

## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

- .1 General Instructions: Section 01 10 00
- .2 Thermometers and Pressure Gauges - Piping Systems: Section 23 05 20

### **1.2 REFERENCES**

- .1 American National Standards Institute/National Fire Prevention Association (NFPA)
  - .1 NFPA 13-2013, Standard for the Installation of Sprinkler Systems, edition recognized by authority having jurisdiction.
  - .2 NFPA 20-2013, Standard for the Installation of Stationary Pumps for Fire Protection.
  - .3 NFPA 25-2014, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS). Material Safety Data Sheets (MSDS).
- .3 Underwriter's Laboratories of Canada (ULC)
  - .1 CAN/ULC S543-09, Standard for Internal Lug Quick Connect Couplings for Fire Hose.

### **1.3 SAMPLES**

- .1 Submit samples of following:
  - .1 Each type of sprinkler head.
  - .2 Signs.

### **1.4 DESIGN REQUIREMENTS**

- .1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, by hydraulic calculations for uniform distribution of water over design area. Occupancy hazard to be as required by NFPA 13.
- .2 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.
- .3 Design and provide each system to give full consideration to blind spaces, combustible spaces concealed piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.

- .4 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.
- .5 Location of Sprinkler Heads:
  - .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13.
  - .2 Uniformly space sprinklers on branch.
  - .3 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers. Center on tiles where possible (minimum 150mm from T-bar grid when not).
- .6 Water Distribution:
  - .1 Make distribution uniform throughout the area in which sprinkler heads will open.
  - .2 Discharge from individual heads in hydraulically most remote area to be 100% of specified density required in NFPA 13.
  - .3 Difference between pressure required and pressure available to be 34.5 kPa minimum.
- .7 Density of Application of Water:
  - .1 Size pipe to provide specified density when system is discharging specified total maximum required flow.
  - .2 Application to horizontal surfaces below sprinklers shall be as required for NFPA 13.
- .8 Sprinkler Discharge Area:
  - .1 Area: hydraulically most remote area as defined in NFPA 13.
- .9 Outside Hose Allowances:
  - .1 Include allowance in hydraulic calculations for outside hose streams per NFPA.
- .10 Friction Losses:
  - .1 Calculate losses in piping in accordance with Hazen-Williams formula with 'C' value of 120 for steel piping, and 140 for cement-lined ductile-iron piping.
- .11 Water Supply: conduct flow test on hydrants adjacent the site prior to the completion of hydraulic calculations. This flow test will establish criteria for basis of design in accordance with NFPA 13.
- .12 Show the following in the drawings submitted to the Departmental Representative for approval.
  - .1 Show the layout and size of all piping and equipment from the point of connection to the water supply, to the sprinkler cross mains. The drawings must include a detailed sprinkler riser diagram. Water velocity in the piping should not exceed 6 m/s.
  - .2 Show location and size of service mains, interior feed mains, control valves, sprinkler risers, drain lines, sectional valves and inspector's test valves and switches on the drawings.
  - .3 Specify water flow data including hydrant flow results, including location where the hydrant flow test was conducted, the location and size of existing mains and new water supply lines that will serve the sprinkler system (including all supervisory valves), and the location and size of all risers.

- .4 Highlight or clearly indicate the area(s) to be protected by sprinklers on the drawings.
- .5 Specify water flow requirements including the design density, design area, the hose stream demand (including location of the hose stream demand), the duration of supply, and sprinkler spacing and area of coverage in this section.
- .6 Show the location of the backflow preventer (including provisions for a drain and access for maintenance).
- .7 Show all provisions necessary for forward flow testing of the backflow preventer at system demand, as required by NFPA 13 on the drawings. Indicate location of all components and required items, including test ports, for pressure measurements both upstream and downstream of the backflow preventer, a drain to the building exterior, and appropriate permanent means of disposing of the large quantity of water that will be involved in the initial test and subsequent annual tests.
- .8 Highlight all concealed spaces on the drawings that require sprinkler protection, such as spaces above suspended ceilings that are built of combustible material or that can contain combustible materials, such as storage, and communication cabling that is not fire- rated.
- .9 Provide details on the drawings of pipe restraints for underground piping. This includes details of pipe clamps, tie rods, mechanical retainer glands, and thrust blocks.
- .10 Provide supervised trace heated lines and dry pendant heads for exterior overhangs that require sprinkler protection per NFPA 13.
- .13 Unforeseen Sprinkler Heads
  - .1 The sprinkler drawings show the concept and the general layout only. Complete the design in conformance with NFPA 13 including all required heads, piping, pipe sizing, hydraulic calculations, etc. Submit shop drawings showing the completed detailed design and hydraulic calculations.
  - .2 Coordination
    - .1 Coordinate with other trades the installation of the sprinkler system. Reroute piping as required to accommodate the installation of other services where conflicts occur.
  - .3 Sprinkler Guards
    - .1 Provide sprinkler guards in the following areas:
      - .1 Mechanical rooms.
      - .2 Electrical and Communications equipment rooms.
      - .3 Water service entrance room.
- .14 Sprinkler drawings indicate general routing of mains and sprinkler zoning requirements to be followed.

## **1.5 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00.
  - .2 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00.

- .2 Shop Drawings:
  - .1 Submit shop drawings and hydraulic calculations in accordance with Section 01 33 00.
  - .2 Shop drawings: submit drawings and hydraulic calculations stamped and signed by designer who is a professional engineer and acceptable to the authority having jurisdiction.
    - .1 Indicate:
      - .1 Materials.
      - .2 Finishes.
      - .3 Method of anchorage.
      - .4 Number of anchors.
      - .5 Supports.
      - .6 Reinforcement.
      - .7 Assembly details.
      - .8 Accessories.
  - .3 Shop Drawings must be approved by fire marshal prior to any installation.
- .3 Closeout Submittals:
  - .1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 and in accordance with NFPA 20 and 13.
  - .2 Manufacturer's Catalog Data, including specific model, type, and size for:
    - .1 Pipe and fittings.
    - .2 Alarm valves.
    - .3 Valves, including gate, check, and globe.
    - .4 Water motor alarms.
    - .5 Sprinkler heads.
    - .6 Pipe hangers and supports.
    - .7 Pressure or flow switch.
    - .8 Fire department connections.
    - .9 Excess pressure pump.
    - .10 Mechanical couplings.
  - .3 Drawings:
    - .1 Sprinkler heads and piping system layout.
      - .1 Prepare 760 mm by 1050 mm detail working drawings of system layout in accordance with NFPA 13.
      - .2 Show details, plan view, elevations, and sections of systems supply and piping.
      - .3 Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams.
    - .2 Electrical wiring diagrams.

- .4 Design Data:
  - .1 Calculations of sprinkler system design.
  - .2 Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.
- .5 Field Test Reports:
  - .1 Preliminary tests on piping system.
- .6 Records:
  - .1 As-built drawings of each system.
    - .1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes.
    - .2 Submit 760 mm by 1050 mm drawings on reproducible Mylar film with title block similar to full size contract drawings.
- .7 Operation and Maintenance Manuals:
  - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.
  - .2 Provide detailed hydraulic calculations including summary sheet, and Contractors Material and Test Certificate for aboveground and underground piping and other documentation for incorporation into manual specified in Section 01 78 00 and in accordance with NFPA 13.

## **1.6 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: certified journey person in wet sprinkler systems with ten (10) years documented experience approved by manufacturer.
- .2 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.

## **1.7 MAINTENANCE AND SPARE PARTS**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00.
  - .2 Provide spare sprinklers and tools as required by NFPA 13.
  - .3 Provide a small cabinet in the water service entrance room containing a minimum of six (6) spare sprinkler heads for each type used in the facility, and a sprinkler head wrench.

## **1.8 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, shipping, handling and unloading:

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Protection:
  - .1 Store materials indoors in dry location.
  - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
- .3 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 22.

## **PART 2 - PRODUCTS**

### **2.1 ABOVEGROUND PIPING SYSTEMS**

- .1 Provide fittings for changes in direction of piping and for connections.
  - .1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.
- .2 Perform welding in shop; field welding will not be permitted.
- .3 Conceal piping in areas with suspended ceiling, where possible.

### **2.2 PIPE, FITTINGS AND VALVES**

- .1 Pipe:
  - .1 Ferrous: to NFPA 13.
  - .2 Schedule 40 (Screwed, Rolled Grooved or Victaulic F.I.T) for sizes up to 50mm. Schedule 10 Roll Grooved or Schedule 40 (Welded, Rolled Grooved or Flanged) for sizes 2 1/2 and up.
- .2 Fittings and joints to NFPA 13:
  - .1 Ferrous: screwed, welded, flanged or roll grooved.
  - .2 Provide welded, threaded, grooved-end type fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
  - .3 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will not be permitted.
  - .4 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.
  - .5 Fittings: ULC approved for use in wet pipe sprinkler systems.
  - .6 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
  - .7 Side outlet tees using rubber gasketed fittings are not permitted.

- .8 Sprinkler pipe and fittings: metal.
- .9 1034KPa malleable banded iron screwed of 1034KPa cast iron flanged.
- .3 Valves:
  - .1 ULC listed for fire protection service.
  - .2 Gate valves: open by counter-clockwise rotation.
  - .3 Provide rising stem OS & Y valve beneath each alarm valve in each riser when more than one alarm valve is supplied from same water supply pipe.
  - .4 Check valves: flanged clear opening swing-check type with flanged inspection and access cover plate for sizes 10 cm and larger.
- .4 Pipe hangers:
  - .1 ULC listed for fire protection services in accordance with NFPA.

## **2.3 SPRINKLER HEADS**

- .1 General: to NFPA 13 and ULC listed for fire services.
  - .1 All heads to be the quick response type.
  - .2 Release element of each head to be of intermediate temperature rating or higher as suitable for specific application.
  - .3 Provide polished stainless steel ceiling plates or chromium-plated finish on copper alloy ceiling plates, and chromium-plated pendent sprinklers below suspended ceilings.

## **2.4 ALARM CHECK VALVE**

- .1 Alarm check valve to NFPA 13 and ULC listed for fire service.
- .2 Provide variable pressure type alarm valve complete with retarding chamber, alarm test valve, alarm shutoff valve, drain valve, pressure gages, accessories, and appurtenances for proper operation of system.

## **2.5 SUPERVISORY SWITCHES**

- .1 General: to NFPA 13 and ULC listed for fire service.
- .2 Valves:
  - .1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.
- .3 Pressure or flow switch type:
  - .1 With normally open and normally closed contacts and supervisory capability.
  - .2 Provide switch with circuit opener or closer for automatic transmittal of alarm over facility fire alarm system.
  - .3 Connection to the building fire alarm system is the responsibility of the fire alarm contractor. Sprinkler contractor will coordinate fire alarm requirements with the fire alarm contractor.

- .4 Pressure alarm switch:
  - .1 With normally open and normally closed contacts and supervisory capability.

## **2.6 WATER GONG**

- .1 To NFPA 13 and ULC listed for fire service. Location as indicated.

## **2.7 FIRE DEPARTMENT CONNECTION**

- .1 Provide connections approximately 1.5 m above finish grade, location as indicated.
- .2 To NFPA 13 and ULC S543 listed, Siamese type.
- .3 Polished bronze chrome plated recessed or exposed of approved two-way type with plug, chain, and identifying fire department connection escutcheon plate.
- .4 Thread specifications: compatible with local fire department.

## **2.8 EXCESS PRESSURE PUMP**

- .1 Provide pumps on each sprinkler piping riser as required by NFPA 13.
- .2 Pumps:
  - .1 Approved for automatic wet pipe fire extinguishing sprinkler systems; complete with pilot light panel, differential motor control switch, high pressure switch, and low pressure switch.
  - .2 NEMA Class B squirrel cage induction 1725 rpm, continuous duty, drip proof, ball bearing, maximum temperature rise 50 degrees C.
- .3 Coordinate electrical power supply connections for pump and pilot light with the electrical contractor.
- .4 Provide separate fused safety- type switch with locked lever for each connection.
- .5 Pump operation switch: to operate excess pressure pump with pressure differential of 103 kPa.
- .6 Shut-off valve and strainer on pump inlet. Relief valve, check valve and shut-off valve on discharge connections.

## **2.9 PRESSURE GAUGES**

- .1 ULC listed and to Section 23 05 20 - Thermometers and Pressure Gauges - Piping Systems.



- .2 Maximum limit of not less than twice normal working pressure at point where installed.

## **2.10 PIPE SLEEVES**

- .1 Provide pipe sleeves where piping passes through walls, floors, and roofs.
- .2 Secure sleeves in position and location during construction.
- .3 Provide sleeves of sufficient length to pass through entire thickness of walls, floors, and roofs.
- .4 Provide 25 mm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.
  - .1 Firmly pack space with mineral wool insulation.
  - .2 Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to firm but pliable mass, provide mechanically adjustable segmented elastomeric seal.
  - .3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material.
- .5 Sleeves in masonry and concrete walls, floors, and roofs:
  - .1 Provide hot-dip galvanized steel, ductile-iron, cast-iron sleeves.
  - .2 Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in core-drilled hole are completely grouted smooth.
- .6 Sleeves in other than masonry and concrete walls, floors, and roofs:
  - .1 Provide 0.61 mm thick galvanized steel sheet.

## **2.11 ESCUTCHEON PLATES**

- .1 Provide one piece split hinge type metal plates for piping passing through walls, floors, and ceilings in exposed spaces.
- .2 Provide polished stainless steel plates chromium-plated finish on copper alloy plates in finished spaces.
- .3 Provide paint finish on metal plates in unfinished spaces.

## **2.12 SIGNS**

- .1 Attach properly lettered English and approved metal signs to each valve and alarm device to NFPA 13.
- .2 Permanently fix hydraulic design data nameplates to riser of each system.

## **PART 3 - EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

### **3.2 INSTALLATION**

- .1 Install, inspect and test to acceptance in accordance with NFPA 13, NFPA 25, or the authority having jurisdiction, whichever is more stringent.

### **3.3 PIPE INSTALLATION**

- .1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings as required by NFPA 13.
- .2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.
- .3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.
- .4 Inspect piping before placing into position.

### **3.4 SPRINKLER PIPE IDENTIFICATION**

- .1 Provide piping with 50 mm wide red enamel bands or self-adhering red plastic bands spaced at maximum of 6 m intervals.

### **3.5 FIELD QUALITY CONTROL**

- .1 Site Test, Inspection:
  - .1 Perform test to determine compliance with NFPA 25 and specified requirements in presence of Departmental Representative.
  - .2 Test, inspect, and approve piping before covering or concealing.
  - .3 Preliminary Tests:
    - .1 Hydrostatically test each system at 1400 kPa for a two (2) hour period with no leakage or reduction in pressure.
    - .2 Flush piping with potable water in accordance with NFPA 13.

- .3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.
- .4 Test alarms and other devices.
- .5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.
- .4 Formal Tests and Inspections:
  - .1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.
  - .2 Submit written request for formal inspection at least 15 days prior to inspection date.
  - .3 Repeat required tests as directed.
  - .4 Correct defects and make additional tests until systems comply with contract requirements.
  - .5 Furnish appliances, equipment, instruments, connecting devices, and personnel for tests.
  - .6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.

### **3.6 CLEANING**

- .1 Proceed in accordance with Section 01 74 11.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**