

SECTION 21 10 00
WATER-BASED FIRE-SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The design and installation of a hydraulically calculated automatic fire sprinkler system complete and ready for operation, for the entire building including the penthouse, mechanical equipment rooms, attic space, elevator machine rooms, elevator pits, linen and trash chutes, and accessible shafts.
- B. The design and installation of a standpipe system combined with the sprinkler system.
- C. Installation of a new fire pump, sized to meet the system flow and pressure per NFPA 14, NFPA 13 and NFPA 20 the latest editions to provide 430 kPa (65 psi) at the top of standpipe and sized to meet the sprinkler flow and pressure requirements.
- D. Installation of new sectional valves in the sprinkler/standpipe system feed mains as indicated on the drawings.
- E. Modification of the existing sprinkler and standpipe systems as indicated on the drawings.
- F. Existing piping to be reused, replaced or removed as indicated on the drawings. Removal of piping to include all valves, flow switches, supervisory devices, hangers, supports, and associated fire alarm system conduit and wire.
- G. Existing occupant-use hose racks, valves, and accessible piping to be disconnected from their supply, drained, removed, and all remaining inaccessible piping capped.
- H. Replacement of all existing sprinklers. Work to include all necessary piping modifications, new sprinklers and new sprinkler escutcheons.
- I. Provide access doors or panels where control or drain valves are located behind plaster or gypsum walls or ceilings as necessary to install piping above suspended plaster or gypsum ceilings.
- J. Painting of exposed piping and supports to follow Section 09 91 00, PAINTING.

1.2 RELATED WORK

- A. Treatment of penetrations through rated enclosures: Section 07 84 00, FIRESTOPPING.
- B. Access panels for plaster ceilings: Section 08 31 13, ACCESS DOORS AND FRAMES.
- C. Painting of exposed pipe: Section 09 91 00, PAINTING.
- D. Section 21 05 11, COMMON WORK RESULTS FOR FIRE SUPPRESSION.
- E. Alarm Supervision: Section 28 31 00, FIRE DETECTION AND ALARM.
- F. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- G. Section 13 05 41 - Seismic Restraint Requirements for Non-Structural Components.

1.3 DESIGN CRITERIA

- A. The design, materials, equipment, installation, inspection, and testing of the automatic sprinkler system, standpipe system and fire pump shall be in accordance with the required advisory provisions of NFPA 13, 14, 20, 25, 75, 82. Exception to NFPA Fire Codes are as follows:
 - 1. Standpipe system shall be sized to meet volume requirements of NFPA 14 but not pressure requirements.
 - 2. Sprinklers are not required in interstitial areas, except along AGV track systems if the vehicle is combustible.
- B. Base system design hydraulic calculations using the area/density method on the following criteria and in accordance with NFPA 13 latest edition.
 - 1. Sprinkler Protection:
 - a. All patient care, sleeping, treatment, office, waiting areas, educational areas, dining areas, corridors and attics: Light hazard, (0.10 gpm/sq. ft.) over the hydraulically most remote 140 m² (1500 sq. ft.).
 - b. Kitchen, Mechanical Equipment Rooms, Transformer Rooms, Electrical Switchgear Rooms, Electric Closets, Elevator Shafts (if required), Elevator Machine Rooms, Refrigeration Service Rooms, and storage between 9 and 23 m² (100 and 250 sq. ft.): Ordinary Hazard, Group 1, 6.1 L/minute/m² (0.15 gpm/sq. ft.) over the hydraulically most remote 140 m² (1500 sq. ft.).
 - c. Clean and soiled linen rooms, trash rooms, clean and soiled utility rooms, laundry, laboratories, retail sales and storage rooms, storage room over 23 m² (250 sq. ft.), boiler plants,

- loading docks, warehouse spaces, energy centers, Pharmacy and SPD areas: Ordinary Group 2, 8.1 L/minute/m² (0.20 gpm/sq. ft.) over the hydraulically most remote 140 m² (1500 sq. ft.).
- d. File Storage Areas with "Rolling Files" Racks: Ordinary Group 2 for the entire area of the space up to 140 m² (1500 sq. ft.) area of sprinkler operation.
 - e. Provide sprinklers in accessible shafts per NFPA 13 latest edition.
 - f. Provide sprinklers in gravity type metal chutes per NFPA 82.
2. Add water allowance of 15 L/s (250 gpm) for inside and outside hose streams to the sprinkler requirements at the connection to the distribution main.
3. Hydraulic Calculations: The calculated demand including hose stream requirements shall fall no less than 10 percent below the available supply curve.
- C. For each sprinkler zone provide a control valve, flow switch, self-contained test, drain assembly and pressure gage.
- E. Provide a guard for each sprinkler in the janitors' closets, the elevator machine room and sprinklers within 2100 mm (7 ft.) of the floor and other areas as required by NFPA 13.
- G. Seismic Protection: Seismically brace all new and existing piping systems in accordance with NFPA 13 latest edition.

1.4 QUALIFICATIONS:

- A. Designer's Qualifications: Design work and shop drawings shall be prepared by a licensed engineer practicing in the field of Fire Protection Engineering or a NICET (National Institute for Certification in Engineering Technologies) Level III sprinkler technician.
- B. Installer's Qualifications: The installer shall possess a valid State fire protection contractor's license. The installer shall provide documentation of having successfully completed three projects of similar size and scope.
- C. On-site emergency service within four hours notification.

1.5 SUBMITTALS

- A. Submit as one package in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sprinkler design shall be done by a certified professional. All plans shall be stamped by qualified P.E.

Department of Veteran Affairs
Renovate Research Lab Phase 3
Nashville, TN
V.A. Project Number: 626-11-101

- C. Emergency service point of contact name and 24 hour emergency telephone number.
- D. Manufacturer's Literature and Data:
 - 1. Pipe and fittings.
 - 2. Valves
 - 3. Drips
 - 4. Fire Department Siamese Connection
 - 5. Sprinklers-each type, temperature and model
 - 6. Air Compressors
 - 7. Inspectors Test Alarm Modules
 - 8. Sprinkler Cabinets
 - 9. Sprinkler Plugs
 - 10. Pressure Gages
 - 11. Pressure Switches
 - 12. Pipe Hangers and Supports
 - 13. Water Flow Switches
 - 14. Valve Tamper Switches
 - 15. Water Motor Alarm
 - 16. Double Detector Check Valve Assembly
 - 17. Water Measuring Device
 - 18. Fire Pump
 - 19. Jockey Pump
 - 20. Test Header
 - 21. Valve Cabinet
 - 22. Fire Pump Controller and Transfer Switch
 - 23. Fire Pump Test Data
- E. Detailed drawings in accordance with NFPA 13, NFPA 14, and NFPA 20 the latest editions. Drawings shall be prepared using CADD software stamped by fire protection professional engineer and include all new and existing sprinklers and piping. Use format in use at the VA medical center. Drawings are subject to change during the bidding and construction periods. Any wall and ceiling changes occurring prior to the submittal of contractors shop drawings shall be incorporated into the contractors detailed design at no additional contract cost.
- F. Hydraulic calculations for each sprinkler system in accordance with NFPA 13 latest edition.
- G. Operation and Maintenance Data:

1. Indicating Valves
2. Water Flow and valve tamper switches
3. Alarm Valves
4. Fire Pump
5. Excess Pressure Pump
6. Copy of NFPA 25

H. Recommended preventive maintenance schedule.

1.6 AS-BUILT DOCUMENTATION

- A. A Mylar as-built drawing and two blueline copies shall be provided for each drawing. One copy of final CADD drawing files shall also be provided on 89 mm (3 1/2 in.), 1.44 mb diskette, for each drawing.
- B. Four sets of manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- C. Four sets of hydraulic calculations for each sprinkler system updated to include submittal review comments and any changes to the installation which affect the calculations including one electronic set in PDF format.
- D. Four copies of the hydrostatic report and NFPA 13 material and test certificate for each sprinkler system.
- E. Four sets of operation and maintenance data updated to include submittal review comments and any equipment substitutions including one copy of NFPA 25.
- F. Manufacturers literature, hydraulic calculations, reports and operation and maintenance data shall be in a labeled 3-ring binder.

1.7 WARRANTY

- A. All work performed and materials and equipment furnished under this contract shall be free from defects for a period of one year from date of acceptance by the government.
- B. All new piping and equipment incorporated into the new system shall be hydrostatically tested and warranted as new.

1.8 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. National Fire Protection Association (NFPA)
13-2010.....Installation of Sprinkler Systems
14-2010.....Installation of Standpipe and Hose Systems

- 17A-2009.....Standard for wet chemical extinguishing systems
- 20-2003.....Installation of Centrifugal Fire Pump
- 24-2010.....Installation of Private Fire Service Mains and
Their Appurtenances
- 25-2011.....Inspection, Testing and Maintenance of water
Based Fire Protection Systems
- 70-2011.....National Electrical Code
- 72-2010.....National Fire Alarm Code
- 82-2009.....Incinerators, Waste and Linen Handling Systems
and Equipment
- 170-2009.....Standards for Fire Safety Symbols
- 291-2010.....Fire Flow Testing and Marking of Hydrants
- C. Underwriters Laboratories Inc. (UL)
 - 2011.....Fire Protection Equipment Directory
- D. Factory Mutual Engineering Corporation (FM)
 - 2010.....Approval Guide
- E. American Society for Testing and Materials (ASTM)
 - F442-09.....Chlorinated Poly (Vinyl Chloride) (CPVC)
Plastic Pipe
- F. American Society of Sanitary Engineering (ASSE)
 - 1015-2009.....Double Check Backflow Prevention Assembly
- G. Complete maintenance and inspection service for the fire pump and
sprinkler systems shall be provided by a factory trained authorized
representative of the manufacturer of the major equipment for a period
of one year after acceptance of the entire installation by the
government.
- H. Contractor shall provide all necessary test equipment, parts and labor
to perform required maintenance.
- I. All inspections, testing and maintenance work required by NFPA 25, NFPA
20, NFPA 13 and recommended by the equipment manufacturer shall be
provided. Work shall include operation of sprinkler system alarm and
supervisory devices.
- J. Maintenance and testing shall be performed on a quarterly basis. A
computerized preventive maintenance schedule shall be provided and
shall describe the protocol for preventive maintenance of equipment.
The schedule shall include a systematic examination, adjustment, and
cleaning of all equipment.

- K. Non-included Work: Maintenance service shall not include the performance of any work due to improper use, accidents or negligence for what the contractor is not responsible.
- L. Service and emergency personnel shall report to the Engineering Office or their authorized representative upon arrival at the hospital and again upon the completion of the required work. A copy of the work ticket containing a complete description of work performed and parts replaced shall be provided.
- M. Emergency Service:
 - 1. Normal and overtime emergency call-back service shall consist of an on-site response to calls within four hours of notification.
 - 2. Overtime emergency call-back service shall be limited to minor adjustments and repairs to affect the integrity of the system.
 - 3. The fire pump, standpipe system and all but a single sprinkler system must be operational before the responding service person leaves the facility.
- N. The contractor shall maintain a log at the fire pump controller. The log shall list the date and time of all examinations and trouble calls, condition of the system, and name of technician. Each trouble call shall be fully described, including the nature of the trouble, necessary correction performed, and parts replaced.

PART 2 - PRODUCTS

2.1 GENERAL

All devices and equipment shall be Underwriters Laboratories Inc. listed for their intended purpose. All sprinklers shall be Factory Mutual approved.

2.2 PIPING AND FITTINGS

- A. Pipe and fittings from inside face of building 300 mm (12 in.) above finished floor to a distance of approximately 1500 mm (5 ft.) outside building: Ductile Iron, flanged fittings and 316 stainless steel bolting.
- B. Fire Protection water supply within the building up to sprinkler system isolation valves shall be per NFPA 13, black steel, schedule 10 minimum, Copper or CPVC.
- C. Sprinkler piping downstream of the isolation valve on wet-pipe systems shall be per NFPA 13 black steel, schedule 10 minimum.

- D. Threaded or flanged fittings shall be ANSIB1 6.3 cast iron, class 125 minimum. Threaded fittings are not permitted on pipe with wall thickness less than schedule 40.
- E. All fittings on galvanized piping shall be galvanized in accordance with ASTM A53.
- F. Slip type or clamp-on type rubber gasketed fittings shall be listed for each piping application.
- G. Piping Materials Standards:
 - 1. Ferrous piping - follow ASTM A 795 Standard
 - 2. Welded and seamless steel pipe - follow ANSI/ASTM A 53
 - 3. Wrought steel pipe - follow ANSI/ASME B36.10M
 - 4. Electric resistance welded steel pipe - follow ASTM A 135
 - 5. Seamless copper tube - follow ASTM B 75
 - 6. Seamless copper water tube - follow ASTM B 88
 - 7. Wrought seamless copper and copper alloy tube - follow ASTM B 251
 - 8. Fluxes for soldering applications of copper and copper alloy tube - follow ASTM B 813
 - 9. Brazing filler metal - follow AWS A5.8
 - 10. Solder metal, 95-5 - follow ASTM B 32
 - 11. Alloy material - follow ASTM B 446
 - 12. Non-metallic piping CPVC pipe - follow ASTM F 442
- H. Fitting Materials Standards:
 - 1. Cast iron threaded fitting, Class 125 and 250 - follow ASME B16.4
 - 2. Cast iron pipe flanges and flanged fittings - follow ASME B16.1
 - 3. Malleable iron threaded fittings, Class 150 and 300 steel - follow ASME B16.3
 - 4. Factory made wrought steel butt weld fittings - follow ASME B16.9
 - 5. Buttwelding ends for pipe, valves, flanges, and fitting - follow ASME B16.25
 - 6. Wrought copper and copper alloy solder joint pressure fittings - follow ASME B16.22
 - 7. Cast copper alloy solder joint pressure fitting - follow ASME B16.18
 - 8. Chlorinated polyvinyl chloride (CPVC) - follow ASTM F 437
- I. Pipe Identification - All pipe, including specially listed pipe allowed by NFPA 13, shall be marked continuously along its length by the manufacturer in such a way as to properly identify the type of pipe.

Pipe identification shall include the manufacturer's name, model designation, or schedule.

2.3 VALVES

A. Listed Indicating Valves:

1. Gate: OS&Y, 2400 kPa (350 psi) -Water Working Pressure (WWP) .
2. Butterfly: Gear operated, indicating type, 2400 kPa (350 psi) water working pressure (WWP). Butterfly valves are to be installed in a manner that does not interfere with the operation of any system component.
3. Ball (inspectors test and drain only): iron body, stainless steel trim, for 2050 kPa (300 psi) service, indicating type.
4. Ball and butterfly valves shall not be used on incoming water service, and on the suction side of either the fire pump or jockey pump.

B. Check Valves: Swing type, rubber faced or wafer type spring loaded butterfly check valve, 2400 kPa (350 lb.) water working pressure (WWP).

C. Alarm Check: Iron body, bronze mounted, variable pressure type with retarding chamber. Provide basic trimmings for alarm test by pass, gages, drain connections, mounting supports for retarding chamber, and drip funnel. Provide pressure sensitive alarm switch to actuate the fire alarm system.

D. Drain Valves: Threaded bronze angle, globe, ball or butterfly, 4100 kPa (600 psi), Water or gas (WOG) equipped with reducer and hose connection with cap or connected to a drain line.

E. Self-contained Test and Drain Valve:

1. Ductile iron body with bronze "Drain" and "Test" bonnets. Acrylic sight glass for viewing test flow. Various sized orifice inserts to simulate flow through 14 mm (17/32 in.), 13 mm (1/2 in.), 12 mm (7/16 in.), and 10 mm (3/8 in.) diameter sprinklers, 32 mm (1 1/4 in.) female threaded outlets or 32 mm (1 1/4 in.) one-quarter turn locking lug outlets for plain end pipe (end preparation to be in accordance with manufacturer's recommendation).
2. Bronze body, with chrome plated bronze ball, brass stem, steel handle, Teflon seat and sight glasses. Provide valve with three position indicator plate (off, test, and drain), 6 mm (1/4 in.) tapping for pressure gage and various other orifice inserts to

simulate flow through 10 mm (3/8 in.), 12 mm (7/16 in.), 13 mm (1/2 in.), and 14 mm (17/32 in.) diameter sprinklers.

- F. Dry Pipe Valve: Flanged, iron body. Provide basic trimmings for alarm test bypass, water flow alarm, high and low pressure switches, gages, drain connections, drip funnel, accelerator and necessary pipe, fittings and accessories required to provide a complete installation.
- G. Standpipe Hose Valve: 65 mm (2 1/2 in.) screwed, brass hose angle valve, 2400 kPa (350 psi) water working pressure, WWP, male hose threads same as local fire department service, 65 mm x 40 mm (2 1/2 in. x 1 1/2 in.) reducer, and with permanently attached polished brass cap and chain: Provide for valves installed in a cabinet a 65 mm (2 1/2 in.) attached cap and chain and a 65 mm x 40 mm (2 1/2 in. x 1 1/2 in.) reducer placed in cabinet.
- H. Standpipe hose valve cabinets: Cabinets shall be white glossy polyester coated 20 gage steel with continuous steel hinge with brass pin, recessed type 600 x 600 x 250 mm (24 x 24 x 10 in.).
- I. Double Check Backflow Prevention Assembly: Provide two independent check valves with OS&Y shut off valves, ball type test cocks. Maximum friction loss through assembly shall not exceed 35 kPa (5 psi) at design flow. Unit shall be functional in vertical or horizontal position, rated for 1200 kPa (175 psi) working pressure. Check valve assembly shall be in accordance with AWWA Class D. Double check backflow prevention assembly shall be FM approved, ASSE approved and UL listed.

2.4 AUTOMATIC BALL DRIPS

- A. Cast brass 20 mm (3/4 in.) in line automatic ball drip with both ends threaded with iron pipethreads.

2.5 SPRINKLERS

- A. Quick response sprinklers shall be standard type except as noted below. The maximum distance from the deflector to finished ceiling shall be 50 mm (2 in.) for pendent sprinklers. Pendent sprinklers in finished areas shall be provided with semi-recessed adjustable screwed escutcheons and installed within the center one-third of their adjustment. The sprinkler shall be installed in the flush position with the element exposed below the ceiling line. At the specified locations, provide the following type of sprinklers. All sprinklers except "institutional" type sprinklers shall be FM approved. Provide quick

Department of Veteran Affairs
Renovate Research Lab Phase 3
Nashville, TN
V.A. Project Number: 626-11-101

response sprinklers in all areas, except where specifically prohibited
by their listing or approval, and the following:

Department of Veteran Affairs
 Renovate Research Lab Phase 3
 Nashville, TN
 V.A. Project Number: 626-11-101

LOCATION	TYPE
Mechanical Equipment Rooms, Electrical & Electrical Switch Gear Rooms	Quick Response, Upright or Telephone Closets, Transformer Vaults Pendent Brass [93 °C (200 °F)]
Elevator Shafts, Dumbwaiter Shafts, Elevator Machine Rooms, Elevator Pits	Standard Upright or Sidewall Brass [93 °C (200 °F)]
Gravity Type Linen & Trash Chutes	Standard Upright or Pendent Brass [66-74 °C (150-165 °F)]
Warehouse [Storage under 3600 mm (12 ft.)]	Quick Response, Pendent or Upright, Brass [77-74 °C (150- 165 °F)]
Warehouse [Storage over 3600 mm (12 ft.)]	See NFPA 13
Cold rooms, Freezers, Controlled Temperature Rooms and Unheated Areas	Standard Pendent, Dry Type [66- 74 °C (150-165 °F)]
Kitchen Hoods, Exhaust Ducts & Duct Collars	Standard Pendent or Upright (Extra High Temperature [163-191 °C (325- 375 °F.)]
Generator Rooms	Standard Pendent or Upright [141 °C (286 °F)]
Mental Health and Behavioral Unit: Nursing Bedroom, Toilets and all areas with plaster/ dry wall ceilings within the area	Institutional Quick Response; Chrome plated with 85 lb. breakaway, Pendent, Horizontal Sidewall [66-74 °C (150-165 °F)]
Patient Sleeping, Patient Bathrooms, and Corridors within a Patient Ward	Residential, Quick Response, Recessed Pendent, Chrome Plated, [66-74 °C (150-165 °F)]
All Patient Treatment, Elevator Lobbies and Corridors	Quick Response, Recessed Pendent, Chrome Plated [66-74 °C [150- 165 °F)]
Operating Rooms, Radiology Rooms, Nuclear Medicine Rooms	Quick Response, Recessed Pendent, Chrome Plated, Sidewall [66-74 °C (150-165 °F)]
All Areas Not Listed Above	Quick Response, Recessed Pendent, Sidewall, Chrome Plated [66-74 °C (150-165 °F)]

B. Do not use quick response sprinklers in the same sprinkler zone with
 other sprinklers types.

C. Sprinklers to be installed as per NFPA 13.

2.7 TOOLS AND REPLACEMENT PARTS

A. Sprinkler Cabinet:

1. Provide a minimum 5 percent spare sprinklers with escutcheons with a minimum of two of each type/or as required by NFPA-13, whichever is more demanding.
2. Provide a minimum of two of each type sprinkler wrenches used.
3. Install cabinets in each building where directed by the Resident Engineer.
4. Spare sprinklers shall be kept in a cabinet where ambient temperatures do not exceed 100 Deg F.

B. Sprinkler system water flow switch: one of each size provided.

C. Sprinkler system valve tamper switch: one of each type provided.

D. Sprinkler system pressure switch: one of each type provided.

E. Provide two sprinkler plugs attached to multi-section extension poles 2400 mm (8 ft.) minimum.

2.8 FIRE PUMP

A. Provide a fire pump system, complete with pump, motor, controller, accessories, and complying with all the requirements of NFPA 20 latest edition. Pump shall deliver not less than 65 percent of rated head at 150 percent of rated capacity. Churn pressure shall not exceed 140 percent of rated design pressure. Pump capacity shall match existing pump being replaced.

B. Provide a horizontal base mounted, split case, bronze fitted, single stage, double suction, centrifugal fire pump.

C. Provide fire pump controller, approved for fire pump service, completely assembled, wired and tested at the factory. Mark controller "Fire Pump Controller". Enclose equipment in approved NEMA 3R enclosure. The combined manual and automatic type controller shall include the following:

1. Disconnect switch, externally operable, quick break type.
2. Circuit breaker, time delay type with trips in all phases for 300 percent of the motor full load current.
3. Motor starter to be wye delta closed transition type starting capable of being energized automatically through the pressure switch or manually by means of an externally operable handle.
4. Running period timer set to keep motor in operation, when started automatically, for a period not to exceed ten minutes.

5. Pilot lamp to indicate circuit breaker closed and power available.
6. Ammeter test link and voltmeter test line.
7. Alarm relay to energize an audible or visible alarm through an independent source of power to indicate circuit breaker open or power failure.
8. Provide means on the controller to operate an alarm contact continuously while the pump is running.
9. Provide all necessary wiring and interface circuitry to enable fire alarm system to accept monitoring signals from controller.
- E. Provide fire pump controller with an automatic and manual built-in emergency transfer switch specifically approved for fire pump service. All wiring between the fire pump controller and the transfer switch shall be done at the factory and the entire unit assembly factory tested. The transfer switch shall include emergency power isolation switch, control relays, solid state sensing and timing equipment as well as the power transfer switch all in an NEMA 3R enclosure.
- F. Hydrostatically test the pump at 150 percent of the working pressure but in no case to less than 1700 kPa (250 psi). Provide a complete factory performance test and furnish characteristic curves prepared from the test results.
- G. Include the following accessories with the fire pump unit:
 1. Eccentric tapered suction reducer.
 2. Concentric tapered discharged increaser.
 3. Hose valves.
 4. Caps and chains.
 5. Pressure gages.
 6. Circulation relief valve.
 7. Automatic air release valve.
 8. Ball drip valve.
 9. Coupling guard.
 10. Water measuring device.
 11. Test header.
- H. Provide remote alarm panel and mount at location of constant attendance. Alarm panel shall operate on 115 volt, 60 Hertz power for supervisory voltage. Furnish panel with visible/audible pump power failure, pump running supervisory power failure alarm signals and phase reversal on line side of motor starter.

- I. Provide the services of a factory-trained representative to align coupling and be available to assist in final acceptance test.
- J. Set main relief valve to prevent pressure on the fire protection system components in excess of that pressure which the system is capable of withstanding. Install in accordance with NFPA 20.
- K. Water Measuring Device: Capable of water flow of not less than 175 percent of pump rated capacity, to test the pump. Provide discharge drain line from the device to a suitable drain.
- L. Pump Settings:
 - 1. Jockey Pump Stop Point: Pump churn pressure plus the minimum static supply pressure.
 - 2. Jockey Pump Start Point: Jockey pump stop point less 70 kPa (10 psi).
 - 3. Fire Pump Start Point: Jockey pump start point less 35 kPa (5 psi). Use 70 kPa (10 psi) increments for each additional fire pump.
 - 4. Where minimum run timer is provided, fire pump shall continue to operate after attaining these pressures. Final pressures shall not exceed pressure rating of the system.
 - 5. When the operating differential of pressure switches does not permit these settings, settings shall be as close as equipment will permit. Establish settings through observation of pressures on test gages.
 - 6. When minimum run timer is provided, the fire pump shall continue to operate at churn pressure beyond the stop setting. Final pressure shall not exceed the pressure rating of the system components.

2.9 JOCKEY PUMP

- A. Provide new jockey pump. New pump capacity to match existing pump capacity.
- B. Pump shall be close coupled turbine type, cast iron frame and case, bronze impeller, bronze fitted, stainless steel shaft, tungsten carbide mechanical seal.
- C. Jockey Pump Controller: UL Listed, with magnetic starter, fusible disconnect switch, hand-off automatic selector switch, control circuit transformer, running period timer, adjustable Mercury tube pressure switch, and NEMA 2, driptight, rated for 460 volts, 3 phase.
- D. Jockey pumps must be sized to make up the allowable leakage rate within 10 minutes or 1 GPM whichever is larger and should have rated capacities of not less than accepted leakage rate. They shall have

discharge pressure sufficient to maintain the desired fire protection system pressure.

2.10 IDENTIFICATION SIGNS

Provide for all new and existing sectional valves, riser control valves, system control valves, drain valves, test and drain connections and alarm devices with securely attached identification signs (enamel on metal) in accordance with NFPA 13.

2.11 STANDPIPE HOSE VALVE CABINETS

White glossy polyester coated 20 gage steel box, 20 gage tubular steel door and 18 gage frame with continuous steel hinge with brass pin, welded and ground smooth steel corner seams, recess type, 600 x 600 x 250 mm (24 x 24 x 10 in.). Finish door and frame with white prime polyester coating.

2.12 HANGERS AND EARTHQUAKE BRACING

In accordance with NFPA 13 and 14. Comply with seismic requirements as per 15050 for seismic zone locations.

2.13 WATERFLOW SWITCHES

- A. Integral, mechanical, non-coded, non-accumulative retard type, with two sets of SPDT auxiliary contacts and adjustable from 0 to 90 seconds. Set flow switches at an initial setting between 20 and 30 seconds.
- B. All conduit and wiring connected thereto shall be provided in Section 28 31 00, FIRE DETECTION AND ALARM.

2.14 VALVE SUPERVISORY SWITCHES

- A. Provide each indicating sprinkler, standpipe and fire pump control valve with adequate means for mounting a valve supervisory switch.
- B. Mount switch so as not to interfere with normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem is moved no more than one fifth of the distance from its normal position.
- C. The mechanism shall be contained in a weatherproof die cast aluminum housing, which shall provide a 20 mm (3/4 in.) tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.
- D. Switch housing to be finished in red baked enamel.
- E. Supervisory switches for ball and butterfly valves may be integral with the valve.
- F. All conduit and wiring connected thereto shall be provided in Section 28 31 00, FIRE DETECTION AND ALARM.

2.15 PRESSURE SWITCHES

- A. Provide with 15 mm (1/2 in.) NPT male pressure connection.
- B. Alarm switch shall be activated by any flow of water equal to or in excess of the discharge from one sprinkler.
- C. Supervisory switch shall be activated by either high or low air pressure condition.
- D. Furnish switch in a red baked enamel, weatherproof, oil resistant housing with tamper resistant screws.

2.16 WATER MOTOR GONG

Provide water powered mechanical device providing an audible signal when there is a flow of water in the automatic sprinkler system.

2.17 WALL, FLOOR AND CEILING PLATES

- A. Exposed piping passing through walls, floors or ceilings shall be provided with chrome colored escutcheon plates.
- B. Comply with NFPA 101 Fire Barrier Penetration codes.

2.18 PRESSURE GAUGE

- A. Provide a 1280 kPa (200 psi) pressure gauge at each flow alarm switch location, at the top of each sprinkler or standpipe riser, at each main drain connection, and on the suction and discharge of the fire pump.

2.19 HANGERS

- A. Hangers shall be designed to support five times the weight of the water filled pipe plus 250 Lb (114Kg) at each point of piping support.
- B. These points of support shall be adequate to support the system.
- C. The spacing between hangers shall not exceed the value given for the type of pipe as indicated in NFPA 13 tables.
- D. Hanger components shall be ferrous.
- E. Detailed calculations shall be submitted, when required by the reviewing Authority, showing stress developed in hangers, piping, fittings and safety factors allowed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Supervisory Switches: For each indicating sprinkler system riser, sprinkler zone, main service entrance, fire pump supply and discharge, jockey pump supply, provide a supervisory switch that is connected to the fire alarm system. Standpipe hose valves and test and drain valves shall not be provided with supervisory switches.

- B. Waterflow Switches: For each sprinkler zone and where indicated on drawings, provide a waterflow switch. Install waterflow switch and adjacent valves in easily accessible locations.
- C. Sprinkler Zone: Each sprinkler zone shall coincide with each smoke zone and fire alarm zone.
- D. Piping connections:
 - 1. Combined Standpipe and Sprinkler System: Provide standpipe system complete including fire pump, where required. Start the sprinkler system work for each zone at valve connection to standpipe location at each zone.
- E. Drains, Test Pipes and Accessories:
 - 1. Provide a drain at base of risers, drain connection on valved sections, and drains at other locations for complete drainage of the system. Provide valve in drain lines and connect to the central drain riser. Discharge riser outside over splash block, indirectly over standpipe drain connected to storm sewer, or as indicated. The main drain shall be capable of full discharge test without allowing water to flow onto the floor.
 - 2. Provide test pipes in accordance with NFPA 13. Test pipes shall be valved and piped to discharge through proper orifice as specified above for drains.
- F. Provide a 1280 kPa (200 psi) pressure gage at each flow alarm switch location, at the top of each sprinkler or standpipe riser, at each main drain connection, and on the suction and discharge of the fire pump.
- G. Conceal all piping, except in pipe basements, stairwells and rooms without ceilings.
- H. Install new piping and sprinklers aligned with natural building and other sprinklers lines.
- I. Locate piping in stairways as near ceiling as possible to prevent tampering by unauthorized personnel. Provide a minimum headroom of 2250 mm (7 ft.-6 in.) for all piping.
- J. Piping arrangement shall avoid contact with other piping and equipment and allow clear access to other equipment or devices requiring access or maintenance.
- K. Install CPVC piping only above gypsum board or acoustical ceiling panels classified for surface burning characteristics (See UL product category BIYR in the Building Materials Directory), or behind a Listed

Sprinkler Cover Support System. In unfinished areas with flat ceiling construction and sprinkler deflectors installed within 200 mm (8 in.) of the ceiling, piping may be exposed when listed quick response sprinklers are used. In addition to the above, use CPVC only when allowed by the local Authority Having Jurisdiction.

- L. Cutout disks, which are created by cutting holes in the walls of pipe for flow switches and non-threaded pipe connections, shall be affixed near to the pipe where the originated. They shall be displayed until final inspection and then removed.
- M. For each new or existing fire department connection, locate the symbolic sign given in NFPA 170 a distance of 2400 to 3000 mm (8 to 10 ft.) above each connection location. The sign shall be 450 x 450 mm (18 x 18 in.) with symbol at least 350 x 350 mm (14 x 14 in.).
- N. Firestopping shall comply with Section 07 84 00, FIRESTOPPING. All holes through stairways, smoke barrier walls, and fire walls shall be sealed on a daily basis.
- O. Provide hydraulic design information signage as required by NFPA 13 and 14.
- P. Install access doors in ceilings of rooms where above ceiling access is required.

3.2 TEST

- A. Automatic Sprinkler System: NFPA 13 and 25.
- B. Standpipe and Hose System: NFPA 25.
- C. Centrifugal Fire Pumps: NFPA 20.

3.3 INSTRUCTIONS

Furnish the services of a competent instructor for not less than two four-hour periods for instructing personnel in the operation and maintenance of the fire pump and sprinkler system, on the dates requested by the COTR.

- - - END - - -