

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for wet pipe fire protection and sprinkler systems for heated areas.
- .2 Related Sections:
 - .1 Section 01 33 00 - Submittal Procedures
 - .2 Section 01 61 00 - Common Product Requirements
 - .3 Section 01 74 11 - Cleaning
 - .4 Section 01 78 00 - Closeout Submittals
 - .5 Section 26 05 00 - Common Work Results - for Electrical
 - .6 Section 28 31 00 - Fire Alarm Systems

1.2 REFERENCES

- .1 American National Standards Institute/National Fire Prevention Association (ANSI/NFPA)
 - .1 ANSI/NFPA 13, Installation of Sprinkler Systems.
 - .2 ANSI/NFPA 24, Installation of Private Fire Service Mains and Their Appurtenances.
 - .3 ANSI/NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN4 S543, 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 ordinary hazard occupancy or 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 Location of Sprinkler Heads:
 - .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13 for ordinary hazard occupancy.
 - .2 Uniformly space sprinklers on branch.
- .7 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.
- .8 Density of Application of Water:
 - .1 Size pipe to provide specified density when system is discharging specified total maximum required flow.
- .9 Sprinkler Discharge Area:
 - .1 Area: hydraulically most remote area as defined in NFPA 13.
- .10 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.
- .11 Water Supply:
 - .1 Conduct flow and pressure test of water supply in vicinity of project to obtain criteria for basis of design in accordance with ANSI/NFPA 13.
- .12 Show the following in the drawings submitted to the Contract Administrator 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 contract drawings must include a detailed sprinkler riser diagram. Water velocity in the piping should not exceed 6 m/s (20 ft/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 waterflow 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 waterflow 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) where the potable water supply system is at risk of contamination by the sprinkler system on the drawings.
- .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.

1.5 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered and acceptable to the authority having jurisdiction.
 - .2 Indicate:
 - .1 Materials.
 - .2 Finishes.
 - .3 Method of anchorage
 - .4 Number of anchors.
 - .5 Supports.
 - .6 Reinforcement.
 - .7 Assembly details.
 - .8 Accessories.

- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 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.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.
 - .2 Manufacturer's Field Reports: manufacturer's field reports specified.
- .4 Closeout Submittals:
 - .1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals in accordance with ANSI/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.
 - .11 Glycol system components.
 - .3 Drawings:
 - .1 Sprinkler heads and piping system layout.
 - .1 Prepare 760mm 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.

- .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 760mm 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 - Closeout Submittals.
 - .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 - Closeout Submittals in accordance with ANSI/NFPA 13.

1.6 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in wet sprinkler systems with documented experience and approved by manufacturer.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with City's Safety & Health Requirements.

1.7 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Provide spare sprinklers and tools as required by ANSI/NFPA 13.

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
 - .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 General Conditions.

Part 2 Products

2.1 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 for all piping to be installed in existing construction; field welding will not be permitted except for new construction areas.
- .3 Conceal piping in areas with suspended ceiling without modification to existing structure.
- .4 Provide a freeze-resistant glycol system for the garage.

2.2 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to ANSI/NFPA 13.
 - .2 Copper tube: to ANSI/NFPA 13.
- .2 Fittings and joints to ANSI/NFPA 13:
 - .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .2 Copper tube: screwed, soldered, brazed.
 - .3 Provide welded, threaded, grooved-end type 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 32 mm 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 Valves:
 - .1 ULC listed for fire protection service.
 - .2 Gate valves: open by counterclockwise rotation.
 - .3 Provide rising stem OS & Y wall indicator 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 ANSI/NFPA 13 and ULC listed for fire services.
- .2 Sprinkler Head Type:
 - .1 Type A: upright bronze complete with wire guards.
 - .2 Type C: pendant chrome glass bulb type complete with chrome wire guards.
 - .3 Type E: flush polished satin chrome link and lever type.
- .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 flush mount heads in all suspended ceilings.
 - .3 Provide protection against damage from projectiles for all heads installed in the gymnasium.
 - .4 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.
 - .5 Provide sprinkler heads as required.
 - .6 Deflector: not more than 75 mm below suspended ceilings.
 - .7 Ceiling plates: not more than 25 mm deep.
 - .8 Ceiling cups: not permitted.

2.4 ALARM CHECK VALVE

- .1 Alarm check valve to ANSI/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 WATER MOTOR ALARMS

- .1 Provide alarms approved weatherproof and guarded type, to sound locally on flow of water in each corresponding sprinkler system.
- .2 Mount alarms on outside of outer walls of each building at location as directed.
- .3 Provide separate drain piping directly to exterior of building.

2.6 SUPERVISORY SWITCHES

- .1 General: to ANSI/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 Connect into building fire alarm system.
 - .4 Connection of switch: Section 28 31 00 - Fire Alarm Systems.
 - .5 Alarm actuating device: mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and instantly recycle.
- .4 Pressure alarm switch:
 - .1 With normally open and normally closed contacts and supervisory capability.

2.7 FIRE DEPARTMENT CONNECTION

- .1 Provide connections approximately 1.5m above finish grade, location as indicated.
- .2 To ANSI/NFPA 13 and ULC S543 listed, Siamese type.
- .3 Polished bronze chrome plated recessed exposed of approved two-way type with 2.5 inch National Standard female hose threads 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.
- .2 Pumps:
 - .1 Pumps: positive displacement, gear type rated at 1 lpm, integrally mounted with motor.
 - .2 Double acting displacement type, open cylinder design, direct drive, ULC listed, complete with relief valve.
- .3 Pump and motor unit:
 - .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 EEMAC Class B squirrel cage induction 1725 rpm, continuous duty, drip proof, ball bearing, maximum temperature rise 50 degrees C, 0.25kW, 120/1/60.
 - .3 Capacity: 7.6 L/min.
- .4 Provide electrical power supply connections for pump and pilot light panel at supply side of building service panel.
- .5 Provide separate fused safety-type switch with locked lever for each connection.

- .6 Provide pressure pump sensing piping in supply piping upstream of fire pump.
- .7 Pump operation switch: to operate excess pressure pump with pressure differential of 103 kPa.
- .8 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.
- .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 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 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 INSPECTOR'S TEST CONNECTION

- .1 Locate inspector's test connection at hydraulically most remote part of each system, provide test connections approximately 3 m above floor for each sprinkler system or portion of each sprinkler system equipped with alarm device.
- .2 Provide test connection piping to location where discharge will be readily visible and where water may be discharged without property damage.
- .3 Provide discharge orifice of same size as corresponding sprinkler orifice.

2.13 SIGNS

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

2.14 ANTIFREEZE

- .1 Antifreeze loops to ANSI/NFPA 13, locations as required.

2.15 SPARE PARTS CABINET

- .1 Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to each alarm valve. Number and types of extra sprinkler heads as specified in NFPA 13.

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 ANSI/NFPA 13 and ANSI/NFPA 25.
- .2 The installation must be performed in a two phase approach.
 - .1 The first phase will include:
 - .1 the installation of the distribution for the new expansion south of gridline 'FX'
 - .2 New front vestibule
 - .2 The second phase includes:
 - .1 installation of the water main to the building

- .2 sprinkler tree and associated pumps, valves, controls, etc. within the new sprinkler room
- .3 main branch pipe to feed the new expansion distribution
- .4 the distribution for the entire existing building (north of gridline 'FX')
- .3 Unless performed by this division, provide termination requirements to plumbing contractor for new 150 mm sprinkler line.
- .4 Identify all areas where ceilings are installed. Areas with finished ceilings must have concealed pipe installations. Where ceilings are installed tight to the underside of joists, plan for pipes to be installed tight to the wall/ceiling to allow for GWB bulkheads to be constructed.
- .5 Identify all areas with exposed ceilings in public or occupied spaces. All piping in these areas are to be branch piping only (no mains-except in gymnasium where it will be allowed), tight to the ceiling with minimal elbows for a neat appearance.
- .6 Identify all areas with exposed ceilings in un-occupied spaces (ex. storage rooms). All piping in these areas to follow conventional installations.
- .7 All piping in exposed areas is to be finished to match the colour of the exposed ceiling. Confirm ceiling paint finishes with the architect.
- .8 Provide sealed plans for the permit application following the award of tender contract.

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 - Fire Alarm System.
- .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 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 50 mm wide red enamel bands 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 attic spaces, spaces above suspended ceilings, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material.
 - .2 Provide piping with 50 mm wide red enamel bands self-adhering red plastic bands spaced at maximum of 6 m intervals.

3.6 FIELD QUALITY CONTROL

- .1 Site Test, Inspection:
 - .1 Perform test to determine compliance with specified requirements in presence of Contract Administrator.
 - .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.
- .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.
- .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 as described in PART 1 - SUBMITTALS.
 - .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 PART 1 - QUALITY ASSURANCE.
- .3 Site Tests:
 - .1 Field test each fire pump, driver and controllers in accordance with ANSI/NFPA 20. Testing shall include:
 - .1 Verification of proper installation, system initiation, adjustment and fine tuning.
 - .2 Verification of the sequence of operations and alarm systems.
 - .2 Testing to be witnessed by authority having jurisdiction.
 - .3 Develop, with Contract Administrator assistance, detailed instructions for O & M of this installation.

3.7 CLEANING

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

END OF SECTION