SECTION 21 13 16 - DRY PIPE AND PREACTION SPRINKLER SYSTEMS

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. Pipes and fittings
2. Hangers
3. Fire protection valves.
    a. Dry pipe valves.
    b. Preaction valves.
4. Corrosion Management Products.
    a. Nitrogen Generation Assembly including air compressor
    b. Nitrogen Manifold/Pressure Maintenance Devices.
    c. Nitrogen Vent Devices.
    d. Nitrogen Gas Analyzer.
5. Sprinklers.
6. Alarm devices.

B. Refer to Section 21 13 13 “Wet Pipe Sprinkler Systems” for:

1. Backflow prevention.
2. Listed fire protection valves:
    a. Electronically supervised indicating butterfly valves.
    b. Check valves.
    c. OS&Y gate valves
3. Trim and drain valves.
    a. Angle valves.
    b. Ball valves.
    c. Globe valves.
4. Fire Department Connections.
5. Sprinkler specialty pipe fittings.
6. Sprinklers.
7. Alarm Devices.
8. Automatic Air Vent.
9. Pressure Gauges.
10. Signs.

C. Related Sections:

1. Section 21 05 17 “Sleeves and Sleeve Seals for Fire Suppression Piping.”

2. Section 21 05 18 “Escutcheons for Fire Suppression Piping.”
3. Section 21 05 33 “Heat Tracing for Fire Suppression Piping”.
4. Section 21 07 00 “Fire Suppression Systems Insulation”.
5. Section 21 12 00 “Fire Suppression Standpipes.”
6. Section 21 13 13 “Wet Pipe Sprinkler Systems.”
7. Section 09 90 00 “Painting”.

1.3 DESCRIPTION OF WORK

A. Provide all required labor, materials, equipment, testing and services necessary for a complete and operational dry pipe and preaction fire protection system for the areas of the building as hereinafter described and as shown on the engineering drawings.

B. Coordination of work and schedules with other trades.

C. It is intended that the engineering drawings and specification shall describe and provide for a working installation complete in every detail and all items necessary for such complete installation shall be provided whether or not specifically mentioned herein or shown on the engineering drawings.

1.4 DEFINITIONS

A. Standard Pressure Sprinkler Piping: Listed for 175 psi minimum working pressure.

1.5 SYSTEM DESCRIPTION

A. Dry pipe and preaction fire sprinkler system design criteria shall be strictly per this specification.

B. Dry pipe fire sprinkler systems to provide fire protection for the areas indicated on the engineering drawings and where areas are subject to freezing.

C. I.T. Comm Rooms – Provide double Interlock, pneumatic/electric preaction fire sprinkler system as shown on the engineering drawings.

D. Interface fire sprinkler systems with building fire and smoke alarm systems.

E. Ordinary Hazard Group II dry pipe fire sprinkler systems:

1. Density - 0.20 GPM/sq ft
2. Operating Area - 1,950 sq ft
3. Areas:

    a. All Baggage Handling Areas, TSA Bag Screening Areas and Conveyors in areas subject to freezing

        1) Temperature Classification: Varies
        2) Response Type: QR

    b. Ramp Level office areas

        1) Temperature Classification: Ordinary
        2) Response Type: QR

F. Ordinary Hazard Group II preaction fire sprinkler systems:

1. Density - 0.20 GPM/sq ft
2. Operating Area - 1,950 sq ft
3. Areas:

    a. DFW Comm Rooms and UPS Rooms

        1) Temperature Classification: Intermediate
        2) Response Type: QR

G. Sprinkler spacing shall be as follows:

1. Acoustical Tile - Locate sprinklers in accordance with the architectural and engineering drawings. Not more than a 3 in. radius tolerance about the point identified by dimension will be accepted. Where rows of sprinklers are provided within the same ceiling plane, any part of the tolerance used for one sprinkler shall be the same for all others in that same row.
2. Hard Ceilings - Locate sprinklers in accordance with the architectural and engineering drawings. Sprinklers shall be in line with light fixtures and other sprinklers where indicated on the drawings. Coordinate closely with the electrical contractor.
3. Unfinished Areas - Locate sprinklers as shown on the engineering drawings.

H. Standpipes: See Section 211200.

I. Provide fire department connection as indicated on the engineering drawings.

J. Provide all necessary offsets, raises or drops in main or branch line piping and auxiliary drains required by building conditions whether or not shown on the engineering drawings.

K. Examine the job conditions and verify all measurements, distances, elevations, clearances, pipe sizes, etc.

L. The pipe sizes shown on the plans are intended for space coordination and estimating purposes only. Final selection of pipe diameters is to be determined by the installing contractor through hydraulic calculations in accordance with NFPA 13.

1.6 PERFORMANCE REQUIREMENTS

A. Standard Pressure Piping System Component: Listed for 175 psi minimum working pressure.

B. Water Supply – Available fire hydrant flow test records indicate the following conditions:

1. Terminal A:

    a. Date: 01/26/2023
    b. Performed by: GFS Texas
    c. Location of Static and Residual Hydrants: Near Gates A14 and A16
    d. Static Pressure: 79 psi
    e. Residual Pressure: 77 psi
    f. Residual Hydrant Flow Rate: 900 GPM

2. Terminal C:

    a. Date: 01/26/2023
    b. Performed by: GFS Texas
    c. Location of Static and Residual Hydrants: Near Gates C29 and C35
    d. Static Pressure: 80 psi
    e. Residual Pressure: 78 psi

f. Residual Hydrant Flow Rate: 900 GPM

C. The contractor shall be responsible for obtaining a current water flow test.

1. The following items shall be addressed when performing a fire flow test:

a. The pressure hydrant should be closer to a feed main than the flow hydrant.
b. The number of flow hydrants should be determined.

2. The following data need must be recorded during a fire flow test:

a. Static Pressure: This refers to the pressure reading before water flows. It is taken from the pressure hydrant just prior to time of the fire flow test.
b. Residual Pressure: This refers to the pressure reading while water is flowing. It is taken from the pressure hydrant while the flow hydrants are flowing full.
c. This pressure is taken to determine the fire flow for sufficient fire coverage.
d. Pitot Pressure: This reading is taken by a pitot gauge from the flow hydrants.
e. The pitot gauge should be inserted into the center of the flowing outlet at
f. approximately half of the diameter away from the nozzle.

1.7 SUBMITTALS

A. The engineering drawings have been prepared using computer aided drafting software. These documents will be made available to the successful fire sprinkler contractor in either electronic format. Utilization of these documents for the development of shop drawings and submittals does not relieve the fire sprinkler contractor from any of these responsibilities required herein.

B. Submittals shall be in accordance with requirements of the General Conditions of the Contract.

C. Product Data: For all dry pipe and preaction sprinkler system equipment.

1. Literature shall clearly identify exactly what components are being provided and shall include: finish, size, type, etc. Literature which is not clearly identified will be rejected.

D. Shop Drawings:

1. Drawings must be comprehensive of entire project, demonstrating coordination with other disciplines, complete in all detail and the same scale as the engineering drawings.
2. Hydraulic calculations.

a. Hydraulic calculations shall comply with NFPA 13. This includes a water supply graph and hydraulic cover sheet. The cover sheet shall include the name and location of the calculated area, ceiling height, occupancy, design criteria, sprinkler spacing, system type, sprinkler make, model, size, K factor and temperature rating, flow requirements, C factor used, water supply data and source of information. The Contractor shall prepare and submit, at a minimum, hydraulic calculations for the hydraulically most remote area for each occupancy hazard.
b. The Contractor's calculations shall be prepared using a margin of safety of 10 psi with respect to available residual pressure.
c. Hydraulic calculations shall extend to the point of the waterflow test.
d. Use of outlet extensions or sprigs shall be reflected in hydraulic calculations. This may be accomplished through use of an equivalent K-factor in conjunction with the sprinkler (in which case supporting calculations are required), or through inclusion as piping.

E. As-Built Drawings

1. Maintain at the site an up-to-date marked hard copy set of as-built drawings that shall be corrected and delivered to the Owner upon completion of work.
2. Upon completion furnish the Owner with '.dwg' file of each reviewed shop drawing, revised to show "as-built" conditions, and final hydraulic calculations, manufacturer's data sheets and NFPA certificates.

F. Field Test Reports and Certificates: Indicate test results for compliance with performance requirements and as described in NFPA 13. Include “Contractor’s Material and Test Certificate for Aboveground Piping.”

G. Field quality control reports.

H. The engineer will review this submittal for consistency with the engineer’s Construction Documents.

I. After the satisfactory review by the engineer, provide submittals to the Authority Having Jurisdiction (AHJ).

J. The fire sprinkler contractor shall be responsible for responding, in writing, to any comments from the AHJ or the insurance underwriter within ten (10) working days after the receipt of their comments. Copies of the response shall be sent to the General Contractor and the engineer.

K. Provide record documents in accordance with requirements of the General Conditions of the Contract.

L. Provide operating and maintenance instructions to the Owner in accordance with requirements of the General Conditions of the Contract.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include preparing shop drawing submittal, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility.
2. Installer shall be State and Locally Licensed.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. References: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with all applicable codes and referenced design standards.

1. International Building Code – 2015 Edition with DFW Amendments
2. International Fire Code – 2015 Edition with DFW Amendments
3. NFPA 13, Sprinkler Systems – 2013 Edition
4. DFW International Airport Design Criteria Manual – Nov 2015 (Rev 2, Oct 2020)

D. Equipment and components shall be UL Listed for fire protection system installation.

E. All fire sprinkler system components shall be installed free of any rust, corrosion or visible damage. All items not complying with this requirement shall be replaced without cost to the Owner.

1.9 PROJECT CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify Construction Manager, Owner, Insurance Underwriter, AHJs in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Construction Manager's, Owner's written permission.
3. Provide temporary piping, fittings and valves as required to maintain sprinkler service.

B. Damage

1. Protect all unfinished work to prevent damage and furnish protection of all surrounding areas where necessary.

C. Leak Damage

1. The Contractor shall be responsible during the installation and testing periods of the sprinkler system for any damage to the work of others, to the building or its contents caused by leaks in any equipment, by unplugged or disconnected pipes or fittings, or by overflow. The Contractor shall pay for the necessary replacements or repairs to work of others damaged by such leakage.
2. Water shall not be introduced into the system during conditions where there is danger of freezing or when the building is not closed and heated.

D. No field welding of sprinkler piping is permitted. All welds shall be shop welded.

1.10 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Coordinate installation of systems with all other disciplines.

1.11 EXTRA MATERIALS

A. Provide at the riser manifold spare sprinkler cabinets in accordance with the requirements of NFPA 13 that are stocked with sprinklers and escutcheon assemblies proportionate to those provided in the building and all necessary sprinkler wrenches as required by NFPA 13.

1.12 REGULATORY REQUIREMENTS

A. All work shall meet the requirements of Section 1.8.

B. The fire sprinkler contractor shall not pursue any approvals or interpretations of the engineer’s Construction Documents except through the engineer.

C. Sprinkler piping shall not be concealed where it is inaccessible unless it is first inspected and accepted by a representative of the authority having jurisdiction.

D. Any work performed prior to the satisfactory review by the engineer and approval by the authority having jurisdiction and the insurance underwriter will be solely at the fire sprinkler contractor's risk.

E. The system will not be acceptable until final testing and receipt of the Contractor's Material and Test Certificate has been obtained.

1.13 WARRANTY

A. Repair all defective workmanship or replace all defective materials for a period of **[one]** year from the date of acceptance by the Owner. Workmanship or equipment found to be defective during that period shall be replaced without cost to the Owner.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Per local requirements and NFPA 13. All pipe shall have a Corrosion Resistance Ratio (CRR) equal to or greater than 1.00. Refer to the current UL Fire Protection Equipment Directory - Steel Sprinkler Pipe for acceptable manufacturer, sizes, and joining methods.

B. Dry sprinkler systems may consist of Schedule 10 galvanized for 3-inch pipe and larger, Schedule 40 for 2-½-inch pipe and smaller, and the sprinkler system attached to a nitrogen generator.

C. Standard-Weight, Schedule 40, Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

D. Galvanized-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.

E. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

F. Galvanized-Steel Couplings: ASTM A 865/A 865M, threaded.

G. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

H. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Anvil International.
    b. Gruvlock.
    c. Shurjoint Piping Products.
    d. Tyco.
    e. Victaulic.
    f. Viking.

2. Galvanized or Painted Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions.
4. Grooved fittings shall be provided with the style, grade, and type of gasket recommended for the specific application by the manufacturer of the fitting or coupling.

I. Pressure Rating: 175 psi minimum. All components shall be rated for the maximum system working pressure to which they are exposed.

2.2 HANGERS

A. All hangers to be of approved materials and spaced in accordance with NFPA 13 and the piping manufacturer's specifications.

B. The section modulus required by NFPA 13 shall be provided for all trapeze members supporting piping.

C. Hangers shall be corrosion resistant.

2.3 SPECIALTY VALVES

A. General Requirements:

1. Pressure Rating: 175 psi minimum. All components shall be rated for the maximum system working pressure to which they are exposed.
2. Body Material: Cast or ductile iron.

B. Dry Pipe Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Reliable.
    b. Tyco.
    c. Victaulic.
    d. Viking.

2. Design: Differential pressure type.
3. Include all necessary trim including alarm connections, pressure flow switch, pressure gauges, drain, air pressure maintenance device, low/high air pressure alarm, and accelerator if system volume exceeds 500 gallons.

C. Preaction Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Reliable.
    b. Tyco.
    c. Victaulic.
    d. Viking.

2. Design:

   a. Single Interlock - Dry-Pilot Actuation.
   b. Double Interlock - Electric/Pneumatic Actuation.

3. Include all necessary trim including alarm connections, pressure flow switch, pressure gauges, drain, air pressure maintenance device, low/high air pressure alarm, and accelerator if system volume exceeds 500 gallons.

2.4 CORROSION MANAGEMENT PRODUCTS

A. Nitrogen Generator System

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. South-Tek Systems – N2 Blast.
   b. Owner Approved Equal.

2. The fire sprinkler contractor shall furnish and install a Nitrogen Generator System(s). Install per manufacturer's instructions.

   a. The Nitrogen Generator System must be installed with a compressor sized appropriately for the application and capable of achieving system pressure within 30 minutes in accordance with NFPA 13.
   b. The air compressor shall have a dedicated unswitched power source of sized as directed by the engineer/designer.
   c. Air compressor shall be rated by the manufacturer for continuous duty service.
   d. Air compressor shall have an output pressure rating of at least 125 psi.
   e. Air compressor shall be capable of producing a continuous volume of compressed air that is sufficient to meet the design requirements of the fire protection systems and each Nitrogen Generator System.

3. Each Nitrogen Generation System shall be designed to achieve a nitrogen concentration of 95% or greater and maintain that concentration within the fire protection system continuously. The output nitrogen quality shall be confirmed by a portable Gas Stream Analyzer provided by the contractor.
4. Provide manufacturer's technical support for commissioning of the Nitrogen Generator System.

B. Nitrogen Distribution Manifold / Pressure Maintenance Assembly:

1. Furnish and install Distribution Manifold/Pressure Maintenance Devices for each system that are compatible with the Nitrogen Generator System.
2. Distribution Manifold/Pressure Maintenance Devices shall be equipped with a field adjustable pressure regulator for use in setting the maximum system pressure.
3. Provide dedicated 120VAC electrical power to each Device as required.
4. The Nitrogen Distribution Manifold / Pressure Maintenance Assembly shall be installed per the manufacturer's instructions.

C. Automatic Nitrogen Purge Vent

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. South-Tek Systems – Auto Purge System (APS)

b. Owner Approved Equivalent

2. The fire sprinkler contractor shall install Automatic Nitrogen Vent devices on each dry pipe sprinkler system as shown on the schematic drawings. The piping connection to the fire protection system must use a piping arrangement that will not create a water trap.

D. Nitrogen Quality Sensor/Analyzer:

1. Furnish and install a Nitrogen Quality Sensor in conjunction with the Nitrogen Generator System.
2. Provide dedicated 120VAC electrical power to each Device as required.
3. Air Maintenance Device shall be installed per the manufacturer's instructions.

2.5 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Reliable.
2. Tyco.
3. Victaulic.
4. Viking.

B. General Requirements:

1. Pressure Rating for Automatic Sprinklers: 175 psi minimum. All components shall be rated for the maximum system working pressure to which they are exposed.
2. Only sprinklers manufactured utilizing Belleville spring seals will be acceptable for use.
3. If dry pendent or recessed sprinklers are protecting a walk-in cooler, freezer or similar area and the piping supplying these sprinklers is in a conditioned space, a compatible dry sprinkler boot shall be used.

C. Sprinkler Types:

1. Dry Chrome Recessed - Glass Bulb Quick Response Dry Recessed Sprinkler with polished chrome recessed escutcheon;
2. Brass Upright - Glass Bulb Quick Response Upright Sprinkler;
3. Dry Brass Pendent - Glass Bulb Quick Response Dry Pendent Sprinkler;
4. Dry Chrome Pendent - Glass Bulb Quick Response Dry Pendent Sprinkler with polished chrome 2-piece telescoping escutcheon;
5. Dry Horizontal Sidewall - Quick Response Dry Horizontal Sidewall Sprinkler.

D. Sprinkler Escutcheons: Materials, types, and finishes shall match sprinklers.

1. Escutcheons shall be listed for use with the sprinkler it is installed with.

E. Sprinkler Guards:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Reliable.
b. Tyco.
c. Victaulic.
d. Viking.

2. Type: Wire cage with fastening device for attaching to sprinkler.

3. Guard Finish: Clear Chromate over Zinc Plating.

2.6 ALARM DEVICES

A. Alarm device types shall match piping and equipment connections.

B. Pressure Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Guardian.
   b. Potter Electric.
   c. System Sensor.

2. Type: Electrically supervised water flow switch with retard feature.
3. Components: Single-pole, double-throw switch with normally closed contacts; 24-volt D.C, or 110-volt A.C.; tamperproof cover; corrosion resistant components; dust tight construction.
4. Design Operation - Alarm: Rising pressure, adjustable 4 - 8 psi.
5. Design Operation - Supervisory: Pressure differential, adjustable 2 - 10 psi above or below normal system air pressure.
6. 0 to 120 seconds adjustable range.
7. Pressure Rating: 175 psi minimum. All components shall be rated for the maximum system working pressure to which they are exposed.
8. Detector shall be furnished and installed by the fire sprinkler contractor and wired complete by the electrical contractor.

C. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Guardian.
   b. Potter Electric.
   c. System Sensor.

2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts 24-volt - D.C. or 110 volt A.C.; tamperproof cover; dust tight construction.
4. Design: Signals that controlled valve is in other than fully open position.
5. Supervisory switch shall be furnished and installed by the fire sprinkler contractor and wired complete by the electrical contractor.

PART 3 - EXECUTION

3.1 COORDINATION WITH OTHER TRADES

A. Coordinate closely with all other trades to expedite construction and avoid interference.

3.2 SYSTEM INSTALLATION

A. Deviations from engineering documents requires prior written approval from the Engineer of Record.

B. Piping Standard: Comply with requirements in NFPA 13 for installation of sprinkler piping.

C. Install "Test Connections" at the remote point of systems.

D. Install sprinkler piping with drum drip drains at all low points for complete system drainage.

E. Connect compressed air supply to sprinkler piping.

F. Install alarm devices in piping systems.

G. Install hangers and supports for sprinkler system piping according to NFPA 13.

H. At a minimum, system piping shall be sloped in accordance with NFPA 13. Where conditions allow, piping shall be sloped in excess of NFPA 13. The contractor shall inspect systems, using a digital level, after installation to confirm that all piping has been adequately sloped. Any pipes found not to be in compliance with the minimum slopes outlined in NFPA 13 shall be adjusted and/or reinstalled to provide adequate pitch.

I. After inspection and any required adjustments have been completed, the contractor shall submit written certification that all system piping is sloped, at a minimum, in accordance with NFPA 13.

J. Each dry-pipe system shall have its own air pressure supervisory switch to monitor and report both high and low air pressure conditions. The switch shall be located between the air supply check valve and sprinkler alarm valve.

K. A manual shut-off valve shall be provided between the hi/low switch and the main air supply line leading to the compressor. The air compressor shall be hardwired directly to a lockable disconnect box or to a dedicated branch circuit.

L. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section "Sleeves and Sleeve Seals for Fire Suppression Piping."

M. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 21 Section "Sleeves and Sleeve Seals for Fire Suppression Piping."

N. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 21 Section "Escutcheons for Fire Suppression Piping."

O. Firestop all penetrations of fire rated walls.

3.3 JOINING OF PIPE AND FITTINGS

A. All pipe shall be joined in accordance with NFPA 13 and manufacturers recommendations.

B. Where grooved fittings and couplings are used together they shall be of the same manufacturer.

C. Bushings shall not be used.

D. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

H. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

I. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

J. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

L. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 NITROGEN-GENERATION, CORROSION-MITIGATION SYSTEM

A. Install in accordance with manufacturer's written installation instructions.

B. Locate purge vent/valve in accordance with manufacturer's written installation instructions.

C. Route alarm signals in code-approved electrical conduit from nitrogen generator system control panel to the supervisory circuit.

3.5 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping as according to ANSI/ASME A13.1.

3.6 PAINTING

A. Painting of sprinkler piping is not included in this contract.

B. Piping shall be degreased, prepped, and ready for paint in exposed ceiling areas where indicated on the drawings.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Air Leak Test: After installation, charge to 40 psi for 24 hours. Use 24 hour recorder to document test. Any leakage that results in a loss of pressure in excess of 1.5 psi for 24 hours shall be considered a failure. Repair leaks and retest until no leaks exist.
2. Water Leak Test: After installation, charge systems to 200 psi, or 50 psi above maximum working pressure if over 150 psi, for 2 hours. If any pressure is lost, the test shall be considered a failure. Repair leaks and retest test until no leaks exist.
3. Energize circuits to electrical equipment and devices.
4. Start and run air compressors.
5. Coordinate with fire alarm tests. Operate as required.
6. Verify that equipment hose threads are same as local fire department equipment.

C. Tests shall be witnessed by the authority having jurisdiction, and Owner's authorized agent.

D. Preliminary testing procedures shall be conducted as mentioned above to assure proper operation when the final testing is performed.

E. The Contractor's Material and Test Certificates as required by the Texas State Fire Marshal must be completed and submitted to the Engineer before final acceptance may be given.

F. The contractor shall utilize the Corrosion Management Product manufacturer's testing and commissioning protocols.

3.8 CLEANING

A. Dust or blow away dirt and debris from sprinklers. Sprinklers with foreign materials that cannot be readily dusted or blown away must be replaced.

B. Remove and replace sprinklers with paint other than factory finish, including overspray.

C. Maintain the premises free from accumulation of waste materials and rubbish caused by this work.

D. At the completion of the work, remove all surplus materials, tools, etc., and leave the premises clean.

3.9 SAFETY

A. All work shall be performed in compliance with the Occupational Safety and Health Act of 1970 and the Construction Safety Act Standards.

B. Contractor shall attend all job site safety meetings.

3.10 DEMONSTRATION

A. demonstration of operation of fire protection systems to Owner's Authorized Representatives.

END OF SECTION