
PART 1 - GENERAL1.1 SUBMITTALS

- .1 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .2 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.
- .3 Use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .4 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into closeout manual.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .3 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 Colour coding chart.
 - .4 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.
 - .5 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.

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- .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.
 - .6 Approvals:
 - .1 Submit two (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.
 - .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
 - .8 Site records:
 - .1 Departmental Representative will provide one (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.
 - .9 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.

- .10 Submit copies of as-built drawings for inclusion in final TAB report.

1.2 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

PART 2 - EXECUTION

2.1 PAINTING REPAIRS AND RESTORATION

- .1 Do painting in accordance with Section 09 91 99 - Painting for minor works.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

2.2 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 - 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.

2.3 DEMONSTRATION

- .1 The 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 The Departmental Representative will record these demonstrations on video tape for future reference.

2.4 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 REFERENCES

- .1 National Fire Protection Association (NFPA)
 - .1 NFPA 14-10, Standard for the Installation of Standpipe and Hose 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 Test reports:
 - .1 Submit certified test reports for standpipe and hose assembly from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .4 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.
- .5 Field Quality Control Submittals:
 - .1 Manufacturer's Field Reports: manufacturer's field reports specified.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for standpipe and hose system for incorporation into manual.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in standpipe and hose assembly.
- .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.

PART 2 - PRODUCTS

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| <u>2.1 DESCRIPTION</u> | <ul style="list-style-type: none">.1 Design system to NFPA 14 and following parameters:<ul style="list-style-type: none">.1 Stand alone: hydraulic. |
| <u>2.2 PIPE, FITTINGS AND VALVES</u> | <ul style="list-style-type: none">.1 Pipe:<ul style="list-style-type: none">.1 Ferrous: to NFPA 14..2 Fittings and joints to NFPA 14:<ul style="list-style-type: none">.1 Ferrous: screwed, welded, flanged or roll grooved.<ul style="list-style-type: none">.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..3 Valves:<ul style="list-style-type: none">.1 ULC listed for fire protection service..2 Up to NPS 2: bronze, screwed ends, grooved, OS&Y gate..3 NPS 2 1/2 and over: cast or ductile iron, roll grooved ends, indicating butterfly valve..4 Check valves: spring actuated swing type, composition disc or seal..4 Pipe hangers:<ul style="list-style-type: none">.1 ULC listed for fire protection services..5 Drain valve: NPS 1, complete with hose end, cap and chain..6 Inspector's test connections: NPS 1 gate valve. |
| <u>2.3 CABINETS</u> | <ul style="list-style-type: none">.1 To NFPA 14 and ULC listed: flush, type as indicated, constructed of 1.6 mm thick steel, 180 degrees opening door of 2.5 mm thick steel with hinge same side as water supply and latching device..2 Cabinets to maintain fire resistive rating of construction in which they occur..3 Cabinet door: with 5 mm full glass panel. |

- .4 Large enough to accommodate angle valve, hose rack, fire hose nozzle and spanner, fire extinguisher and NPS 2 1/2 fire department valve.

2.4 HOSE RACK

- .1 ULC listed, swivel type with pins to permit hose to be hung in folds. Locking device shall prevent flow of water into hose until last fold is removed from rack. Complete with hose, nozzle and angle valve.

2.5 FIRE HOSE AND NOZZLE

- .1 Hose: ULC listed, 38 mm nominal diameter, 30 m long, synthetic jacket, synthetic rubber lined.
- .2 Nozzle: ULC listed, 38 mm nominal diameter, plastic adjustable combination fog-straight stream with shut-off.

2.6 ANGLE VALVES

- .1 ULC listed for fire service. NPS 1 1/2 cast or forged brass complete with hand wheel, open or drip connections, or hydrolator valve. Where water pressure exceeds 690 kPa, provide ULC listed pressure reducing device.

2.7 FIRE DEPARTMENT VALVE

- .1 ULC listed, NPS 2 1/2 forged or cast brass angle valve: with thread compatible with local fire department, complete with handwheel, cap and chain. Cap to be part of ULC listing for valve.

2.8 FINISHES

- .1 In finished areas, chrome plate valves, nozzles, fittings and hose rack and spanner.
- .2 Cabinets.
 - .1 Tub: prime coated.
 - .2 Door and frame: No. 4 satin finish stainless steel.

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 and test to acceptance in accordance with NFPA 14.
- .2 Install pipework in accordance with good practice.
- .3 Run inspectors test connections to sight glass.
- .4 Install drain pipes and valves to drain parts of systems and so arranged that any one standpipe riser can be drained without shutting down any other parts of systems.
- .5 Install 90 mm diameter pressure gauge at top of risers and in accordance with NFPA 14.
- .6 The source of the water supply shall be reliable and capable of providing the required supply for not less than 30 minutes.

3.3 SITE TEST

- .1 General:
 - .1 In accordance with NFPA 14, supplemented as specified.
- .2 Testing witnessed by authority having jurisdiction.
- .3 Disposal of water used in flushing and testing:
 - .1 Discuss appropriate measures with Departmental Representative.
- .4 Timing:
 - .1 Connect fire hoses when flushing out and pressure tests have been completed.
 - .2 Charge system with water when there is no possibility of freeze-up.
- .5 Procedures:
 - .1 Verify that system is complete prior to start-up and testing procedures.
 - .2 Verify that ULC labels are visible.

- .3 Fill system with water for pressure. Record water supply pressure.
- .4 Pressure test piping system as required by authority having jurisdiction.
- .5 Verify flow switches are operational.
- .6 Verify valves in system are visible and monitored.
- .7 Flushing: fill with water, let stand at operating pressure for 1 week. Drain risers separately, then drain main.
- .8 Perform flow tests, including tests of pre-action systems, as required by:
 - .1 Authority having jurisdiction.
 - .2 Applicable NFPA standards such as 13, 14, 20, 1273.
 - .3 Local building codes.
- .6 Documentation:
 - .1 Provide written certification to Departmental Representative that system was installed, flushed and tested in accordance with appropriate codes.
 - .2 Certificate to include:
 - .1 Contractors name.
 - .2 Contractors address.
 - .3 Contractors license number.
 - .4 List of approved materials and devices installed.
 - .5 Description of system test conducted.
 - .6 Dates of flushing and testing.
 - .7 Certification that connections conform to acceptable standards.
 - .8 Certification that system is complete and in service.
 - .9 Approved signage has been provided and attached as appropriate.
 - .10 Hose threads of system and test connections match those of responding fire department.

END OF SECTION

PART 1 - GENERAL1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for wet pipe fire protection and sprinkler systems for heated areas.
 - .2 Sustainable requirements for construction and verification.
- .2 Related Sections:
 - .1 Section 21 05 01 Common Results for Mechanical

1.2 REFERENCES

- .1 American National Standards Institute/National Fire Prevention Association (ANSI/NFPA)
 - .1 ANSI/NFPA 13-2010, Installation of Sprinkler Systems.
 - .2 ANSI/NFPA 25-2010, 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-M984, Standard for Internal Lug Quick Connect Couplings for Fire Hose.

1.3 DESIGN
REQUIREMENTS

- .1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, for light hazard occupancy. For hydraulic calculations the sprinkler system shall be 500 US GPM at 100 PSIG available where the capped connection stubs out onto the floor within the ceiling space.
- .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 light hazard occupancy.
 - .2 Uniformly space sprinklers on branch.
- .7 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.

1.4 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).
 - .2 Submit hydraulic calculations and sprinkler piping/head layout drawing for review. Drawing and calculation shall be stamped and signed by a Professional Departmental representative licensed in the Province of Ontario. Co-ordinate installation for ceiling system removal with the General Contractor to accommodate the sprinkler system installation. Co-ordinate with all other trades to avoid interferences. Any deviation to the contract documents which results in additional cost shall be absorbed by this Contractor.
- .2 Shop Drawings:
 - .1 Submit 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.
- .3 Quality assurance submittals: submit following:
 - .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 in accordance with ANSI/NFPA 20.
 - .2 Manufacturer's Catalog Data, including specific model, type, and size for:
 - .1 Pipe and fittings.
 - .2 Sprinkler heads.
 - .3 Pipe hangers and supports.
 - .4 Mechanical couplings.
 - .3 Design Data:
 - .4 Field Test Reports:
 - .1 Preliminary tests on piping system.
 - .5 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.
 - .6 Operation and Maintenance Manuals:
 - .1 Provide maintenance data for incorporation into manual

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in wet sprinkler systems with documented experience approved by manufacturer.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

1.6 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials.
 - .2 Provide spare sprinklers and tools as required by ANSI/NFPA 13.

1.7 DELIVERY,
STORAGE, AND
HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Protection:
 - .1 Store materials indoors in dry location.
 - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
- .3 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS2.1 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; field welding will not be permitted.
- .3 Conceal piping in areas with suspended ceiling and.

2.2 PIPE, FITTINGS
AND VALVES

- .1 Pipe:
 - .1 Ferrous: to ANSI/NFPA 13.
- .2 Fittings and joints to ANSI/NFPA 13:
 - .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .2 Provide welded, threaded, grooved-end type fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
 - .3 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will not be permitted.
 - .4 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.

- .5 Fittings: ULC approved for use in wet pipe sprinkler systems.
- .6 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
- .7 Side outlet tees using rubber gasketed fittings are not permitted.
- .8 Sprinkler pipe and fittings: metal.

- .3 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. Temperature rating 74°C (165°F.)
 - .2 Type B: pendant chrome glass bulb type. Temperature rating 74°C (165°F.)
 - .3 Type C: recessed polished chrome glass bulb type with ring and cup. temperature rating 74°C (165°F.)
 - .4 Type F: side wall polished satin chrome link and lever type.
 - .5 Refer to the drawings and legend for types of heads. Quick response type heads are required in new construction for light hazard applications, all heads to be quick-response type in accordance with 3.6.2.9 of NFPA 13.
- .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, and chromium-plated pendent 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.
 - .5 Deflector: not more than 75 mm below suspended ceilings.
 - .6 Ceiling plates: not more than 25 mm deep.
 - .7 Ceiling cups: not permitted.

2.4 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.

2.5 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.

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.

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 CONNECTIONS TO
EXISTING WATER
SUPPLY SYSTEMS

- .1 Notify Departmental Representative in writing at least fifteen (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.

3.5 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 one (1) coat of pretreatment primer applied to minimum dry film thickness of 0.3 ml, and one (1) 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 two (2) coats of paint to match adjacent surfaces.
 - .2 Provide valves and operating accessories with one (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, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a pre-finished 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 the 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 two (2) hour period with no leakage or reduction in pressure.

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- .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 fifteen (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 Fire Commissioner of Canada Canadian Forces Fire Marshal authority having jurisdiction.

.3 Develop, with Departmental Representative assistance, detailed instructions for O & M of this installation.

- .4 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.

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