SECTION 13915

FIRE SUPPRESSION SYSTEMS

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.

1.2 SUMMARY

A. This Section includes the following fire-suppression piping inside the building:

1. Automatic wet-type, Class [I] [II] [III] standpipe systems.
2. Automatic dry-type, Class [I] [II] [III] standpipe systems.
3. Semiautomatic dry-type, Class [I] [II] [III] standpipe systems.
4. Manual wet-type, Class I standpipe systems.
5. Manual dry-type, Class I standpipe systems.
6. Wet-pipe sprinkler systems.
7. Dry-pipe sprinkler systems.
8. Preaction sprinkler systems.
9. Deluge sprinkler systems.
10. Combined dry-pipe and preaction sprinkler systems.

B. Related Sections include the following:

1. Division 2 Section "Water Distribution" for piping outside the building.
2. Division 10 Section "Fire-Protection Specialties" for cabinets and fire extinguishers.
3. Division 13 Section "Fire Alarm" for alarm devices not specified in this Section.
4. Division 13 Section "[Electric-Drive, Horizontal Fire Pumps] [Electric-Drive, Vertical-Turbine Fire Pumps] " for fire pumps, pressure-maintenance pumps, and pump controllers.
5. Division 13 Section "[Fire-Extinguishing Foam Piping] [Halogen Agent Extinguishing Piping] [Clean-Agent Extinguishing Systems]" for extinguishing systems.
6. Division 16 Section “Fire Alarm”

1.3 DEFINITIONS

A. AHJ: Authority Having Jurisdiction

B. ANSI: American National Standards Institute

C. ASME: American Society of Mechanical Engineers

D. ASTM: American Society for Testing and Materials

E. CR: Chlorosulfonated polyethylene synthetic rubber.

F. Engineer: Nevada Registered Fire Protection Engineer

G. FM: Factory Mutual

H. FMG: Factory Mutual Global

I. High-Pressure Piping System: Fire-suppression piping system designed to operate at working pressure higher than standard 175 psig (1200 kPa).

J. NPS: Nominal Pipe Size

K. Owner: Clark County Department of Airports

L. PE: Polyethylene plastic.

M. UL: Underwriter's Laboratory

N. Underground Service-Entrance Piping: Underground service piping below the building.

1.4 SYSTEM DESCRIPTIONS

A. Combined Standpipe and Sprinkler System: Fire-suppression system with both standpipe and sprinkler systems. Sprinkler system is supplied from standpipe system.

B. Automatic Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 (DN 65) hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

C. Automatic Wet-Type, Class II Standpipe System: Includes NPS 1-1/2 (DN 40) hose stations. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

D. Automatic Wet-Type, Class III Standpipe System: Includes NPS 1-1/2 (DN 40) hose stations and NPS 2-1/2 (DN 65) hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

E. Automatic Dry-Type, Class I Standpipe System: Includes NPS 2-1/2 (DN 65) hose connections. Has open water-supply valve and dry-pipe valve with standpipes containing compressed air. Opening fire-hose valve releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into standpipes.

F. Automatic Dry-Type, Class II Standpipe System: Includes NPS 1-1/2 (DN 40) hose stations. Has open water-supply valve and dry-pipe valve with standpipes containing compressed air. Opening fire-hose valve releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into standpipes.

G. Automatic Dry-Type, Class III Standpipe System: Includes NPS 1-1/2 (DN 40) hose stations and NPS 2-1/2 (DN 65) hose connections. Has open water-supply valve and dry-pipe valve with standpipes containing compressed air. Opening fire-hose valve releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into standpipes.

H. Semiautomatic Dry-Type, Class I Standpipe System: Includes NPS 2-1/2 (DN 65) hose connections. Has open water-supply valve and deluge valve with standpipes containing air. Actuation of detection device permits water pressure to open deluge valve. Water then flows into standpipes.

I. Semiautomatic Dry-Type, Class II Standpipe System: Includes NPS 1-1/2 (DN 40) hose stations. Has open water-supply valve and deluge valve with standpipes containing air. Actuation of detection device permits water pressure to open deluge valve. Water then flows into standpipes.

J. Semiautomatic Dry-Type, Class III Standpipe System: Includes NPS 1-1/2 (DN 40) hose stations and NPS 2-1/2 (DN 65) hose connections. Has open water-supply valve and deluge valve with standpipes containing air. Actuation of detection device permits water pressure to open deluge valve. Water then flows into standpipes.

K. Manual Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 (DN 65) hose connections. Has small water supply to maintain water in standpipes. Piping is wet, but water must be pumped into standpipes to satisfy demand.

L. Manual Dry-Type, Class I Standpipe System: Includes NPS 2-1/2 (DN 65) hose connections. Does not have permanent water supply. Piping is dry. Water must be pumped into standpipes to satisfy demand.

M. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

N. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.

O. Preaction Sprinkler System: Automatic sprinklers are attached to piping containing air. Actuation of fire-detection system in same area as sprinklers opens deluge valve, permitting water to flow into piping and to discharge from sprinklers that have opened.

P. Deluge Sprinkler System: Open sprinklers are attached to piping connected to water supply through deluge valve. Fire-detection system in same area as sprinklers opens valve. Water flows into piping system and discharges from attached sprinklers when valve opens.

Q. Combined Dry-Pipe and Preaction Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Fire-detection system in same area as sprinklers actuates tripping devices that open dry-pipe valve without loss of air pressure and actuates fire alarm. Water discharges from sprinklers that have opened.

1.5 PERFORMANCE REQUIREMENTS

A. Standard Piping System Component Working Pressure: Listed for at least 175 psig (1200 kPa).

B. High-Pressure Piping System Component Working Pressure: Listed for 250 psig (1725 kPa) minimum.

C. Fire-suppression standpipe system design shall be approved by authorities having jurisdiction.

1. Minimum residual pressure at each hose-connection outlet is the following:
   a. NPS 1-1/2 (DN 40) Hose Connections: 65 psig (450 kPa).
   b. NPS 2-1/2 (DN 65) Hose Connections: 125 psig (690 kPa).
2. Unless otherwise indicated, the following is maximum residual pressure at required flow at each hose-connection outlet:
   a. NPS 1-1/2 (DN 40) Hose Connections: 100 psig (690 kPa).
   b. NPS 2-1/2 (DN 65) Hose Connections: 175 psig (1200 kPa).

D. Fire-suppression sprinkler system design shall be approved by the AHJ.

1. Margin of Safety for Available Water Flow and Pressure: 10 psi or 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:
   a. Automobile Parking Areas: Ordinary Hazard, Group 1.
   b. Control Tower: Ordinary Hazard, Group 1.
   c. Baggage Screening Areas: Ordinary Hazard, Group 2.
   d. Baggage Handling: Ordinary Hazard, Group 2.
   e. Building Service Areas: Ordinary Hazard, Group 1.
   f. Dry-Cleaners: Ordinary Hazard, Group 2.
   g. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
   h. Gaming Areas: Ordinary Hazard, Group 1.
   i. General Storage Areas: Ordinary Hazard, Group 2.
   j. Laundries: Ordinary Hazard, Group 1.
   k. Machine Shops: Ordinary Hazard, Group 2.
   l. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
   m. Office Areas: Light Hazard.
   n. Passenger Waiting Areas: Ordinary Hazard, Group 1.
   o. Repair Garages: Ordinary Hazard, Group 2.
   p. Restaurant Service Areas: Ordinary Hazard, Group 1.
   q. Solvent Cleaning Areas: Extra Hazard, Group 2.
3. Minimum Density for Automatic-Sprinkler Piping Design:
   a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. (6.3 mL/s over 139-sq. m) area.
   b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. (9.5 mL/s over 139-sq. m) area.
   c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. (12.6 mL/s over 139-sq. m) area.
   d. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over 2500-sq. ft. (18.9 mL/s over 232-sq. m) area.

e. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over 2500-sq. ft. (25.2 mL/s over 232-sq. m) area.
f. Special Occupancy Hazard: As determined by authorities having jurisdiction.

4. Minimum Density for Deluge-Sprinkler Piping Design:
   a. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm (9.5 mL/s) over entire area.
   b. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm (12.6 mL/s) over entire area.
   c. Extra-Hazard, Group 1 Occupancy: 0.30 gpm (18.9 mL/s) over entire area.
   d. Extra-Hazard, Group 2 Occupancy: 0.40 gpm (25.2 mL/s) over entire area.
   e. Special Occupancy Hazard: As determined by the AHJ.
5. Maximum Protection Area per Sprinkler: Per UL listing.
6. Maximum Protection Area per Sprinkler:
   a. Office Spaces: [120 sq. ft. (11.1 sq. m)] [225 sq. ft. (20.9 sq. m)].
   b. Storage Areas: 130 sq. ft. (12.1 sq. m).
   c. Mechanical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
   d. Electrical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
   e. Other Areas: According to NFPA 13 recommendations, unless otherwise indicated.
7. Total Combined Hose-Stream Demand Requirement: According to NFPA 13, unless otherwise indicated:
   a. Light-Hazard Occupancies: 100 gpm (6.3 L/s) for 30 minutes.
   b. Ordinary-Hazard Occupancies: 250 gpm (15.75 L/s) for 60 to 90 minutes.
   c. Extra-Hazard Occupancies: 500 gpm (31.5 L/s) for 90 to 120 minutes.

E. Seismic Performance: Fire-suppression piping shall be capable of withstanding the effects of earthquake motions determined according to NFPA 13 and ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1.6 SUBMITTALS

A. Product Data for the following:

1. Piping materials, including flexible connections and sprinkler specialty fittings.
2. Pipe hangers and supports, including seismic restraints.
3. Valves, including listed fire-protection valves, unlisted general-duty valves, and specialty valves and trim.
4. Air compressors, including electrical data.
5. Excess-pressure pumps, including electrical data.
6. Sprinkler spray nozzles, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.
7. Hose connections, including size, type, and finish.
8. Hose stations, including size, type, and finish of hose connections; type and length of fire hoses; finish of fire hose couplings; type, material, and finish of nozzles; and finish of rack.
9. Roof hose cabinets.

10. Monitors.
11. Fire department connections, including type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.
12. Alarm devices, including electrical data.
13. Where a data sheet shows more than one product, the specific proposed product shall be clearly indicated by arrows or ther suitable means.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Fire-hydrant flow test report.

D. Approved Sprinkler Shop Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations. Shop drawings shall be coordinated with product data and hydraulic calculations.

1. CONTRACTOR shall submit shop drawings and one set of sepias, catalog data sheets, and hydraulic calculations to OWNER for approval in accordance with these specifications.
2. The submittal of shop drawings shall be complete. Partial submittals will not be reviewed and will be returned to CONTRACTOR. Shop drawings shall show all of the information required by NFPA 13 and NFPA 14 for working plans, and shall include drawings showing the location of all equipment, controls, piping, valves, drains, inspector test valves and power-supply connections for the fire and jockey pumps. The drawings shall also show locations of all sway and seismic bracing and of flexible couplings installed as flexure joints, and location and diameter of all necessary core drills, pipe sleeves and pipe clearance openings in walls and floors.
3. Shop drawings shall contain a list of all material to be used for the sprinkler and standpipe fire pump system on this project. The manufacturer, trade name and catalog number shall be given for each item.

E. Permits: Prior to start of installation, CONTRACTOR shall submit copies of all permits and approvals to OWNER necessary to conduct this work.

F. Samples: CONTRACTOR shall submit to OWNER for approval samples of all types of proposed sprinklers, including types of finishes available an a complete list of where each type and finish will be installed.

G. Certificates: CONTRACTOR shall provide OWNER with one copy of all documents that are reviewed and approved by the local code authorities. These documents shall include, but not be limited to the following:

1. Site inspection forms/waterflow information.
2. Permit drawings.
3. Final inspection forms per NFPA 13, 14, and 20.
4. Final installation and testing report for the fire pump.

H: Operation and Manitenance Manual: CONTRACTOR shall provide OWNER with a loose-leaf manual containing:

1. 11”X17” reduced copies of the record drawings required below:
2. Copy of NFPA 25.
3. Copy of all test certificates and approvals.
4. Service directory.

I. System Charts: CONTRACTOR shall prepare and submit graphic charts showing the location and designation of each system installed under this project. The charts shall be provide on background drawings for the building, showing system zone boundaries and system designations. Coordinate with OWNER for system designations to conform with existing designations at the Airport. The chart shall be provided in color, showing all zone boundaries, system designations, risers, inspector test valves, drains, dripdrums and control valve locations. Submit preliminary copies of the chart for review and approval prior to submtting final copies. Provide three hard copies and one electronic (AutoCAD) copy.

J. Draft O&M Manual: CONTRACTOR shall submit to OWNER, copies of the draft manual for approval (excluding test certificates and drawings).

K. Final O&M Manual: Within 30 days of the completion of the work, copies of the approved manual with reduced drawings and test certificates shall be delivered to OWNER.

L. Record Drawings: CONTRACTOR shall provide and maintain on the site an up-to-date record set of approved shop drawings which shall be marked to show each and every change made to the sprinkler system from the original approved shop drawings. This shall not be construed as authorization to deviate from or make changes to the shop drawings approved by OWNER without written instruction from OWNER in each case. This set of drawings shall be used only as a record set. CONTRACTOR shall prepare as-built drawings.

M. Final Submittal: Upon review of the blueline record drawings, before final approval, one set of reproducible mylar record drawings and additional sets of blue line record drawings shall be delivered to OWNER. As-built drawing shall be prepared by CONTRACTOR on AutoCAD latest release.

N. If CONTRACTOR's submittals, upon review by OWNER do not conform to the requirements of these specifications, CONTRACTOR shall be required to resubmit with modifications, within ten (10) working days of receipt of OWNER's notification to CONTRACTOR. CONTRACTOR shall be responsible for OWNER's extra expenses for subsequent review of rejected submittals necessitated by CONTRACTOR's failure to make the requested modifications.

1.7 QUALITY CONTROL

A. Applicable Codes and Standards

1. NFPA 11 Standard for Low-, Medium-, and High-Expansion Foam Systems
2. NFPA 13, Standard for the Installation of Sprinkler Systems

3. NFPA 14, Standard for the Installation of Standpipe Systems
4. NFPA 15, Water Spray Fixed Systems for Fire Protection
5. NFPA 16 Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems
6. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."
7. NFPA 25, Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems
8. NFPA 72, National Fire Alarm Code
9. NFPA 230, Fire Protection of Storage
10. NFPA 415, Standard on Airport Terminal Buildings, Fueling Ramp Drainage and Loading Walkways

B. Governmental Jurisdiction: All work and materials shall conform to all Federal, State and local codes and regulations governing this installation including the current editions of the International Building Code and the Uniform Fire Code as modified or interpreted by the Clark County Building and/or Fire Department.

C. Code Conflict: If there is a conflict between the referenced NFPA standards, Federal, State and local codes and this specification, it shall be the Contractor's responsibility to bring the conflict to the attention of the Owner for resolution.

D. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
   a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
   b. Installer and journeymen to have at least five (5) years of experience in installation of systems of this type and be familiar with all applicable local, state and Federal laws and regulations.
   c. Installer shall be licensed and obtain all permits necessary to perform work of this type. Copies of the Contractor's licenses shall be provided to the Owner prior to any work.
   d. Provide a job site supervisor who is to be present at all times when work is actively in progress.

1.8 COORDINATION

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

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounting, steel cabinet with hinged cover, with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench based upon total number of sprinklers installed. Include separate cabinet with sprinklers and wrench for each type of sprinkler on Project.
2. Coordinate with Owner or Owner's representative for location of spare sprinkler cabinet.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. GENERAL: All equipment and system components furnished and installed shall be new and of first quality, and be listed by Underwriters Laboratories Inc. for their intended use. All such equipment and system components shall be installed within the limitations of the respective UL listings.

2.2 STEEL PIPE AND FITTINGS

A. Sprinkler system piping shall meet the requirements of NFPA 13. Contractor shall base his bid on the use of any one or a combination of the following:

1. Galvanized Schedule 40 Pipe and Pipe Fittings: Shall meet ASTM A-795 or ASTM A-53 requirements with:
   a. Threaded pipe couplings and fittings, or AWS D1.1, welded.
   b. Mechanical grooved pipe couplings and fittings for roll or cut pipe.
   c. Pressure ratings: Pressure ratings of all fittings shall meet or exceed maximum working pressures available within the system.
   d. Grooved couplings: Provide standard grooved couplings for all piping. Use grooved couplings specifically designed for fire protection systems only.
   e. Galvanized protection: All piping and related fittings shall be galvanized, repair any galvanized finishes damaged during installation to match orginal finish.

B. Corrosion protection: All piping and hangers where exposed to the weather or installed in a corrosive atmosphere shall be protected against corrosion.

2.3 CONTROL AND DRAIN VALVES

A. Types: Sprinkler system control and drain valves shall be the following types:

1. O.S.&Y. gate valves or butterfly valves with integral valve supervisory switches, whose entire assembly is approved for use in sprinkler systems. Butterfly valves shall be used for all valves, except where O.S. & Y gate valves are required by NFPA 20. O.S. & Y valves larger than 8" shall be manufactured by Victaulic or Kennedy, all other valves shall be manufactured by Victaulic. Valves manufactured by Central shall not be used.

B. Listing: All valves must be UL listed for their intended use.

C. Signs: All water supply control valves and drain valves, including auxiliary drains, shall be permanently marked with metal signs to show their function and sprinkler system zone which they serve. Tape or “magic marker” is not acceptable.

D. Pressure Ratings: Pressure ratings of all valves shall meet or exceed maximum working pressures available within the system.

E. Where pressures exceed 175 psi, provide listed and approved pressure reducing valves to limit pressures on the system. Pressure reducing valves will be pilot operated and capable of reducing pressure under all flow and non-flow conditions. Pressure reducing valves shall be provided with appropriate means for testing and inspections as required by NFPA 13 and NFPA 14. Provide gauges on both sides of each PRV, along with associated isolation valves.

F. Supervision: All control valves shall be electrically supervised by the new fire alarm system. Provide required supervisory switches for monitoring and all electrical connections to the existing fire alarm system.

G. Dry pipe valve: Dry pipe valves shall be installed for sprinkler systems installed in areas where temperatures may be below 40 F. Dry pipe valves shall be iron body, bronze trimmed, and complete with all accessories required for a complete installation; including drains, gauges, and automatic air pressure maintenance devices. Provide all necessary trim piping as required by NFPA and the manufacturer. Quick-opening devices shall be listed and approved. Listed automatic air compressors shall be used.

H. Exhausters: The use of exhausters is prohibited.

2.4 SPRINKLERS

A. Types: Automatic sprinklers shall be of the following types. Quick response sprinklers shall be used in all light-hazard occupancies. Sprinklers manufactured by Central Sprinkler Corporation shall not be used. All sprinklers shall be manufactured by Victaulic, Viking, or Reliable.

1. OWNER's will select sprinklers for installation in finished areas. These shall include:
   a. Concealed sprinklers in all public areas within the concourse/hub areas. Sprinkler cover plates shall be chrome finish or factory painted to match ceiling finish.
   b. Semi-recessed sprinklers with matching escutcheons, in all other areas with finished ceilings. Sprinkler shall be chrome finish with matching chrome escutcheons.
   c. Standard upright or pendent sprinklers shall be installed in all areas with no ceilings. No pendent sprinklers shall be installed for any dry pipe systems.

B. Final Selection: OWNER's will select finishes for all automatic sprinklers and escutcheons from samples of available finishes supplied by CONTRACTOR.

C. Uniformity: All sprinklers within a space shall be from the same manufacturer and have the same heat response element, including temperature rating and response characteristics.

D. Temperature Rating: It shall be CONTRACTOR's responsibility to install sprinklers of the proper temperature rating as required by NFPA 13 and the Clark County Fire Department.

E. Corrosion Resistance: Sprinklers located on exterior piping systems, or located in corrosive atmospheres shall be corrosion resistant.

F. Sprinkler Escutcheons: Escutcheons shall be metal and be listed with the sprinklers for recessed sprinkler locations.

G. Sprinkler Orifice: All sprinklers shall be standard orifice sprinklers (1/2" orifice) unless specifically approved otherwise.

2.5 IDENTIFICATION SIGNS: Contractor shall furnish and install hydraulic calculation signs for each the standpipe. Contractor shall also provide identification signs for all valves installed under this section.

A. Required Information: Hydraulic calculation signs shall include all information indicated in NFPA 13. Valve identification signs shall identify the function of the valve and the area served.

B. Description: Signs shall be rigid, flat steel or aluminum plaques with embossed enamel background and lettering. Signs shall be secured by chain or durable wire to each sprinkler zone control valve, or in an obvious location specifically approved by OWNER.

2.6 SUPERVISORY AND ALARM EQUIPMENT: All waterflow, pressure and valve supervisory switches shall be furnished, installed and properly adjusted by CONTRACTOR. Alarm monitoring of these devices shall be provided under this contract.

A. Contacts: All waterflow, pressure and valve supervisory switches shall be provided with two "Form C" (D.P.D.T.) contacts for monitoring. Specific contact rating shall be coordinated with the Fire Alarm Contractor. Switches shall be manufactured by Potter or equal.

B. Waterflow Switches: Vane-type waterflow indicators shall be provided to indicate waterflow in each wet-pipe sprinkler system zone. Waterflow indicators shall have dust and moisture-proof covers. Switches shall be manufactured by Potter or equal.

C. Supervisory Switches: Valve supervisory switches shall be provided for all valves controlling the water supply to the sprinkler and standpipe systems. Valve supervisory switches shall have cast aluminum housings, corrosion-resistant parts, and tamper-proof covers, which will cause switches to activate when removed. For butterfly valves, use integral valve supervisory switches whose entire assembly is approved for use in sprinkler systems. Loop type supervisory switches shall not be used. Switches shall be manufactured by Potter or equal.

D. Fire pump controllers in the fire pump room shall be provided with additional contacts for supervision by the fire alarm system. Contacts are required for pump running, loss of power, phase reversal and transfer switch position. Dry contacts shall be provided for each status indicator.

E. Electrical distribution wiring and testing of all valve supervisory switches to be provided under Division 16. This Contractor shall provide personnel to adjust and assist in all testing of fire protection systems and equipment.

2.7 FIRE DEPARTMENT HOSE VALVES AND CABINETS: Fire Department hose valves shall have a polished chrome finish and shall be installed on all new standpipes as shown on the drawings, with clearances as required by the Fire Department.

A. Size: All fire department hose valves shall be 2 1/2-inches and shall be threaded as required by the Fire Department. Confirm local size requirements. Provide cabinets for all hose valves in finished areas. Refer to Section 10520 – Fire Protection Specialties.

B. Bracing: The valve supply piping shall be braced securely to the building structure.

2.8 MISCELLANEOUS PRODUCTS

A. Pressure Gauges: Pressure gauges shall be UL listed 4-inch minimum dial type gauges with a maximum limit of not less than twice the normal working pressure at the point installed. All gauges shall be provided with a shut-off valve (gauge-cock). Pressure gauges shall be provided on both sides of the fire pump, both sides of pressure reducing valves and at each floor control assembly.

B. Charts: A plastic laminated zone chart shall be provided adjacent to each main zone control valve assembly. The chart shall show the location of the valve and the zone served, and the F.D.C. location on a floor plan of the project. Each chart shall be on background drawings of both levels. Each zone shall be color coded and numbered. The color of the zone shall be the same as the control valve and riser piping. Each chart shall be at least 10 inches by 10 inches in size.

2.9 WARRANTY: CONTRACTOR shall be responsible during the design, installation, testing and one-year warranty periods for any damage caused by him (or his subcontractors) or by defects in its (or its subcontractors') work, materials, or equipment. All warranty periods shall begin when the Certificate of Occupancy is obtained.

A. Emergency Service: During the installation and warranty period, CONTRACTOR shall provide emergency repair service for the system within four (4) hours of a request by OWNER for such service. This service shall be provided on a 24-hour per day, seven days per week basis.

2.10 SPARE PARTS AND SPECIAL TOOLS: Spare parts and special tools shall be provided to OWNER prior to final acceptance.

A. Spare Parts: CONTRACTOR shall install two (2) metal sprinkler cabinets containing a minimum total of four (4) sprinklers, of each type, finish and temperature rating used, but

not less than 24 spare sprinklers. Contractor shall provide two (2) sets of sprinkler wrenches compatible with each type of sprinkler provided. The cabinets shall be installed at the locations approved by OWNER.

B. Special Tools: CONTRACTOR shall supply OWNER with two (2) complete sets of special tools and equipment necessary to perform routine maintenance on the system.

PART 3 - EXECUTION

3.1 WORKING CONDITIONS

A. It shall be CONTRACTOR's responsibility to inspect the drawings and become familiar with the conditions under which the work will be performed.

B. Construction Meetings: CONTRACTOR shall be responsible for attending construction coordination meetings with OWNER.

3.2 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13, NFPA 14, and NFPA 291. Use results for system design calculations required in Part 1 "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.3 EARTHWORK

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.4 EXAMINATION

A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 GENERAL INSTALLATION

A. Aesthetics shall be a primary consideration when installing piping. Any facet of installation that does not meet with OWNER’s approval shall be revised by CONTRACTOR to OWNER's satisfaction at no extra cost.

B. All holes made by CONTRACTOR in any wall, ceiling, or floor shall be patched by CONTRACTOR, restoring the wall, ceiling, floor or member to its original condition, fire resistance and integrity.

C. Location of all equipment, controls, piping, valves and drains shall be subject to OWNER's approval.

D. All sprinklers and equipment shall be installed in accordance with manufacturer's instructions. All special tools recommended by the manufacturer shall be used. All sprinkler drops above finished ceilings shall be installed with a swing joint. Sprinklers shall be flush with the ceiling and symmetrical. Where installed in drop tile ceilings, they will be installed in the center of tile.

E. All equipment shall be installed in accordance with manufacturer's instructions. All special tools recommended by the manufacturer shall be used.

F. Sprinklers shall be installed with the deflector to ceiling distances in accordance with NFPA 13.

G. Sprinklers subject to mechanical damage shall be equipped with sprinkler installation guards.

3.5 VALVE APPLIACATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Listed Fire-Protection Valves: UL listed and FMG approved for applications where required by NFPA 13 and NFPA 14.
   a. Shutoff Duty: Use ball, butterfly, or gate valves.

3.6 SERVICE-ENTRANCE PIPING

A. Connect fire-suppression piping to water-service piping of size and in location indicated for service entrance to building. Refer to Division 2 Section "Water Distribution" for exterior piping.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping. Refer to Division 2 Section "Water Distribution" for backflow preventers.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.7 WATER-SUPPLY CONNECTION

A. Connect fire-suppression piping to building's interior water distribution piping. Refer to Division 15 Section "Domestic Water Piping" for interior piping.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water distribution piping. Refer to Division 15 Section "Plumbing Specialties" for backflow preventers.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.8 PIPING INSTALLATION

A. All sprinkler piping installed in public areas or non-public areas with suspended ceilings shall be concealed in the walls, ceilings or soffits. Pipe in unfinished areas may be exposed.

B. All exposed pipe which passes through a wall, ceiling, or floor shall be provided with escutcheon plates.

C. All exposed piping and devices shall be installed as high as possible, but no less than 7-feet 0-inches above the finished floor in traffic or working areas, and so as not to obstruct any portion of a window, doorway, stairway or passageway, and shall not interfere with the operation or accessibility of any mechanical, plumbing or electrical equipment.

D. Operating Chains: Valves controlling water supply to the sprinkler systems shall be less than 7-feet 0-inches above the finished floor. When specifically approved by OWNER, they may be higher if they are provided with operating chains.

E. Protection: CONTRACTOR shall provide OWNER approved, adequate permanent protection for any installed piping, valves, devices or accessories which are subject to physical damage or may be hazards.

F. Sealant: Pipe which passes through fire-resistive barriers (including shaft walls) shall be sleeved and grouted or sealed with a UL listed sealant to maintain the integrity and rating of the fire resistive barrier per requirements of NFPA 13.

G. Color and Number Code: Sprinkler system riser and valves shall be painted to correspond to required color and numbered code chart.

3.9 VALVE INSTALLATION

A. Install listed fire-protection valves, specialty valves and trim, controls, and specialties according to NFPA 13 and NFPA 14 and the AHJ.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water supply sources.

D. Specialty Valves:

1. Alarm Check Valves: Install in vertical position for proper direction of flow, including bypass check valve and retarding chamber drain-line connection.
2. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
   a. Air-Pressure Maintenance Devices for Dry-Pipe Systems: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig (95- to 410-kPa) adjustable range; and 175-psig (1200-kPa) maximum inlet pressure.
   b. Install air compressor and compressed-air supply piping.
   c. Install compressed-air supply piping from building's compressed-air piping system.
3. Deluge Valves: Install in vertical position, in proper direction of flow, in main supply to deluge system.

3.10 SPRINKLER APPLICATIONS

A. Drawings indicate sprinkler types to be used. Where specific types are not indicated, use the following sprinkler types:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Pendent, recessed, flush, and concealed sprinklers, as indicated.
3. Wall Mounting: Sidewall sprinklers.
4. Spaces Subject to Freezing: Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as indicated. The use of glycol-based freeze protection is prohibited.
5. Deluge-Sprinkler Systems: Upright and pendent open sprinklers.
6. Special Applications: Extended-coverage, flow-control, and quick-response sprinklers where indicated.
7. Sprinkler Finishes:
   a. Upright, Pendent, and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.
   b. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
   c. Flush Sprinklers: Bright chrome, with painted white escutcheon.
   d. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.

3.11 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels and tiles.

B. Sprinklers shall be installed in-line and symmetrical with respect to walls, partitions, ceiling grid, etc.

C. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space. The use of glycol-based freeze protection is prohibited.

3.12 HOSE-CONNECTION INSTALLATION

A. Install hose connections adjacent to standpipes, unless otherwise indicated.

B. Install freestanding hose connections for access and minimum passage restriction.

C. Install NPS 1-1/2 (DN 40) hose-connection valves with flow-restricting device, unless otherwise indicated.

D. Install NPS 2-1/2 (DN 65) hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 (DN 65 by DN 40) reducer adapter and flow-restricting device, unless otherwise indicated.

E. Install wall-mounting-type hose connections in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose. Refer to Division 10 Section "Fire-Protection Specialties" for cabinets.

3.13 HOSE-STATION INSTALLATION

A. Install freestanding hose stations for access and minimum passage restriction.

B. Install NPS 1-1/2 (DN 40) hose-station valves with flow-restricting device, unless otherwise indicated.

C. Install NPS 2-1/2 (DN 65) hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 (DN 65 by DN 40) reducer adapter and flow- restricting device, unless otherwise indicated.

D. Install freestanding hose stations with support or bracket attached to standpipe or substrate.

E. Install wall-mounting, rack-type hose stations in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose. Cabinets are specified in Division 10 Section "Fire-Protection Specialties."

3.14 ROOF HOSE CABINET INSTALLATION

A. Install cabinets, and install shutoff valve inside building in heated space.

3.15 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire department connections in vertical wall.

B. Install freestanding-type, fire department connections in level surface.

1. Install protective pipe bollards on two sides of each fire department connection. Refer to Division 5 Section "Metal Fabrications" for pipe bollards.

C. Install ball drip valve at each check valve for fire department connection.

3.16 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Connect water-supply piping to fire-suppression piping. Include backflow preventer between potable-water piping and fire-suppression piping. Refer to Division 15 Section "Plumbing Specialties" for backflow preventers.

D. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.

E. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.

F. Connect compressed-air supply to dry-pipe sprinkler piping.

G. Connect air compressor to the following piping and wiring:

1. Pressure gages and controls.
2. Electrical power system.
3. Fire alarm devices, including low-pressure alarm.

H. Electrical Connections: Power wiring is specified in Division 16.

I. Connect alarm devices to fire alarm.

J. Ground equipment according to Division 16 Section "Grounding and Bonding."

K. Connect wiring according to Division 16 Section "Conductors and Cables."

L. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.17 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and NFPA 14 and in Division 15 Section "Mechanical Identification."

3.18 FIELD PAINTING

A. Field painting shall conform to the requirements of Section 09900, Painting.

B. Stainless steel, galvanized steel, and nonferrous surfaces shall not be painted.

C. Factory painted items requiring touch-up in the field shall be thoroughly cleaned of all foreign material and shall be primed and top-coated with the manufacturer's standard factory finish.

D. Exposed ferrous surfaces shall be painted with two coats of enamel paint conforming to Fed. Spec. TT-E-489, Class A. Factory primed surfaces shall be solvent-cleaned before painting. Surfaces that have not been factory primed shall be prepared and primed in accordance with the enamel paint manufacturer's recommendations.

3.19 FLEXIBLE COUPLINGS, HANGERS AND SWAY BRACING

A. All flexible couplings, hangers and sway bracing shall be designed and installed as required by NFPA 13 and 20 (including all appendices). Flexibility, internal pressure, and differential movement between the piping and building, earth, or other supporting structure(s) shall be allowed for, so that no allowable stress is exceeded in any member. Earthquake bracing must be of a type which allows the inspector to visually ascertain that the minimum necessary fastening torque and thread depths have been achieved.

3.20 SEISMIC CONSIDERATIONS

A. Sprinkler piping on any floor level may cross building structural separations such as expansion and seismic joints. These areas of the sprinkler systems piping shall be specifically designed with approved flexible connections at each crossing and able to accommodate the calculated differential motions during an earthquake, but not less than a minimum of 4-inches. All required structural, differential movement and drift calculations shall be prepared by a licensed structural engineer possessing current State of Nevada registration. CONTRACTOR shall verify locations of seismic joints.

3.21 AIR COMPRESSOR

A. Install air compressors for the dry-pipe systems. Compressors for dry-pipe system shall be adequately mounted on concrete foundation, or riser, and be equipped with pressure regulator, drain outlet and air drier.

3.22 SYSTEM TESTS CERTIFICATION

A. CONTRACTOR shall provide OWNER with written certification that all equipment:

1. Has been inspected and tested by a manufacturer's certified representative.
2. Is installed in accordance with the manufacturer's recommendations and UL listings.
3. Is in proper working order.

3.23 TRAINING

A. CONTRACTOR shall conduct two (2) training sessions of four (4) hours each to familiarize the building personnel with the features, operation and maintenance of the sprinkler,

standpipe, and fire pumping systems. CONTRACTOR is responsible to conduct and schedule all training sessions with OWNER. Provide at least seven (7) days notice.

B. CONTRACTOR shall submit a proposed training agenda for OWNER's review and approval within 60 days of authorization to proceed. The proposed training agenda shall include, but not be limited to, the following:

1. Overview of system operation.
2. Overview of system equipment and device locations.
3. Detailed operation guidelines.
4. Detailed maintenance procedures.
5. Periodic testing procedures.

C. CONTRACTOR shall submit the final approved training agenda 14 days prior to the first training session.

3.24 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Energize circuits to electrical equipment and devices.
4. Start and run air compressors.
5. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
6. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
7. Coordinate with fire alarm tests. Operate as required.
8. Coordinate with fire-pump tests. Operate as required.
9. Verify that equipment hose threads are same as local fire department equipment.

B. Report test results promptly and in writing to Architect and authorities having jurisdiction.

3.25 CLEANING AND PROTECTION

A. Clean dirt and debris from sprinklers.

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

C. Protect sprinklers from damage until Substantial Completion.

3.26 DEMONSTRATION

A. Engage a factory-authorized service representative to train OWNER'S maintenance personnel to adjust, operate, and maintain specialty valves. Refer to Division 1 Section “Closeout Procedures Demonstration and Training."

END OF SECTION 13915

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