

PART 1 - GENERAL

- 1.1 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Product Data:
    - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
  - .3 Shop drawings:
    - .1 Drawings to show:
      - .1 Mounting arrangements.
      - .2 Operating and maintenance clearances.
    - .2 Drawings and product data accompanied by:
      - .1 Detailed drawings of bases, supports, and anchor bolts.
      - .2 Acoustical sound power data, where applicable.
      - .3 Points of operation on performance curves.
      - .4 Manufacturer to certify current model production.
      - .5 Certification of compliance to applicable codes.
      - .6 Shop drawings to be stamped by the Contractor indicating they have reviewed the product or detail being proposed for this project from a constructability aspect. The Contractor shall submit project specific shop drawings indicating they have reviewed all dimensional aspects of the material, equipment, and site.
    - .3 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- 1.2 CLOSEOUT SUBMITTALS
- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
  - .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
    - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
    - .2 Operation data to include:
      - .1 Control schematics for systems including environmental controls.
      - .2 Description of systems and their controls.
      - .3 Description of operation of systems at

- various loads together with reset schedules and seasonal variances.
- .4 Operation instruction for systems and component.
  - .5 Description of actions to be taken in event of equipment failure.
  - .6 Valves schedule and flow diagram.
  - .7 Colour coding chart.
- .3 Maintenance data to include:
- .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .4 Performance data to include:
- .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
  - .2 Equipment performance verification test results, including pre-functional tests, functional tests and start-up reports.
  - .3 Completed performance verification forms
  - .4 Special performance data as specified.
  - .5 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
  - .6 NFPA 13 certification
  - .7 Seismic Reports
  - .8 Building Occupancy permits and Inspection reports
  - .9 Final shop drawings as reviewed by the Departmental Representative.
- .5 Approvals:
- .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
  - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .6 Additional data:
- .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
- .1 Departmental Representative will provide one set of electronic PDF mechanical drawings. Provide one set of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
  - .2 Transfer information daily to white prints

- to show work as actually installed.
- .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .8 As-Built drawings:
- .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows:  
"AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED"  
(Signature of Contractor) (Date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.
- .10 Completed BGIS CMMS forms, per Section 23 05 53 - Mechanical Identification.

1.3 MAINTENANCE  
MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers.

1.4 DELIVERY,  
STORAGE AND  
HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect equipment and material from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS .1 Not used.

PART 3 - EXECUTION

3.1 SYSTEM CLEANING .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork.

3.2 DEMONSTRATION .1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.3 Instruction duration time requirements is 16 hrs for sprinkler and plumbing systems.

.4 Departmental Representative will record these demonstrations on video tape for future reference.

3.3 CLEANING .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management: separate waste materials for reuse and recycling.  
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS .1 Conform with requirements of front end Sections 00 and 01 as they apply to the work of this discipline.

1.2 GENERAL .1 This project shall be commissioned prior to substantial completion. A Commissioning Authority shall be present on behalf of the Departmental Representative and shall determine the commissioning requirements. A Commissioning Agent retained by the Contractor shall perform the commissioning activities, with assistance as required from this sub-contractor, and shall submit the results of these activities to the Commissioning Authority for review and acceptance.

.2 The sub-contractor shall provide all required labour and materials to assist the Commissioning Agent in the completion of the commissioning activities and requirements.

PART 2 - PRODUCTS

2.1 PRODUCTS .1 Not applicable.

PART 3 - EXECUTION

3.1 Execution .1 Coordinate demonstration and verification of mechanical systems with the Commissioning Agent. Invite Cx Departmental Representatives to participate in all commissioning activities.

.2 Attend meetings with the Commissioning Agent as required to establish requirements for commissioning process throughout construction.

.3 Perform the following key activities:  
.1 Submittals - submit shop drawings and product data sheets.  
.2 Manufacturer's factory tests - submit results.  
.3 Equipment start-up tests - perform and submit results.  
.4 Manufacturer's start-up tests - perform and submit results.  
.5 Verify operation and performance of systems.

- .6 Adjust and recommission systems as necessary to achieve specified performance.
  - .7 Load Balancing - complete and submit results.
  - .8 Maintenance and Operations Manual - prepare and submit.
  - .9 Instruction of operating staff - provide as necessary.
- .4 Refer to Commissioning Specifications in Section 01 for a complete list of required activities.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 National Fire Prevention Association (NFPA)
    - .1 NFPA 13-2016, Standard for the Installation of Sprinkler Systems.
    - .2 NFPA 25-2017, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .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 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.
  - .5 Certificates:
    - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .6 Manufacturers' Instructions:
    - .1 Provide manufacturer's installation instructions.
  - .7 Field Quality Control Submittals:
    - .1 Manufacturer's Field Reports: manufacturer's field reports specified.

- 1.3 CLOSEOUT SUBMITTALS
- .1 Provide operation, maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittal.
  - .2 Manufacturer's Catalog Data, including specific model, type, and size for:
    - .1 Pipe and fittings.
    - .2 Valves, including gate, check, and globe.
    - .3 Sprinkler heads.
    - .4 Pipe hangers and supports.
    - .5 Pressure or flow switch.
    - .6 Mechanical couplings.
  - .3 Drawings:
    - .1 Sprinkler heads and piping system layout.
      - .1 Prepare 760mm by 1050mm 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.
  - .5 Field Test Reports:
    - .1 Preliminary tests on piping system.
- 1.4 QUALITY ASSURANCE
- .1 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.
- 1.5 MAINTENANCE MATERIAL SUBMITTALS
- .1 Extra Materials:
    - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

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 pipe schedules.
- .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, exit signs, emergency 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 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 for light hazard occupancy.
  - .2 Uniformly space sprinklers on branch.
- .8 Water Distribution:
  - .1 Make distribution uniform throughout the area in which sprinkler heads will open.

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.
- .2 Conceal piping in areas with suspended ceiling and drywall ceiling.

2.3 PIPE, FITTINGS  
AND VALVES

- .1 Pipe:
  - .1 Ferrous: 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 Provide threaded, fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
  - .3 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.
  - .4 Fittings: ULC approved for use in wet pipe sprinkler systems.
  - .5 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
  - .6 Side outlet tees using rubber gasketed fittings are permitted.
  - .7 Sprinkler pipe and fittings: metal.
- .3 Valves:
  - .1 ULC listed for fire protection service.
  - .2 Gate valves: open by counterclockwise rotation.
  - .3 Provide 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 or spring actuated check type with flanged inspection and access cover plate for sizes 10 cm and larger.
  - .5 Provide gate valve in piping protecting elevator hoistways, machine rooms, and machinery spaces.
- .4 Pipe hangers:
  - .1 ULC listed for fire protection services in accordance with NFPA 13.

2.4 SPRINKLER HEADS

- .1 General: to NFPA 13 and ULC listed for fire services.
- .2 Sprinkler Head Type, refer to Drawing legend:
  - .1 upright bronze.
  - .2 semi-recessed chrome glass bulb type with ring and cup.
  - .3 Concealed type, white finish.

- .3 Provide nominal 1.2cm orifice sprinkler heads.
  - .1 Release element of each head to be of 68°C 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 Deflector: not more than 75mm below suspended ceilings.
  - .4 Ceiling plates: not more than 25mm deep.
  - .5 Ceiling cups: not permitted.

## 2.5 PRESSURE GAUGES

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

## 2.6 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 2.5cm 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.
  - .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 0.61mm thick galvanized steel sheet.

2.7 ESCUTCHEON  
PLATES

- .1 Provide one piece type metal plates for piping passing through walls, floors, and 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 FIRE HOSE  
CABINETS

- .1 Fire hose and extinguisher cabinets shall be ULC listed, flush mounted type except where shown otherwise, constructed of 1.6 mm brushed stainless steel with full opening door, approved latching device, 5 mm thick full glass panel.
- .2 The building wall behind flush cabinets must maintain the fire resistance of the wall or partition in which they are installed.
- .3 Provide 1-1/2" chrome plated angle valve, chrome plated brass combination nozzle, 30 m ULC listed 1-1/2" hose, compact hose rack with water stop, chrome plated wrench, and chrome plated 2-1/2" angle valve for fire department use.
- .4 For each cabinet supply one 10 lb multipurpose dry chemical extinguisher, ULC listed rated 4A-60BC.
- .5 Where pressures at the hose valve exceed 90 psig install fixed orifice restrictors in the 1-1/2" hose valve to limit hose pressure when flowing to 100 psig maximum, and use ULC listed pressure restricting type 2-1/2" chrome plated hose valves with removable pin to enable fire department to obtain full flow if required.
- .6 Where pressures at the hose valve exceed 175 psig special pressure reducing valves which shall regulate pressure under flow and no flow conditions shall be used in place of the fire hose valves specified above

2.10 FIRE EXTINGUISHERS .1 Shall be 10 lb multipurpose dry chemical extinguisher rated 4A-60BC.

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 control and fire alarm wiring, including connections to fire alarm systems, in accordance with National Electrical Code.

.3 Provide wiring in rigid metal conduit or intermediate metal conduit.

.4 Flexible metal conduit: to CSA C22.2 No. 56 liquid-tight flexible metal at device connection point.

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.
- .4 Obtain at least two consecutive satisfactory bacteriological samples from piping, analyzed by certified laboratory, and submit results prior to piping being placed into service.

3.6 CONNECTIONS TO  
EXISTING WATER  
SUPPLY SYSTEMS

- .1 Notify Departmental Representative 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.
- .5 Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labour as required.

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 mil, and one coat of zinc chromate primer applied to minimum dry film thickness of 1.0 mil.

- .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 50mm wide red enamel bands self-adhering red plastic bands spaced at maximum of 6m 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, crawl spaces, 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 50mm wide red enamel bands self-adhering red plastic bands spaced at maximum of 6m 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.
    - .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.

END OF SECTION