

## **SECTION 22 33 00 - WET FIRE SPRINKLER SYSTEMS**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

#### **1.2 RELATED WORK**

- A. Basic Mechanical and Electrical Requirements.
- B. Excavation and Backfill.
- C. Piping and Accessories.
- D. Valves.
- E. Water Supply.
- F. Motors, Starters, and Auxiliaries.
- G. Electric Wiring in Plumbing Work.

#### **1.3 QUALITY ASSURANCE**

- A. Follow all requirements, recommendations and appendices to comply with the latest edition of the following publications, codes, standards, and listings/approvals:
  - 1. National Fire Protection Association (NFPA):
    - a) NFPA 13: Standard for the Installation of Sprinkler Systems.
    - b) NFPA 25: Recommended Practice for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.
  - 2. Factory Mutual Engineering Corporation (FM):
    - a) Approval Guide with Supplements.
  - 3. Underwriters Laboratories, Inc. (UL): Fire Protection Equipment Directory with Supplement.
  - 4. Building and Fire Code of New York State, as amended.
  - 5. OSHA Rules and Regulations.
  - 6. Requirements of insurance and other authorities having jurisdiction.

- B. Equipment, devices, hangers, and components shall be UL listed and FM approved and labeled for the intended fire protection service.
- C. The fire protection work shall be performed by an experienced firm regularly engaged in the installation of fire protection sprinkler systems.
- D. The requirements of this Project's Contract Documents may meet or exceed the requirements of NFPA and other Codes and Standards listed by this Section. The Fire Protection Contractor shall comply with all requirements of the Project Documents in such cases. In situations where NFPA may allow several different methods for sprinkler and fire protection related work and hydraulics, ultimately the method utilized for this project will be determined by these Contract Documents and the Project Engineer. Verify all such situations prior to the bid date.

#### 1.4 SYSTEM DESCRIPTION

- A. The fire protection system shall be a wet pipe automatic sprinkler system arranged to properly protect all spaces as indicated.
- B. Water supply shall be through the 6 in. underground fire protection water main to the system's main riser. Calculated water supply data at the municipal main indicates the following:
  - 1. 80 psi static.
  - 2. 71 psi residual.
  - 3. 1307 gpm flowing.
- C. Fire department connections shall be provided to allow the servicing fire department to augment the system's normal automatic water supply.
- D. The system shall be hydraulically calculated accordance with all provisions of the Contract Documents and any other authority having jurisdiction.
- E. Use of the room design method will not be permitted. Calculations shall be based upon the specific hazard for the areas being protected. The following minimum requirements shall be provided as actually installed in the protected spaces.
  - 1. Light hazard: Offices, Admin Areas, Toilet Rooms, Conference Rooms, etc...
    - a) Water density: 0.10 gpm/sq. ft.
    - b) Hydraulic remote area: 1500 sq. ft.
    - c) Combined hose demand: 100 gpm
  - 2. Ordinary Hazard Group 1: Mechanical Rooms, Storage Rooms, Janitor's Closets, etc...
    - a) Water density: 0.15 gpm/sq. ft.
    - b) Hydraulic remote area: 1500 sq. ft.

- c) Combined hose demand: 250 gpm
- F. Maximum coverage for any sprinkler head shall not exceed NFPA requirements.
- G. A minimum 5 psi safety factor shall be provided between the available municipal water supply curve and the total system demand point. The total system demand point shall be at the municipal water main and include the calculated sprinkler and interior hose stream demands plus the exterior hose stream demand at the residual pressure required for proper system operation.
- H. The maximum velocity of flow shall not exceed 20 ft. per second in above ground piping except as resulting from throttling of flow in sprinkler riser/drop nipples or 15 ft. per second in pipe segments which contain paddle type waterflow indicators.
- I. Include allowances in hydraulic calculations for head losses through paddle type flow switches and roll grooved pipe segments.
- J. Water supply control valves shall be electrically supervised and mechanically locked for proper position. Waterflow and supervisory circuits shall be in accordance with the requirements of electrical specifications. Electric connections to sprinkler system equipment shall be by Division 26. Furnish wiring diagrams for all equipment.
- K. Provide 3/16 in. x 1 in. cadmium plated carbon steel chains and master keyed all brass case hardened padlocks to lock water supply valves in the proper position.

## 1.5 SUBMITTALS

- A. Product Data:
  - 1. Submit manufacturer's catalog cut, specifications and installation instructions for each item or component of fire protection system. Clearly indicate pertinent information such as, but not limited to:
    - a) Manufacturer, model number.
    - b) Materials, size and type connection.
    - c) Pressure ratings of components.
    - d) FM approval/UL listing.
- B. Samples:
  - 1. If requested, submit sample of sprinklers.
- C. Drawings:
  - 1. Submit complete NFPA 13 drawings, hydraulic calculations with cross reference to applicable drawings, water supply data, and equipment schedule with ratings including those of fire and jockey pumps, controllers and all components, for the system to the Owner's Representative, Insurance Underwriter, and other authorities having jurisdiction including:

- a) Hydraulic calculations shall be submitted for each design density/remote area with items in NFPA 13 incorporated including sketches to indicate flow quantities, sprinklers operating and direction of flow for pipes in looped and gridded systems.

D. Record Drawings:

- 1. Submit Record Drawings, hydraulic calculations, test reports, and NFPA Above and Below Ground Material and Test Certificates to the Owner's Representative, Insurance Underwriter and other Authorities Having Jurisdiction.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Mixing of manufacturers or models of the same or similar component will not be acceptable.

### **2.2 FIRE DEPARTMENT CONNECTION - VERIFY TYPE WITH FIRE MARSHALL**

- A. General: Cast brass; straight or angle body as required; two-way lug swivel inlets with individual drop clappers; cast brass, raised letter escutcheon labeled automatic sprinkler; matching brass plugs and chains.
  - 1. 2-1/2 in. x 2-1/2 in. x 4 in.
  - 2. 2-1/2 in. NST hose threads shall match those in use by the Fire Department.
  - 3. Polished brass escutcheon, inlets, plugs, and chains.
  - 4. Design equipment: Elkhart model numbers are included for reference.
  - 5. Manufacturers: Badger-Powhatan, Croker-Standard, Guardian, Elkhart, or approved equal.
    - a) Horizontal Flush Wall Type: Elkhart #166.
    - b) Projecting Wall Type: Elkhart #156.
    - c) Free Standing Sidewalk Type: Elkhart #15.
    - d) 18 in. long brass cover sleeve with matching finish.
- B. General: Aluminum adapter with storz inlet, female NPT outlet. Cast brass escutcheon plate. Hardcoated aluminium storz cap with attachment cable. 45 degree body style.
  - 1. Branding: "Auto Sprk".
  - 2. Finish: Aluminum with brass plate.

3. Verify size and type of FDC with fire marshal.
4. Manufacturers: Badger-Powhatan, Croker-Standard, Elkhart, or approved equal.

## **2.3 GAUGES**

- A. Accuracy: ANSI B40.1 Grade B,  $\pm 2\%$  of span; 0 to 300 psi standard range.
  1. Case: Anodized aluminum, glass lens; copper alloy tube, tip and socket; brass movement.
  2. Connection: 1/4 in. NPT male bottom connection.
  3. Manufactures: Viking Model 01124A Air Pressure Gauge and 01934A Water Pressure Gauge or approved equal.

## **2.4 SPRINKLER EQUIPMENT**

- A. Manufacturers: Gem, Reliable, Viking, or approved equal.
- B. Riser Check Valve:
  1. Design equipment: Tyco CV-1FR or approved equal.
- C. Sprinklers: Brass or bronze 165°F ordinary temperature classification for light hazards and 212°F for ordinary hazards. Use 286°F sprinklers in Mechanical, Electrical, and Elevator Rooms; in vicinity of heat equipment/sources; and in accordance with Contract Documents.
  1. Finished ceiling areas: Chrome plated finish sprinklers with matching two piece adjustable deep two piece adjustable semi-recessed, equal to Viking E-1/F-1. Escutcheon for all areas name specific areas:
  2. Unfinished ceiling areas: Natural brass/bronze finish pendent or upright sprinklers as required.
  3. Sprinklers shall not have any portion of the fusible/frangible element recessed or covered.
  4. Types and design equipment.
    - a) SSP and SSU: Gem F950, Reliable Model G, Viking Model M.
    - b) Horizontal sidewall: Gem F950/Q-46, Reliable Model G/HSW-1, Viking Model M.
    - c) Quick response UL 199 listed: Gem FR-1 Aquarius F995 pendent and F996 sidewall; Central Omega C-1 pendent and HEC-12 sidewall; Reliable Model **GFR ZX-1** Viking Model M Microfast H Horizon.

- d) Dry pendent/sidewall: Gem Issue C solder type, Central H-1, Reliable G3, Viking Model C, Victaulic VicFlex VS1
- e) Institutional: Viking Pendant or Sidewall, Grunau Model PH-2 Style A B
- f) Intermediate level: Gem F950, Reliable Model G, Viking Model M with Water Shield and Guard.
- g) Public areas, offices and other finished ceiling areas: Provide 155°F white painted finish quick response, extended coverage, light hazard, extra-large orifice sprinklers with matching semi-recessed escutcheon. Viking Model 08339 and SIN VK608, with Model F-1 adjustable escutcheon or approved equal.
- h) Unfinished ceiling areas: Provide rough brass finish, pendent or upright as noted, quick response, extended coverage, light hazard, extra-large orifice sprinklers, temperature rating as appropriate for hazard. Make: Viking Model 08339 and SIN VK608 or approved equal.
- i) Attic spaces shall be Tyco BB, SD, HIP, AP attic sprinklers or approved equal.
- j) Concealed sprinkler heads as noted on the drawings: Provide 165°F quick response, extended coverage, light hazard, large orifice sprinklers with matching semi-recessed escutcheon. Viking Model 08498A and SIN VK625, with white (1004) cover base model 09804 or approved equal.
- k) Horizontal sidewall sprinklers: Provide rough brass finish horizontal sidewall sprinklers, 155°F. Make: Viking Model M5, "Microfast" or approved equal.
- l) Concealed horizontal sidewall sprinklers (Quick response): Concealed horizontal sidewall sprinklers shall have a cover plate that is a push-on, pull-off assembly with a cover diameter no greater than 2-3/4". Concealed sprinklers shall have a 1/2" NPT, a standard orifice, and a nominal K Factor of 5.6. Quick response horizontal sidewall sprinklers shall be cULus Listed for Light Hazard and Ordinary Hazard occupancies. Concealed Horizontal Sidewall Sprinklers shall be equal to Viking SIN VK408.

D. Mechanical Guards For Sprinklers:

- 1. Design equipment: Gem F774, Viking Model D-1, or approved equal.

E. Sprinkler Cabinets And Spare Sprinklers:

- 1. Steel or aluminum construction with shelves and shelf holes to accommodate spare sprinklers.

2. Red with hinged front door and label.
3. With sprinkler wrenches compatible for each type used.
4. Provide a stock of 12 spare sprinklers for each system, of the type and proportion to those used in each system.
5. Design equipment: Gem F740, Reliable Model A1, Viking Model 01724A or 01725A, or approved equal.

## **2.5 ALARM EQUIPMENT**

- A. Electric Bell: 6" round red enamel steel bell with a 24VDC electric motor
1. Design equipment: Potter, Tyco, Viking or approved equal.
- B. Electric Waterflow:
1. Pressure switches: At main riser to indicate waterflow condition
    - a) Case: Drip-proof.
    - b) Service and range: As required for air or water service.
    - c) Adjustable differential.
    - d) S.P.D.T. contacts.
    - e) 24 VDC.
    - f) Design equipment: Potter Electric, Autocall, or approved equal.
  2. Paddle type waterflow indicators: Adjustable pneumatic retard feature.
    - a) Dual S.P.D.T. contacts.
    - b) 24 VDC.
    - c) Design equipment: Autocall WF-5, Potter Electric VSR-D or VSR-T, or approved equal.
- C. Electric Tamper Switches: Supervise valves controlling water supplies in the open/proper position. Integral with the valve or separate with provisions to actuate a supervisory alarm upon valve movement and upon removal of the device cover, with mounting brackets and hardware.
1. 24 VDC, S.P.D.T contacts.
  2. Design equipment: Potter Electric Model OSYSU-A for OS&Y valves and Model PIVSU-A for post indicator and butterfly valves.

## **2.6 SYSTEM COMPONENT IDENTIFICATION**

- A. Control, drain and test valves shall be provided with permanently marked identification signs of baked enamel substantial metal construction. The signs shall be permanently mounted on the piping or wall at the valve, or on the valve, but shall not be hung on the valve with wires or chains which permits easy removal of the sign. The sign shall clearly indicate the valve's purpose and what portion of the structure it serves. Additional signs,

shall be provided at each alarm check valve to clearly indicate hydraulic calculation data.

## 2.7 HEAT TRACING

- A. Listed heat tracing systems shall be permitted in accordance with NFPA 13. Where used to protect branch lines, the heat tracing system shall be specifically listed for use on branch lines. Electronic supervision of the heat tracing system shall provide positive confirmation that the circuit is energized.

System consists of a self-regulating heating cable, connection kits, accessories, and energy-efficient control and monitoring controller. The heating cable shall have a polyolefin jacket for aboveground fire sprinkler piping, including standpipes, mains, and branch fire sprinkler piping.

- B. Delegated Design: Engage manufacturer to design complete and functional heat-tracing system as required by project documents.
- C. Heating Element: Pair of parallel No. 16 AWG, nickel-coated, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, non-heating leads with connectors at one end, and seal the opposite end with a watertight end seal. Cable shall be capable of crossing over itself once without overheating.
- D. Comply with UL 515A, CSA 22.2 No 130-03, and IEEE 515.1 requirements. 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.
- E. Basis-of-Design Product: Subject to compliance with requirements, provide RAYCHEM, a brand of nVent; XL-Trace Pipe Freeze/Flow Maintenance or approved equal.
- F. Controls:
1. Single-Circuit Local Digital Controller equal to RAYCHEM 465
  2. Multi-Circuit Distributed Digital Control System equal to RAYCHEM; ACS-30.

Control and monitor pipe freeze protection for fire protection circuits using a centralized control system with distributed power and control modules.

Approval: The complete heat trace system (heating cable, connection kits, and controller) shall be UL Listed (VGNI) and marked for intended use of freeze protection of standpipes, mains and branch fire sprinkler piping.

- G. Heating Cable Connection Kits equal to RAYCHEM; RayClic



Connection kits shall be rated NEMA 4X to prevent water ingress and corrosion. All components shall be UV stabilized and shall not require cutting into heating-cable core to expose bus wires.

H. Accessories:

- a. Cable Installation Accessories: Fiberglass tape, cable ties, connection kits, and end seals all furnished by manufacturer or as recommended in writing by manufacturer.
- b. Identification: Provide and install "Electric Heat Traced" labels on exterior of pipe insulation every 10 ft. on opposite sides of pipe, and on all splices, tees, crosses, and power connections for the entire length of heat traced piping.
- c. Thermal Pipe Insulation:
  - 1) Pipes to be thermally insulated in accordance with manufacturer's written requirements.
  - 2) Thermal Insulation: Flame retardant, closed-cell or fiberglass with waterproof covering. Thickness = 2-inches

I. INSTALLATION

1. Test and install system per the manufacturer's recommendations.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. The nature of the work requires coordination with other trades. Shop fabrication shall be done at the Contractor's risk. Relocation of piping and components to avoid obstructions may be necessary. Relocation, if required, shall be done at the Contractor's expense. The installation shall be performed in a workmanlike manner as determined by the Owner's Representative and in accordance with the Contract Documents, manufacturer's printed installation instructions, and submitted and Owner's Representative reviewed drawings.
- B. Piping shall not pass directly over electric panel boards, switchboards, motor control centers, and similar electric and telephone equipment. However, protection for these spaces shall be provided.
- C. Piping shall be installed concealed above finish ceiling area with sprinklers located in the center quarter points of ceiling tiles where ceiling tiles are used.
- D. Provide a readily removable flushing connection consisting of a cap at each end of cross mains.
- E. Provide mechanical guards for heads in mechanical and storage spaces, less

than 8 ft. above finished floor subject to mechanical damage.

- F. Pipe ball drip valves to discharge at a floor drain or to the exterior. Pipe 2 in. main drains and water motor gong drains to discharge to the exterior at approximately 24 in. above finished grade.
- G. Securely install the spare sprinkler cabinets to the building wall at the main riser.
- H. Inspector's test valves shall be installed 7 ft. or less above the finished floor.
- I. Fire department connections shall be installed 3 ft. above finished grade and water motor gongs approximately 10 ft. above finished grade.
- J. Upright sprinklers directly on branch lines shall be installed with their frame parallel to the piping.
- K. Provide sprinkler protection under ductwork, groups of ductwork and other obstructions to water spray and distribution. Use intermediate level sprinklers if subject to water spray from above.
- L. Exposed pipe shall be left clean for painting.
- M. For anti-freeze loops, use only chemically pure or United States Pharmacopoeia 96.5% grade glycerin and 30% water solutions.
- N. Coordinate and activate the systems or portions of the system to operational status as soon as possible.

### **3.2 PIPING, VALVES, HANGERS, ETC.**

- A. Refer to other applicable sections. Run slightly off level to low points; provide drain valves arranged per Contract Documents.

### **3.3 ADDITIONAL SPRINKLERS AND MECHANICAL SPRINKLER GUARDS**

- A. Include an allowance for providing 10 additional sprinklers and associated piping/supports installed at locations where job conditions or equipment selections may require. Provide a credit for sprinklers, piping and supports not installed.

### **3.4 STAIRWAYS**

- A. Sprinklers shall be installed beneath all stairways of combustible construction.
- B. In noncombustible stair shafts having noncombustible stairs with noncombustible or limited combustible finishes, sprinklers shall be installed at the top of the shaft and under the first landing above the bottom of the shaft.
- C. Where noncombustible stair shafts are divided by walls or doors, sprinklers shall be provided on each side of the separation.

- D. Sprinklers shall be installed beneath landings or stairways where the area beneath is used for storage.
  - 1. Sprinklers shall be permitted to be omitted from exterior stair towers when the exterior walls of the stair tower are at least 50 percent open and when the stair tower is entirely of noncombustible construction.
- E. Stairs Serving Two or More Fire Divisions. Sprinklers shall be installed in the stair shaft at each floor landing where two or more doors open from that landing into separate fire divisions.

### **3.5 TESTS**

- A. General:
  - 1. Pipe installation shall be inspected by Owner's Representative prior to being covered by building construction or backfill.
  - 2. Give the Owner's Representative advance notice of final tests. Perform tests in a safe manner. Provide written certification that tests have been successfully completed. Use NFPA Above and Below Ground Material and Test Certificate Forms.
  - 3. Correct system leaks prior to final test. Do not utilize water additives, caulking, etc., to correct leaks. Provide appliances, equipment, instruments, devices and personnel.
  - 4. Flushing: Follow Contract Documents and utilize open end pipe sections if possible.
- B. Pressure Tests:
  - 1. Hydrostatic tests: Minimum 200 psi and in accordance with NFPA 13 for two hours.
    - a) Air test not accepted as final test.
  - 2. Do not subject existing systems to excess pressures.
- C. Alarm Tests:
  - 1. Demonstrate activation of alarms and operational trip test and water delivery time for dry systems by use of Inspector's test valve.

### **3.6 SYSTEM TURNOVER**

- A. Prior to final acceptance, instruct the Owner's Representative in the proper operation, maintenance, testing, inspection and emergency procedures for all systems furnished, for a period of time as needed. Provide one new original pamphlet of NFPA 25. Indicate in writing to the Owner's Representative the provisions for proper maintenance, testing, and inspection of the systems as

required by local fire codes.

**END OF SECTION**