoring, and bracing shall not be left in place, unless otherwise provided for in the contract or authorized by the Engineer. The removal of sheeting, shoring and bracing shall be done in such a manner as not to endanger or damage either new or existing structure, private or public properties, and so as to avoid cave-ins or sliding of the banks. All holes or voids left by the removal of the sheeting, shoring, or bracing shall be immediately and completely filled and compacted with suitable materials.

#### **C. GUARANTEE**

1. Guarantee the backfilling of excavation and trenches against settlement for a period of one (1) year after the final completion of the contract under which the work is performed.
2. Make all repairs or replacements made necessary by settlement, including refilling, compacting, and reseeding or resodding the upper portion of the ditch and repairing broken or settled pavements, driveways, and sidewalks within five (5) days after notice from the Engineer.

#### **D. PREPARATION**

##### **1. Site Preparation**

Prepare the construction site for construction operations by removing and disposing of all obstructions and objectionable materials in accordance with contract documents.

2. Alignment, Grade and Minimum Cover

a. General

The water and sewer mains shall be laid and maintained to lines and grades established by the plans and specifications with fittings, valves, hydrants, manholes and clean-outs at the required locations, unless otherwise pre-approved by the Engineer. Valve-operating stems shall be oriented in a manner to allow proper operation. Hydrants shall be installed plumb.

b. Cut sheets shall be provided to the City's Inspector. The contractor shall determine the alignment and grade or elevation of the pipeline from offset stakes. Offset stakes shall be placed every 100 feet. The contractor shall also provide a continuous chalk line along the alignment of the trench for use by the operator of the excavating equipment. The contractor shall provide a laser beam and grade pole to assist in grading the ditch to the proper elevation.

c. Should the ditch be graded below the required elevation, bring subgrade to the required elevation with cement stabilized sand or rounded pea gravel. The use of excavating materials for this application will not be allowed.

d. Where pipe grades or elevations are not definitely fixed by contract drawings, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the pipe. Greater pipe cover depths may be necessary for clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevations.

3. Prior Investigation

Prior to excavation, investigation shall be made to the extent necessary to determine the location of existing underground structures and conflicts. Care should be exercised by the Contractor during excavation avoid damage to existing structures.

4. Unforeseen Obstructions

When obstructions that are not shown on the plans are encountered during the progress of work and interfere so that an alteration of the plans is required, the Engineer will alter the plans or order a deviation in line and grade or arrange for removal, relocation or reconstruction of the obstructions.

5. Clearance

When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the approval of the Engineer, to provide clearance as required by federal, state or local regulations or as deemed necessary by the Engineer to prevent future damage or contamination of either structure.

E. EXCAVATION

**All excavation shall meet the most current OSHA regulations.**

1. Classification

Excavation of trenches for pipelines is unclassified. Soils will be classified utilizing OSHA Standards and Regulations. The Contractor shall assume that the site contains the worse type of soils and make provisions for shoring the work area.

2. Trench Excavation

a. General

The trench shall be excavated to the required alignment, depth and width and in conformance with all federal, state and local regulations for the protection of the workmen.

b. Trench Preparation

- i) Trench preparation shall proceed in advance of pipe installation for only as far as pipe will be laid that day.
- ii) The contractor shall keep the trench dry from both storm water and seepage from the sides of the trench. Discharge from any trench dewatering pumps shall be conducted to natural drainage channels, storm sewers or a pre-approved reservoir. Do not discharge into any municipal sewer system without municipal approval. The contractor shall be responsible for cleaning any storm drain system, which was used for dewatering discharge.
- iii) Excavated material shall be placed in a manner that will not obstruct the work nor endanger the workmen, obstruct sidewalks, driveways, or other structures and shall be done in compliance with federal, state, or local regulations.

3. Pavement Removal

Removal of pavement and road surfaces shall be a part of the trench excavation, and the amount removed shall depend upon the width of trench required for installation of the pipe and the dimensions of area required for the installation of valves, hydrants, specials, manholes or other structures. The dimensions of pavement removed shall not exceed the dimensions of the opening required for installation of pipe, valves, hydrants, specials, manholes and other structures by more than twelve (12") inches in any direction, unless otherwise required or pre-approved by the Engineer.

4. Width

See City Standard Bedding and Trench Detail.

5. Bell Holes

Holes for the bells shall be provided at each joint but shall be no larger than necessary for joint assembly and assurance that the pipe barrel will lie flat on the trench bottom. Other than noted previously, the trench bottom shall be true and even in order to provide support for the full length of the pipe barrel, except that a slight depression may be provided to allow withdrawal of pipe slings or other lifting tackle.

6. Subgrade in Earth

- a. Where a firm and stable foundation for the pipe can be obtained in the natural soil, and where special embedment is not shown on the plans, or specified herein, carefully and accurately trim the bottom of the trench to fit the lower portion of the pipe barrel. The bottom of the trench shall be firm, stable and free of standing water.



- b. If water is allowed to collect in an originally dry trench after a reasonable time has passed to complete the embedment of the pipe, as determined by the Engineer, the contractor shall place a minimum of four (4") inches of clean rounded pea gravel in the ditch and pump out all accumulated water before placing the pipe. No deleterious materials will be allowed in the gravel. No extra compensation will be allowed for this work.
- c. Where wet, soft, or spongy material is encountered in the excavation at subgrade level, the contractor shall remove such material at the direction of the Engineer and replace it with crushed stone of sufficient quantity such that when fully compacted, the subgrade is firm and stable.

7. Subgrade in Rock

- a. When excavation of rock is encountered, all rock shall be removed to provide a clearance of at least six (6") inches below and on each side of all pipe, valves and fittings for pipe sizes twenty-four (24") inches or smaller, and nine (9") inches for pipe sizes thirty (30") inches and larger. When excavation is completed, the proper embedment material shall be placed on the bottom of the trench to the previously mentioned depths, leveled and tamped.
- b. These clearances and bedding procedures shall also be observed for pieces of concrete or masonry and other debris or subterranean structures, such as masonry walls, piers or foundations that may be encountered during excavation.
- c. The installation procedures specified in this section shall be followed when gravel formations containing loose boulders greater than eight (8") inches in diameter are encountered.
- d. In all cases, the specified clearances shall be maintained between the bottom of all pipe and appurtenances and any part, projection or point of rock, boulder or stones of sufficient size and placement, which, in the opinion of the Engineer, could cause a fulcrum point.

F. CONCRETE ENCASUREMENT

The Contractor shall place 2,000 psi concrete encasement under and around pipe as shown on the embedment detail, and provide necessary anchors to prevent the pipe from floating out of place. The contractor shall remove and relay any pipes that are floated out of proper position

G. BACKFILLING

1. General

- a. The Contractor shall not begin backfilling until approval has been obtained from the Inspector. Backfilling includes refilling and consolidation of the fill in trenches and excavations up to the natural ground surface or road grade.
- b. Backfill shall be accomplished in accordance with the specified laying condition as shown on the plans.

2. Backfill Material

- a. All backfill material shall meet latest edition of ASTM D2321 unless otherwise specified by the Engineer.
  - b. If excavated material is indicated on the drawings or specified for backfill, and there is a deficiency due to a rejection of part thereof, the contractor shall provide the required amount of sand, gravel or other pre-approved material.
3. Do not leave trenches open overnight without backfilling to the natural ground level. Steel plates (1/2" in thickness) may be used to cover open trenches only with the approval of the Engineer.
  4. Compaction  
Compaction requirements are as specified on the plans.

**END OF SECTION**

SECTION 31 25 13

**EROSION AND SEDIMENTATION CONTROL**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The work covered by this section consists of the installation and maintenance of all erosion siltation control devices, wash down areas, or seeding and sodding applications necessary to effectively prevent storm water pollution of adjoining or downstream areas that may occur as a direct or indirect result of the construction of this project. The contractor is responsible for creating and maintaining the storm water pollution prevention plan by utilizing the base sheets and narrative provided in the bid documents. The contractor is also responsible for submitting the Notice of Intent (NOI) and Notice of Termination (NOT) and conducting inspections as required by the Texas Commission on Environmental Quality (TCEQ.) The required forms for these activities are included in the bid documents.

The engineer will provide:

1. Base Sheets for Erosion Control Plan (ECP)
2. The Narrative for the Storm Water Pollution Prevention Plan (SWPPP)

The contractor will generate, submit, and maintain the:

1. ECP
2. SWPPP
3. NOI (if required)
4. NOT (if required)

**1.2 MEASUREMENT AND PAYMENT**

Erosion and Sediment Control is measured as a lump sum item.

The work and materials as prescribed by this item will be paid on the following schedule:

- A. 25% of the bid value shall be paid when the erosion control plan is fully detailed and implemented, the NOI (if required) is submitted to both TCEQ and the City Inspector, and all of the initial erosion control devices have been installed and are in working order.
- B. 50% of the value will be prorated for the installation and maintenance of erosion control devices during the course of construction as a percent of the total contract value. If the sediment trapping devices on the site appear to be un-maintained, no payment of this portion of the item shall be paid.
- C. 25% will be paid at the completion of construction when the site is stabilized, the NOT is submitted to both TCEQ and the City Inspector and all erosion control devices are removed from the site.

**1.3 SUBMITTALS**

- A. The contractors shall submit the initial erosion control plan along with the NOI (if required) prior to receiving a notice to proceed.

- B. If required, the Contractor is responsible for filing a “Notice of Intent” (NOI.) The contractor shall comply with all TCEQ and EPA regulations and pay the filing fees associated with the regulations. Fees associated with these regulations are subsidiary to the bid item Storm Water Prevention. The forms are available at:  
<http://www.tceq.state.tx.us/assets/public/permitting/waterquality/forms/20022.pdf>  
<http://www.tceq.state.tx.us/assets/public/permitting/waterquality/forms/20023.pdf>
- C. Said NOI must be postmarked two days before construction begins. NOI’s and NOT’s shall be submitted to the address shown on the forms. It is the Contractor’s responsibility to file and provide the owner a copy of the Notice of Termination (NOT) at the completion of the project.

## **PART 2 – PRODUCTS**

N/A

## **PART 3 – EXECUTION**

### **3.1 GENERAL**

- A. It is the responsibility of the Contractor to utilize whatever techniques are necessary to address erosion problems as they occur during construction.
- B. Siltation control and sediment trapping devices shall be installed prior to site clearing, grading or utility construction operations. All devices should be positioned so as to effectively remove silt from storm water before it leaves the site. Of particular concern, are gravel or stone blankets placed at construction traffic exits and entrances. These controls should be closely monitored to see that they trap sediment before it reaches the existing street and drainage system.
- C. Construction activities should be phased to expose a minimum of graded area at one time. Earth exposed by the construction process shall be re-vegetated every two weeks until vegetation is established. Re-vegetation shall require seeding, hydromulching or sodding. Fresh growth of vegetation shall eliminate the need for additional re-vegetation but does not constitute stabilization.
- D. Should a construction process remove any portion of the perimeter controls, the controls should be replaced in accordance with the TCEQ guidelines. Prior to the completion of the project, all bare areas shall be re-vegetated with a cellulose fiber hydromulch seeding process or sodded.
- E. Siltation control devices placed at storm drain inlets and culverts shall be removed by the Contractor once the site has been stabilized.

### **3.2 MAINTENANCE AND INSPECTION**

- A. The contractor shall familiarize himself with the erosion control requirements of TCEQ. The site superintendent, or his representative, shall make a visual inspection of all structural and/or natural controls and newly stabilized areas as required by TCEQ, especially after a rainfall to ensure that all controls are maintained and properly functioning. Any damaged controls shall be repaired prior to the end of the work day, including re-seeding and mulching or re-sodding if necessary. All inspections shall be documented with a written report. Reports shall include the effectiveness of erosion control measures, construction activities conducted since the last report and their location. Reports shall be maintained by the Contractor along with the Erosion Control Plan per the TCEQ guidelines.

- B. The contractor is responsible for the ECP. The contractor shall continuously update the plan with all changes. Areas already stabilized shall be noted on the plan. All sediment trapping devices shall be installed as soon as practical after the area has been disturbed (never more than 14 days). All sediment trapping devices shall be cleaned when the sediment level reaches 25% capacity. Sediment shall be disposed of by spreading on site or hauling away if not suitable for fill.
- C. The Contractor shall be responsible for any and all materials, improvements, and maintenance activities necessary to keep dust, silt, and mud from leaving the work zone, including being tracked by vehicles traveling throughout the zone.
- D. Should, in the opinion of the Owner, the Contractor fail to prevent the escape of dust or contain silt and mud within the project, after due notification by the City Representative, Owner forces will be used to clean up those affected areas, and the cost of same will be deducted from the contract.
- E. Prior to Substantial Completion, the Contractor shall verify that no dust, silt, or mud exists within the work zone in deposits deeper than two inches (2") as a result of the contractor's containment procedures. Should the Contractor claim final completion without removing such deposits, they will be removed by Owner forces and the cost of which shall be deducted from the contract.

**END OF SECTION**

SECTION 31 50 00  
**TRENCH SAFETY**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The work specified under this section requires the Contractor to provide for the safety of the workmen in strict compliance with 29 CFR Part 1926 1993 (Revised as of July 1, 1996 of latest Edition or Revision to) Excavations and Applicable Subparts. The submission of a "TRENCH SAFETY PLAN" which shall fully satisfy the requirements of this specification is required prior to a notice to proceed to start the project.

**1.2 MEASUREMENT**

A. MEASUREMENT

Measure "Trench Safety" as shown on the bid proposal. Shoring of trench at manholes and other unusual structures to be included in this cost.

B. PAYMENT

Pay for "Trench Safety" as shown on the bid proposal. Payment to be full compensation for all work described herein. There will be no increase in the Contract price because of the incorporation of CONTRACTOR's Trench Safety Plan or CONTRACTOR's detailed plans and specifications for the trench safety system into the bid documents and the Construction Contract. There will be no increase in the Contract price because of modifications to CONTRACTOR's plan and/or the CONTRACTOR's detail plans and specifications for the trench safety system, whether or not the result of unforeseen or differing site or soil conditions.

"Trench Safety Plan" shall be included as part of the "Trench Safety" bid item and shall not be paid for as a separate pay item.

**1.3 SUBMITTALS**

A. CERTIFICATES

Submit manufacturer's "Certificate of Compliance," stating that the devices (trench boxes, speed shoring, etc.) to be used for trench safety comply with the requirements of this specification. The certificate should show the design assumptions and limitations of the device and should be sealed by an engineer registered and licensed to practice in the state of Texas.

B. TRENCH SAFETY PLAN

Submit a detailed TRENCH SAFETY PLAN for all work areas. Calculations shall be provided for any areas beyond the capacity of the trench box or speed shoring and sealed by an engineer registered and licensed to practice in the state of Texas. This plan shall include evacuation routes for personnel.

C. COMPETENT PERSON

Contractor shall have a “Competent Person” with regard to OSHA standards, on site at all times. Competent person is generally defined as an individual who, by training and experience, is knowledgeable of applicable standards, capable of identifying hazards, is designated by the employer and has the authority to take actions as needed. Contractor shall provide written proof showing the competent person(s) for the work being performed.

## **PART 2 – PRODUCTS**

### **2.2 MATERIALS**

#### **A. MATERIALS**

##### **1. Timber**

Trench sheeting materials shall be full size, a minimum of 2 inches in thickness, solid and sound, free from weakening defects such as loose knots and splits.

##### **2. Sheet Piling**

Steel sheet piling shall conform to one or more of ASTM A328/328M, ASTM A572/A572M/ ASTM A690/A690M material requirements.

##### **3. Structural Steel**

Steel for stringers (wales) and cross braces shall conform to ASTM A588.

##### **4. Trench Boxes**

Steel trench Boxes to be constructed of steel conforming to ASTM A36/A36M. Connecting bolts used to conform to ASTM A307. Welds shall conform to the requirements of AWS D1.1.

##### **5. Miscellaneous**

Miscellaneous materials to be utilized shall conform to applicable ASTM standards.

#### **B. REFERENCED SPECIFICATIONS**

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

#### **American Society of Testing and Materials (ASTM)**

ASTM A36/A36M	1997 Standard Specification for Carbon Structural Steel
ASTM A307	1997 Revision A-Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile length
ASTM A328/A328M	1996 (REV) Standard Specification for Steel Sheet Piling
ASTM A572/A572M	1997 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality
ASTM A588/A588M	1997 Standard Specification for High-Strength Low-Alloy Structural Steel With 50 ksi (345 MPa) Minimum Yield Point to 4 inch (100 mm) thick
ASTM A690/A690M	1994 Standard Specification for High-Strength Low-Alloy Steel H-Pipes and Sheet Piling for Use in Marine Environments

**American Welding Society, Inc. (AWS)**

AWS D1.1                      1998 Structural Welding Code-Steel

**Occupation Safety And Health Administration (OSHA)**

29 CFR Part 1926            1993 (Revised as of July 1, 1996 of latest Edition or Revision to)  
Excavations and Applicable Subparts

**PART 3 – EXECUTION**

**3.1 CONSTRUCTION METHODS**

A. GENERAL:

The trench safety system shall be constructed, installed and maintained in accordance with the Trench Safety Plan as outlined in 131.03. Bed and backfill pipe to a point at least one (1) foot above top of pipe or other embedded items prior to removal of any portion of trench safety system. Bedding and backfill shall be in accordance to other applicable Specification Sections. Backfilling and removal of trench supports shall be in accordance with Contractor's Trench Safety Plan. Removal of trench safety system to be accomplished in such a manner to cause no damage to pipe or other embedded items. Remove no braces or trench supports until all personnel have evacuated the trench. The trench shall be backfilled to within 5 feet of natural ground prior to removal of entire trench safety system.

B. SUPERVISION:

Provide competent supervisory personnel at each trench while work is in progress to ensure Contractor's methods, procedures, equipment and materials pertaining to the safety systems in this Section are sufficient to meet requirements of OSHA Standards.

C. INSPECTION:

The CONTRACTOR shall make daily inspection of trench safety system to ensure that the system meets OSHA requirements. Daily inspection shall be made by competent personnel. If evidence of possible cave-ins or slides is apparent, all work in the trench is to cease until necessary precautions have been taken to safeguard personnel entering trench. The CONTRACTOR shall maintain permanent record of daily inspections.

D. TIMBER SHEETING

Timber sheeting and size of uprights, stringers (wales,) and cross bracing to be installed in accordance with the TRENCH SAFETY PLAN. Place cross braces in true horizontal position, spaced vertically, and secure to prevent sliding, falling or kick outs. Cross braces to be placed at each end of stringers (wales) in addition to other locations required. Cross braces and stringers (wales) to be placed at splices of uprights, in addition to other locations required.

E. STEEL SHEET PILING

Steel sheet piling of equal or greater strength may be used in lieu of timber trench shoring shown in the OSHA tables (proposed standards). Drive steel sheet piling to a least minimum depth below trench bottom as recommended by CONTRACTOR's Registered Licensed Professional Engineer providing design. Place cross braces in true horizontal position and spaced vertically. Secure to prevent sliding, falling, or kick outs. Cross braces to be placed at each end of stringers (wales), in addition to other locations required.

F. MAINTENANCE OF SAFETY SYSTEM



The safety system to be maintained in the condition as shown on the Trench Excavation and Shoring Safety Plan as designed by the CONTRACTOR's Registered Licensed Professional ENGINEER. The CONTRACTOR shall take all necessary precaution to ensure the safety systems are not damaged during their use. If at any time during its use a safety system is damaged, personnel to be immediately removed from the trench excavation area and the safety system repaired. The CONTRACTOR is to take all necessary precautions to ensure no loads, except those provided for in the plan, are imposed upon the trench safety system.

**END OF SECTION**

SECTION 33 05 01

**POLYVINYLCHLORIDE PIPE AND FITTINGS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The work specified under this section includes the manufacture, construction and installation of Polyvinylchloride (PVC) pipe and fittings for Water Lines and for Gravity and Pressure Sanitary Sewers.

**1.2 REFERENCES**

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM D1784	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds (Latest Edition)
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe (Latest Edition)
ASTM F 1483	Standard Specification for Oriented Poly (Vinyl Chloride), (PVCO) Pressure Pipe (Latest Edition)
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C150	Standard Specification for Portland Cement
ASTM D1598	Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
ASTM D1599	Standard Test Method for Resistance to Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings
ASTM D2122	Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
ASTM D2152	Standard Test Method for Adequacy of Fusion of Extruded Poly (Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion
ASTM D2241	Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2564	Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM F679	Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM D2672	Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement

ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

#### **AMERICAN WATER WORKS ASSOCIATION (AWWA)**

AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe, 4-Inch Through 12- Inch for Water Distribution (Latest Edition)
AWWA C909	Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe. 4-Inch Through 12-Inch for Water Distribution (Latest Edition)
AWWA C104	ANSI Standard for Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water
AWWA C105	ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C111	ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C116	Protective Fusion Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service
AWWA C153	Ductile Iron Compact Fittings, 3 in. through 24 in. and 54 in. through 64 in. for Water Service
AWWA C905	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In.-48 In.

### **1.3 MEASUREMENT AND PAYMENT**

- A. Payment shall be made at the price bid per unit length per the specification SECTION 33 11 13.1 - WATER MAIN CONSTRUCTION or SECTION 33 31 13 - SANITARY SEWAGE SYSTEM.

### **1.4 SUBMITTALS**

- A. Submit manufacturer's data on pipe furnished, indicating compliance with the specifications regarding dimensions, thickness, weights, and materials.
- B. Submit manufacturer's "Certificate of Compliance," stating that the materials furnished comply with this specification.

### **1.5 STORAGE AND HANDLING**

- A. UNLOADING - COLD WEATHER HANDLING

As the temperature approaches and drops below freezing extra care should be used in

handling during cold weather. Pipe at the bottom of a stack may become out-of-round due to the weight of material above it. Allow the pipe to recover to full initial roundness before installation. Pipe may be unloaded by hand, either by passing over the side or off the truck end. Sliding one length on another is permissible in unloading pipe, but lengths in the bottom layer shall be lifted off of the rough surface of the truck body to avoid abrasion. Compact shipping units (palletized bundles in a wood frame) may be unloaded by conventional fork lifts.

B. STOCKPILES

Store pipe on a flat surface so as to support the barrel evenly with bell ends overhanging. Store random lengths separately where they will be readily available. Individual lengths of pipe should be stacked in piles no higher than 5 feet. Pipe shall be protected during long exposures (over 3 months) to sunlight. Do not use clear plastic sheets. Provide for air circulation under sheet.

C. STORING RUBBER RINGS

Store all rubber rings at a central point and distribute them as needed. Keep them clean, away from oil, grease, excessive heat and electric motors which produce ozone. If rubber rings are not to be used immediately, store them in their cartons, as shipped, in a cool dark place out of the direct rays of the sun.

**PART 2 – PRODUCTS**

**2.1 MATERIALS**

A. WATER LINES

1. Pipe

- a. Blue colored Polyvinyl chloride (PVC) pressure pipe, six inch (6”) through twelve inch (12”) , shall conform to the current AWWA – C900 DR 14, be UL listed, be approved by the Texas State Board of Insurance and the National Sanitation Foundation. The outside diameter shall be identical to ductile-iron pipe (CIOD Standard, Table 2, AWWA – C900). All pipe shall be new and have the AWWA designation, pressure class, DR pressure rating and size of pipe stamped on the outside of each joint (follow requirements of C900 2.5.2 Markings). All piping shall be new. Partial pieces from other projects shall not be approved for installation. Metal detector tape shall be installed above all PVC pipe at an elevation of 2 feet below natural ground.
- b. Blue colored DR 14 (meeting current AWWA C-905 standards) for pipe sizes greater than 12 inches.
- c. PVC Pressure Pipe shall be designed and tested in accordance with ASTM D1598, D1599, and D2152.
- d. Fittings for PVC water pipe shall be ductile-iron, and shall conform to AWWA C153, unless otherwise specified.

Fitting joints shall be mechanical joints. Bolts and nuts for mechanical joints, or flanged ends will be of a high strength corrosion resistant low-alloy steel and shall conform to AWWA C111. Flange bolts and nuts for above ground installation shall conform to Appendix A of AWWA C115. Flange bolts and nuts for below ground installation shall be 316 stainless steel. All fittings shall

be epoxy coated and lined unless stainless steel is used.

Where joints are to be restrained, use mega-lug type fitting for pipe six (6") inches in size and larger. Mega-lug type mechanical restraints with less than 6 contact points will not be allowed for six (6") inch pipe sizes and larger.

Polyethylene wrap or encasement of metal fittings shall conform to AWWA C105. Joint tape shall be self-sticking PVC or 8-mil-thick polyethylene.

- e. Joints: PVC water pipe shall be furnished with an elastomeric gasket at each joint and an integral thickened bell as part of each joint. Pipe and fittings must be assembled with a non-toxic lubricant. Provisions must be made at each joint for expansion and contraction. Refer to ASTM F477, D3139 and D3212.

## B. GRAVITY SANITARY SEWER

### 1. Pipe

Flexible pipe and fittings shall be unplasticized polyvinyl chloride gravity sewer pipe shall be green in color, made from clean, virgin, NSF approved Class 12454-B PVC conforming to ASTM D1784. All pipe shall be new and have the ASTM designation, SDR, pressure rating and size stamped on the outside of each joint. All markings shall follow requirements of ASTM D3034.

Polyvinyl chloride (PVC) gravity pipe and fittings in sizes six inch (6") through twelve inch (12") shall conform to ASTM D3034 and be UL listed and approved by the National Sanitation Foundation. Pipe and fittings shall be SDR-26. Eighteen inch (18") pipe and fittings shall be SDR-26 and conform to ASTM F-679, be UL listed and approved by the National Sanitation Foundation.

## C. SEWER FORCE MAIN AND PRESSURE PIPE

### 1. Pipe

- a. Polyvinyl chloride (PVC) pressure pipe, four (4) inch through eight (8) inch, shall be white in color and shall conform to the current ASTM D2241, A W W A – C900, or AWWA C909 standard, be UL listed, be approved by the Texas State Board of Insurance and the National Sanitation Foundation. PVC pipe pressure class shall be equal to or greater than twice the maximum calculated pressure of the force main.
- b. Polyvinyl chloride (PVC) pressure pipe shall be SDR-21 Class 200 and conform to the ASTM D2241 standard, be UL listed and approved by the National Sanitation Foundation and shall be white in color. The outside diameter shall be identical to steel pipe.
- c. PVC Pressure Pipe shall be designed and tested in accordance with ASTM D1598, D1599, and D2152.
- d. Fittings for PVC pressure pipe shall be ductile-iron, and shall conform to AWWA C153, unless otherwise specified. Fitting joints shall be mechanical joints. Bolts and nuts for mechanical joints, or flanged ends will be of a high strength corrosion resistant low-alloy steel and shall conform to AWWA C111. Flange bolts and nuts for above ground installation shall conform to Appendix A of AWWA C115. Flange bolts and nuts for below ground installation shall be

316 stainless steel. All fittings shall be epoxy coated and lined unless stainless steel is used. Polyethylene wrap or encasement of metal fittings shall conform to AWWA C105. Joint tape shall be self-sticking PVC or 10-mil-thick polyethylene.

Where joints are to be restrained, use mega-lug type fitting.

- e. Joints: PVC water pipe shall be furnished with an elastomeric gasket at each joint and an integral thickened bell as part of each joint. Pipe and fittings must be assembled with a non-toxic lubricant. Provisions must be made at each joint for expansion and contraction. Refer to ASTM F477, D3139 and D3212.

## **2.2 TESTING REQUIREMENTS**

See: SECTION 33 01 30 - TESTING OF GRAVITY SEWER SYSTEMS  
SECTION 33 13 10 - HYDROSTATIC TESTING (Used for Waterlines & Sanitary Sewer Force Mains)  
SECTION 33 13 00 - DISINFECTION OF WATERLINES

## **PART 3 – EXECUTION**

### **3.1 TRENCHING**

- A. See Standard Details.

### **3.2 JOINT ASSEMBLY**

- A. Push-on joints shall be assembled as follows:
  1. Thoroughly clean the groove and bell and insert the gasket, making sure that it faces the proper direction and that it is correctly seated.
  2. Dirt or foreign material shall be cleaned from the spigot end to a point one inch (1") beyond the reference mark. A joint lubricant shall be used, and applicable recommendations of the manufacturer shall be followed.
  3. Be sure that the spigot end is beveled, as square or sharp edges may damage or dislodge the gasket and cause a leak. Push the spigot end into the bell of the pipe while keeping the joint straight. Brace the bell while the beveled end is pushed under the ring, so that previously completed joints in the line will not be closed up. Make deflection after the joint is assembled.
  4. Push the spigot end in until the reference mark on the spigot end is flush with the end of the bell. If excessive resistance to insertion of the beveled end is encountered or the reference mark does not reach the flush position, disassemble the joint, and check the position of the ring. If it is twisted or pushed out of its seat, clean the ring, bell and beveled end and repeat assembly. Be sure both lengths are in proper alignment. If the ring was not out of position, measure the distance between the reference mark and beveled end, and check it against correct values from the manufacturer. Relocate the reference mark if it is out of position.
  5. Small pipe can be pushed into the bell end with a long bar. Large pipe requires additional power, such as a jack, lever puller, or backhoe. A timber header should be used between the pipe and jack or backhoe bucket to avoid damage to the pipe.

6. At times when pipe laying is not in progress, the open ends of pipe shall be closed by watertight plug or other means pre-approved by the Engineer. The plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation should the trench fill with water.
- B. Mechanical joints shall be assembled as follows:
1. Wipe clean the bell and spigot end. The spigot end, bell, and gasket should be washed with a soap solution to improve gasket seating.
  2. Place the gland on the spigot end with the lip extension toward the spigot end, followed by the gasket with the narrow edge of the gasket toward the spigot end of the pipe.
  3. Insert the pipe into the bell and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly. Make deflection after joint assembly but before tightening the bolts.
  4. Push the gland toward the bell and center it around the pipe with the gland lip against the gasket.
  5. Align bolt holes and insert bolts, with bolt heads behind the bell flange, and tighten opposite nuts to keep the gland square with the bell.
  6. Tighten the nuts in accordance with manufacturer's recommendations.
- C. When it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane, or where long radius curves are permitted, the amount of deflection shall not exceed that shown in Table 1. Pipes greater than twelve-inches (12") in diameter shall not be deflected.

<b>TABLE 1</b> Maximum Deflection Full Length Pipe Push-on Type Joint		
Pipe Diameter in.	Deflection Angle Deg.	Minimum Radius of Curve ft. *
6	2.5	230
8	1.9	300
12	1.3	450

\* All curvature results from the bending of pipe lengths. There is no deflection at the joint.

- D. Cutting and Beveling
1. A square cut is essential to insure proper assembly. Use either a tubing cutter or a miter box and carpenter's fine-toothed hand saw or hacksaw. (Do not use standard pipe cutters. The cutting wheel will crush or damage the pipe.)
  2. Use a factory-finished beveled end as a guide to determine the angle and length of taper. The end may be beveled using a Pilot beveling tool which will cut the correct taper automatically or a thin steel, "cheese-grater" type of hand tool, Stanley "Sureform" No. 399.

3. With a pencil or crayon, locate the reference mark at the proper distance from the bevel end as indicated by the manufacturer.

**3.3 POLYETHYLENE TUBE PROTECTION**

- A. All cast iron and ductile iron fittings shall be provided with 8 mil polyethylene tube protection. Completely cover all fittings and connections with polyethylene film held securely in place with joint tape or strapping according to the provisions of AWWA C105.

**3.4 EMBEDMENT**

- A. Install embedment as shown on the Plans and in accordance with SECTION 31 23 33 - EXCAVATING, TRENCHING, AND BACKFILLING.

**3.5 TAPPING WATER LINES**

- A. Where a tap occurs within a deflected section of pipe, utilize a fitting (ie: 8" x 1" tapped tee) in lieu of tapping the pipe.
- B. The tapping sleeve specified will be the Smith-Blair 662 or the Ford FTSS\_ Stainless Steel Tapping Sleeve with Epoxy Coated Flange for pipe sizes 6"-24".

**3.6 GRAVITY SANITARY SEWER DEFLECTION TEST**

- A. The sewer line shall be tested for deflection in accordance with SECTION 33 01 30 - TESTING FOR SANITARY SEWAGE GRAVITY SYSTEM.

**END OF SECTION**