

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 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 Province of Manitoba, Canada.
 - .2 Drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 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.
 - .4 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.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Building Energy and Water Consumption:
 - .1 Lighting systems and controls.
 - .2 Constant and variable motor loads.
 - .3 Variable frequency drive (VFD) operation.
 - .4 Cooling load.
 - .5 Air and water economizer and heat recovery cycle.
 - .6 Air distribution static pressures and ventilation air volumes.
 - .7 Indoor water risers and outdoor irrigation systems.

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, Consultant 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.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .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 1 set of reproducible mechanical drawings. Provide sets 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 weekly to reproducibles, revising reproducibles 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.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Furnish spare parts as follows:
 - .1 One set of packing for each pump.
 - .2 One casing joint gasket for each size pump.
 - .3 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .3 Provide one set of special tools required to service equipment as recommended by manufacturers.
- .4 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 HVAC R Equipment:
 - .1 Refrigerant: R-410A
 - .1 HCFC based refrigerant.
 - .2 HFC based refrigerant.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PAINTING REPAIRS AND RESTORATION

- .1 Do painting in accordance with Section 09 91 23 - Interior Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.4 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .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 - ACTION AND INFORMATIONAL 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.

3.5 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
- .3 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.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Departmental Representative will record these demonstrations on video tape for future reference.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 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 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 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
 - .2 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 Shop 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.
 - .4 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.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer post-industrial content, and total cost of materials for project.

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.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .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.
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- .7 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets 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 weekly to reproducibles, revising reproducibles 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.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Furnish spare parts as follows:
 - .1 Sprinkler Head: (Quantity = 2 of each)
 - .2 Fire Extinguisher: (Quantity = 2 of each)
 - .3 Sprinkler Head Wrench: (Quantity = 2 of each)
 - .4 Sprinkler Head Guard: (Quantity = 2 of each)
- .3 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 N/A

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PAINTING REPAIRS AND RESTORATION

- .1 Do painting in accordance with Section 09 91 23 - Interior Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.4 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .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 - ACTION AND INFORMATIONAL 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.

3.5 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

- .2 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.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.
- .5 Departmental Representative will record these demonstrations on video tape for future reference.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 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 REFERENCES

- .1 National Fire Prevention Association (NFPA)
 - .1 NFPA 13-latest edition .Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 25-latest edition, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN4 S543, Standard for Internal Lug Quick Connect Couplings for Fire Hose.

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 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Manitoba, 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.

- .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.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide operation, maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .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.
 - .5 Show sprinkler heads model, and indicate temperature, rating and k factor.

- .4 Design Data:
 - .1 Calculations of sprinkler system design.
 - .2 Indicate type and design of each system and certify each as operation upon completion of installation.
- .5 Field Test Reports:
 - .1 Preliminary and final pressure tests, and flow 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 including summary sheet, and Contractors Material and Test Certificate for aboveground piping and other documentation for incorporation into manual in accordance with NFPA Code Standards.

1.4 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.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance 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 in dry location.

- .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 in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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 ordinary hazard occupancy.
- .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 and light hazard occupancy.
 - .2 Warehouse and Storage Area- Ord-1; 6.1 L/min/sqm over 139 sqm,
 - .3 Exam Area- Ord-2; 8.1 L/min/sqm over 139sqm,
 - .4 Office Area and Public Space – light hazard; 4.1 L/min/sqm over 139 sqm,
 - .5 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 Outside Hose Allowances:
 - .1 Include allowance in hydraulic calculations for outside hose streams.

- .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 Base hydraulic calculations on static pressure and residual pressure at base of sprinkler riser. Contractor to obtain all pressures and perform flow tests as required for hydraulic calculations. Existing building conditions consists of a 500 gpm fire pump and private cistern.
- .13 Provide additional FDC as required for new system sprinkler system headers.

2.2 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

2.3 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.

2.4 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to NFPA 13. Pipe manufactured in North America only.
 - .2 Copper tube: Not allowed.
- .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 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 38 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 permitted.
- .8 Sprinkler pipe and fittings: metal.
- .3 Valves:
 - .1 ULC listed for fire protection service.
 - .2 Gate valves: open by counter clockwise rotation.
- .4 Pipe hangers:
 - .1 ULC listed for fire protection services in accordance with NFPA.

2.5 SPRINKLER HEADS

- .1 General: to NFPA 13 and ULC listed for fire services.
- .2 Sprinkler Head Type:
 - .1 Type A: upright bronze.
 - .2 Type B: pendant chrome link and lever type.
 - .3 Type C: pendant chrome glass bulb type.
 - .4 Type D: recessed glass bulb type with ring and cup.
 - .5 Type E: side wall polished 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 polished chromium-plated finish on copper alloy ceiling plates, sprinklers below suspended ceilings.
 - .3 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.
 - .4 Provide sprinkler heads as indicated as indicated on drawings..
 - .5 Deflector: not more than 75 mm below suspended ceilings.
 - .6 Ceiling plates: not more than 25 mm deep.
 - .7 Ceiling cups: not permitted.

2.6 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, appurtenances for proper operation of system.
- .3 Provide valve complete with internal components that are replaceable without removing the valve from the installed position.

2.7 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 Connect into building fire alarm system.
 - .4 Connection of switch: Section 28 31 00 - Fire Detection and Alarm.
- .4 Pressure alarm switch:
 - .1 With normally open and normally closed contacts and supervisory capability.

2.8 PRESSURE GAUGES

- .1 ULC listed and to Section 23 05 19.01 - Thermometers and Pressure Gauges - Piping Systems.
- .2 Maximum limit of not less than twice normal working pressure at point where installed.

2.9 PIPE SLEEVES

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

2.10 ESCUTCHEON PLATES

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

- .3 Provide paint finish on metal plates in unfinished spaces.

2.11 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.

2.12 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.
- .3 Change existing signs at FDC to show new additional systems.

2.13 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 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 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 50 mm wide red enamel bands spaced at maximum of 6 m intervals throughout piping systems.

3.5 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 2hour 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, personnel for tests.
 - .6 Authority of Jurisdiction, (Office of the Fire Commissioner) 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 - ACTION AND INFORMATIONAL 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 existing fire pump, driver and controllers in accordance with NFPA 20.
- .4 Cleaning
- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
 - .2 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 National Fire Protection Association (NFPA)
 - .1 NFPA13 Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN4 S543-M1984, Standard for Internal Lug Quick Connect Coupling for Fire Hose.

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 for equipment and systems, applicable series designation or style 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 Manitoba, Canada.
- .4 Samples:
 - .1 Submit samples of following:
 - .1 Each type of sprinkler head.
 - .2 Signs and valve tags.
- .5 Test reports:
 - .1 Submit certified test reports for packaged fire pumps from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .2 Test each pump/driver package at factory to provide detailed performance data and to demonstrate compliance with NFPA and specification. Submit certified test curves for approval of Departmental Representative.
 - .3 Test hydrostatically to meet requirements of fire protection system to which it will be connected.
- .6 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

- .7 Manufacturers' Instructions:
 - .1 Instructions: provide manufacturer's installation instructions.
- .8 Field Quality Control Submittals:
 - .1 Manufacturer's Field Reports: submit manufacturer's field reports specified.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Provide detailed hydraulic calculations including: summary sheet, Contractor's Material and Test Certificate for aboveground and piping, as well as other deliverables for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, in accordance with NFPA 13.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in dry 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.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and 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 Packaging Waste Management: remove in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 ENGINEERING DESIGN CRITERIA

- .1 Design system in accordance with NFPA 13, using following parameters:

- .1 Hazard:
- .2 Warehouse and Storage Area- Ord-1; 6.1 L/min/sqm over 139 sqm,
- .3 Exam Area- Ord-2; 8.1 L/min/sqm over 139sqm,
- .4 Pipe size and layout:
 - .1 Hydraulic design.
 - .2 Sprinkler head layout: to NFPA 13 and as directed by authority having jurisdiction.
- .5 Water supply:
 - .1 Conduct flow and pressure test of water supply in vicinity of project to obtain criteria for bases of design in accordance with NFPA 13.
 - .2 Base design on NFPA13 and existing building water flow.
- .6 Zoning:
 - .1 System zoning as indicated.

2.2 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .2 Grooved couplings and fittings made from minimum 90% recycled metal.

2.3 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Galvanized Ferrous: to NFPA 13.
- .2 Fittings and joints to NFPA 13:
 - .1 Ferrous: screwed, welded, roll grooved.
 - .1 Grooved joints designed with two ductile iron housing segments, flush seal gasket for dry service, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
- .3 Auxiliary valves:
 - .1 ULC listed for fire protection service.
 - .2 Up to NPS 2: bronze, screwed ends, grooved, OS
 - .3 Swing or spring-actuated check valves.
 - .4 Ball drip.
 - .5 Tamper devices wired back to fire alarm panel.
- .4 Pipe hangers:
 - .1 ULC listed for fire protection services.

2.4 SPRINKLER HEADS

- .1 General: to NFPA 13 and ULC listed for fire services.

2.5 SPRINKLER HEAD

- .1 Upright bronze.

2.6 SPRINKLER HEAD

- .1 Side wall link and lever type.

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

2.8 DRY PIPE VALVE

- .1 ULC listed.
- .2 Cast or ductile iron, flanged or grooved end type, sized to suit water main.
- .3 Components:
 - .1 Accelerator.
 - .2 Air maintenance device with low pressure alarm.
 - .3 Alarm pressure switch with supervisory capability.
 - .4 Pressure gauges.
 - .5 Drain valve.
 - .6 Test valve with associated piping.
 - .7 Shut off valve - OS
- .4 Provide valve complete with internal components that are replaceable without removing valve from installed position.

2.9 ALARM VALVE

- .1 COMPRESSED AIR SUPPLY
 - .1 Automatic Air Compressor.
 - .2 ULC listed.
 - .3 Capacity:
 - .1 To restore normal air pressure in system within 30 minutes.
 - .2 To provide air pressure of 140 kPa in excess of calculated trip pressure of dry pipe valve.
 - .4 Piping: ferrous, NPS 3/4 screwed joints and fittings, to NFPA 13.

- .2 PRESSURE GAUGES
 - .1 ULC listed and to Section 23 05 19.01 - Thermometers and Pressure Gauges - Piping Systems.
 - .2 Maximum limit of not less than twice normal working pressure at point where installed.
- .3 RELIEF VALVE
 - .1 ULC listed.
- .4 SPARE PARTS CABINET
 - .1 For storage of maintenance materials, spare sprinkler heads and special tools.
 - .2 Construct to sprinkler head manufacturers standard.

Part 3 Execution

- .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.
- .2 INSTALLATION
 - .1 Install, inspect and test to acceptance in accordance with NFPA 13 and NFPA 25.
 - .2 Testing to be witnessed.
 - .3 Install spare parts cabinet as indicated.
 - .4 Pressure gauges:
 - .1 Location:
 - .1 On water side and air side of dry pipe valve.
 - .2 At air receiver.
 - .3 In each independent pipe from air supply to dry pipe valve.
 - .4 At exhausters and accelerators.
 - .2 Install to permit removal.
 - .3 Locate so as not subjected to freezing.
 - .5 Valve identification:
 - .1 Identify drain valve, by-pass valves and main shut-off valve and all auxiliary valves.
- .3 FIELD QUALITY CONTROL
 - .1 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 - ACTION AND INFORMATIONAL 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.
 - .2 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, 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.
- .4 CLEANING
 - .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
 - .2 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION