

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 21 05 01 - Common Work Results for Mechanical.

**1.2 REFERENCES**

- .1 National Fire Prevention Association (NFPA)
  - .1 NFPA (Fire) 13-2013, Standard for the Installation of Sprinkler Systems.
  - .2 NFPA (Fire) 20-2013, Standard for the Installation of Stationary Pumps for Fire Protection.
  - .3 NFPA (Fire) 24-2013, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
  - .4 NFPA (Fire) 25-2014, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- .2 Underwriter's Laboratories of Canada (ULC)
  - .1 CAN/ULC S543-09-AM1, Standard for Internal Lug Quick Connect Couplings for Fire Hose (includes Amendment 1).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 00 10 - General Instructions.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
  - .2 Indicate:
    - .1 Materials.
    - .2 Finishes.
    - .3 Method of anchorage
    - .4 Number of anchors.
    - .5 Supports.
    - .6 Reinforcement.
    - .7 Assembly details.
    - .8 Accessories.
- .4 Samples:
  - .1 Submit samples of following:
    - .1 Each type of sprinkler head.
    - .2 Signs.

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- .5 Test reports:
  - .1 Submit certified test reports for wet pipe fire protection sprinkler systems from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates:
  - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Manufacturers' Instructions:
  - .1 Provide manufacturer's installation instructions.
- .8 Field Quality Control Submittals:
  - .1 Manufacturer's Field Reports: manufacturer's field reports specified.

#### **1.4 CLOSEOUT SUBMITTALS**

- .1 Provide operation, maintenance and engineering data for incorporation into manual specified in Section 01 00 10 - General Instructions in accordance with NFPA 20.
- .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, "Working Drawings (Plans)".
    - .2 Show data essential for proper installation of each system.
    - .3 Show details, plan view, elevations, and sections of systems supply and piping.
    - .4 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.

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- .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 detailed hydraulic calculations for all new installations including summary sheet, and Contractors Material and Test Certificate for aboveground piping and other documentation for incorporation into manual in accordance with NFPA 13.

## **1.5 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: company or person specializing in wet sprinkler systems with documented experience.
- .2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.

## **1.6 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 00 10 - General Instructions.
  - .2 Provide spare sprinklers and tools in accordance with NFPA 13.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Storage and Protection:
  - .1 Store materials indoors.
  - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
- .4 Packaging Waste Management: remove for reuse and return of packaging materials.

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**Part 2 Products****2.1 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.
- .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, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.
- .4 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.
- .5 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.
- .6 Design systems for earthquake protection for buildings in seismic zones 3 and 4, and only essential and high risk buildings in seismic zone 2.
- .7 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.
- .8 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.
- .9 Density of Application of Water:
  - .1 Size pipe to provide specified density when system is discharging specified total maximum required flow.
- .10 Sprinkler Discharge Area:
  - .1 Area: hydraulically most remote area as defined in NFPA 13.
- .11 Friction Losses:
  - .1 Calculate losses in piping in accordance with Hazen-Williams formula with 'C' value of 120 for steel piping, 150 for copper tubing, and 140 for cement-lined ductile-iron piping.
- .12 Water Supply:
  - .1 Provide any tests required on the building water supply for any required calculations.

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**2.2 ABOVE GROUND 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.

**2.3 PIPE, FITTINGS AND VALVES**

- .1 Pipe:
  - .1 Ferrous: to NFPA 13.
  - .2 Copper tube: to NFPA 13.
- .2 Fittings and joints to NFPA 13:
  - .1 Ferrous: screwed, welded, flanged or roll grooved.
    - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
  - .2 Copper tube: screwed, soldered, brazed, grooved.
  - .3 Provide threaded fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
  - .4 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.
  - .5 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32mm and larger.
  - .6 Fittings: ULC approved for use in wet pipe sprinkler systems.
  - .7 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
  - .8 Side outlet tees using rubber gasketed fittings are not permitted.
  - .9 Sprinkler pipe and fittings: metal.
- .3 Pipe hangers:
  - .1 ULC listed for fire protection services in accordance with NFPA.

**2.4 SPRINKLER HEADS**

- .1 General: to NFPA 13 and ULC listed for fire services.
- .2 Sprinkler Head Type:
  - .1 Upright bronze.
    - .1 Standard response upright and conventional sprinklers, thermosensitive, glass-bulb spray sprinklers.
    - .2 Minimum operating pressure: 7 psi (0.5 bar).
    - .3 Ordinary classification: 68°C

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- .2 Semi- recessed chrome with glass bulb type with ring and cup.
  - .1 Standard response pendent sprinklers, thermosensitive, glass-bulb spray sprinklers.
  - .2 Minimum operating pressure: 7 psi (0.5 bar)
  - .3 Ordinary classification: 68°C.
  - .4 Supply with recessed escutcheons.
- .3 Refer to drawing M400 for legend.
- .3 Provide nominal 1.2 cm orifice sprinkler heads.
  - .1 Release element of each head to be of intermediate temperature rating or higher as suitable for specific application.
  - .2 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.
  - .3 Refer to Fire Protection drawing for new sprinkler locations.
  - .4 Deflector: not more than 75 mm below suspended ceilings.
  - .5 Ceiling plates: not more than 25 mm deep.

## 2.5 SUPERVISORY SWITCHES

- .1 General: to NFPA 13 and ULC listed for fire service.
- .2 Replace all supervisory modules on all pressure and flow switches. Connection to Fire Alarm Panel by Division 26. All modules to meet NFPA requirements and be ULC approved.
- .3 Replace supervisory alarms on valves. Alarms to be ULC rated and in accordance with NFPA standards. Connection to new Fire Alarm Panel by Division 26.
- .4 Valves:
  - .1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.
- .5 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 of switch: Section 28 31 00.02 - Multiplex Fire Alarm and Voice Communication Systems.
  - .4 Alarm actuating device: mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and instantly recycle.
- .6 Pressure alarm switch:
  - .1 With normally open and normally closed contacts and supervisory capability.

## 2.6 PIPE SLEEVES

- .1 Provide pipe sleeves where piping passes through walls, floors, roofs.
- .2 Secure sleeves in position and location during construction.
- .3 Provide sleeves of sufficient length to pass through entire thickness of walls, floors, roofs.

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- .4 Provide 2.5 cm 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 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.

**2.7 ESCUTCHEON PLATES**

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

**2.8 SIGNS**

- .1 Attach properly lettered Bilingual 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.

**2.9 SPARE PARTS CABINET**

- .1 Restock the spare parts cabinet as per NFPA 13.

**2.10 ELECTRONIC VALVE MONITORING**

- .1 Provide and install on all isolation valves to indicate when valve is closed.
- .2 Switch is to be ULC rated and functional on 120V, 1 ph, 60 Hz complete with alarm contact.

**2.11 FLOW INDICATOR SWITCH**

- .1 Provide and install ULC labelled indicator switches for all existing flow indicators. Switches are to be single pole, double throw (spdt) with one N.O. contact and one N.C. contact with capacity of 7.5 amp at 120/240V, 1 ph, 60 Hz.

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**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 and NFPA 25.

**3.3 PIPE INSTALLATION**

- .1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.
- .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 ELECTRICAL CONNECTIONS**

- .1 Provide electrical work associated with this section under Section 26 05 00 - Common Work Results for Electrical.
- .2 Provide fire alarm system under Section 28 31 00.02 - Multiplex Fire Alarm and Voice Communication Systems.
- .3 Provide control and fire alarm wiring, including connections to fire alarm systems, in accordance with National Electrical Code.
- .4 Provide wiring in rigid metal conduit or intermediate metal conduit.

**3.5 DISINFECTION**

- .1 Disinfect new piping and existing piping.
- .2 Fill piping systems with solution containing minimum of 50 parts per million of chlorine and allow solution to stand for minimum of 24 hours.
- .3 Flush solution from systems with clean water until maximum residual chlorine content is not greater than 0.2 part per million or residual chlorine content of domestic water supply.

**3.6 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS**

- .1 Notify Contracting Officer in writing at least 15 days prior to connection date.
- .2 Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure.
- .3 Bolt sleeves around main piping.
- .4 Bolt valve to branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service.



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- .5 Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labour as required.
- .6 Contractor is responsible to drain and fill the fire protection piping.

### 3.7 FIELD PAINTING

- .1 Clean, pretreat, prime, and paint new systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories.
- .2 Apply coatings to clean, dry surfaces, using clean brushes.
- .3 Clean surfaces to remove dust, dirt, rust, and loose mill scale.
- .4 Immediately after cleaning, provide metal surfaces with 1 coat of pretreatment primer applied to minimum dry film thickness of 0.3 ml, and one coat of zinc chromate primer applied to minimum dry film thickness of 1.0 ml.
- .5 Shield sprinkler heads with protective covering while painting is in progress.
- .6 Upon completion of painting, remove protective covering from sprinkler heads.
- .7 Remove sprinkler heads which have been painted and replace with new sprinkler heads.
- .8 Provide primed surfaces with following:
  - .1 Piping in Finished Areas:
    - .1 Provide primed surfaces with 2 coats of paint to match adjacent surfaces.
    - .2 Provide valves and operating accessories with 1 coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil.
    - .3 Provide piping with self-adhering red plastic bands spaced at maximum of 6 m intervals throughout piping systems.
  - .2 Piping in Unfinished Areas:
    - .1 Provide primed surfaces with one coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil in spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, spaces where walls or ceiling are not painted or not constructed of a prefinished material.
    - .2 Provide piping with self-adhering red plastic bands wide spaced at maximum of 6 m intervals.

### 3.8 FIELD QUALITY CONTROL

- .1 Site Test, Inspection:
  - .1 Perform test to determine compliance with 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 200 psig for a 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.

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- .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, personnel for tests.
  - .6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.
- .2 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in Section 01 00 10 - General Instructions
- .3 Site Tests:
  - .1 Testing to be witnessed by authority having jurisdiction.
  - .2 Develop, with Departmental Representative assistance, detailed instructions for Operation and Maintenance.
- .4 Verification requirements, include:
  - .1 Materials and resources.
  - .2 Storage and collection of recyclables.
  - .3 Construction waste management.
  - .4 Resource reuse.
  - .5 Recycled content.
  - .6 Local/regional materials.
  - .7 Low-emitting materials.

### **3.9 CLEANING**

- .1 Clean in accordance with Section 01 00 10 – General Instructions.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**