

COMMON WORK RESULTS FOR MECHANICAL

**Part 1 General**

**1.1 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Sprinkler Plan shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
- .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.
- .5 Closeout Submittals:
  - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .2 Operation and maintenance manual approved by, and final copies deposited with, Contract Administrator 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 Valves schedule and flow diagram.
    - .7 Colour coding chart.
  - .4 Maintenance data to include: Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .1 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.
    - .3 Special performance data as specified.

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- .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
  - .1 Submit draft Operation and Maintenance Manual to Contract Administrator for approval. Submission of individual data will not be accepted unless directed by Contract Administrator.
  - .2 Make changes as required and re-submit as directed by Contract Administrator.
- .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 Contract Administrator 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.
- .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 Contract Administrator 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.

**Part 2 Products**

**2.1 NOT APPLICABLE**

- .1 Not Applicable

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**Part 3 Execution**

**3.1 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 90 00- Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

**3.2 CLEANING**

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

**3.3 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 - 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.

**3.4 DEMONSTRATION**

- .1 Contract Administrator 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 Contractor will record these demonstrations on video tape for future reference.

**3.5 PROTECTION**

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

**END OF SECTION**

THERMAL INSULATION FOR PIPING

**Part 1 General**

**1.1 REFERENCES**

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  - .1 ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).
- .2 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
  - .2 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
  - .3 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
  - .4 ASTM C547, Mineral Fiber Pipe Insulation.
  - .5 STM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Manufacturer's Trade Associations
  - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).
- .4 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.
  - .2 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings
  - .3 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

**1.2 DEFINITIONS**

- .1 For purposes of this section:
  - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
  - .2 "EXPOSED" - will mean "not concealed" as specified.
- .2 TIAC ss:
  - .1 CRF: Code Rectangular Finish.
  - .2 CPF: Code Piping Finish.

**1.3 QUALITY ASSURANCE**

- .1 Qualifications:

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- .2 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
  - .3 Deliver materials to Site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
  - .1 Protect from weather, construction traffic.
  - .2 Protect against damage.
  - .3 Store at temperatures and conditions required by manufacturer.

**Part 2 Products**

**2.1 GENERAL**

- .1 Fire and smoke rating in accordance with CAN/ULC-S102.
  - .1 Maximum flame spread rating: 25.
  - .2 Maximum smoke developed rating: 50.
- .2 Insulate fittings and valve bodies with preformed removable insulated fittings.

**2.2 INSULATION**

- .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 75°F mean temperature when tested in accordance with ASTM C335.
- .3 Hot Piping: Formed fine fibrous glass or formed mineral fibre pipe insulation, with factory applied general purpose jacket, factory moulded to conform with piping, "K" value at 75°F maximum 0.25 Btu-in/(hr-ft<sup>2</sup>-°F). Service temperature to 300°F.
- .4 Refrigerant Piping: Formed plastic of closed cell structure or closed cell elastomer, "K" value maximum 0.28 Btu-in/(hr-ft<sup>2</sup>-°F) at 75°F. Maximum water vapour transmission rating of 0.1 perms.
- .5 Condensate Drain Piping: Formed plastic of closed cell structure or closed cell elastomer, "K" value maximum 0.28 Btu-in/(hr-ft<sup>2</sup>-°F) at 75°F. Maximum water vapour transmission rating of 0.1 perms.

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**2.3 JACKETS**

- .1 Canvas:
  - .1 0.72 oz/ft<sup>2</sup> cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
  - .2 Lagging adhesive: compatible with insulation.

**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 PRE-INSTALLATION REQUIREMENT**

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

**3.3 INSTALLATION**

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and this specification.
- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
  - .1 Install hangers, supports outside vapour retarder jacket.
- .5 Supports, Hangers:
  - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

**3.4 INSTALLATION OF ELASTOMERIC INSULATION**

- .1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

**3.5 PIPING INSULATION SCHEDULE**

- .1 Thickness of insulation as listed in following table.
  - .1 Run-outs to individual units and equipment not exceeding 4000 mm long.

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- .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

THERMAL INSULATION FOR PIPING

Application	Pipe Sizes (in)	Insulation Thickness (in)	Recovery Jacket
Hot Water Heating	All Sizes	1-1/2	Canvas
Glycol Heating	All Sizes	1-1/2	Canvas
Refrigerant	All Sizes	1/2	
Cooling Coil cond. drain	All Sizes	1/2	

**END OF SECTION**



DRY PIPE SPRINKLER SYSTEMS

**Part 1 General**

**1.1 REFERENCES**

- .1 American National Standards Institute/National Fire Protection Association (ANSI/NFPA)
  - .1 ANSI/NFPA13, Standard for the Installation of Sprinkler Systems.
  - .2 ANSI/NFPA 25, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

**1.2 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures and in accordance with ANSI/NFPA 13.
    - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in province of Manitoba, Canada.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Test reports:
    - .1 Test hydrostatically to meet requirements of fire protection system to which it will be connected.
  - .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.
  - .4 Manufacturer's Field Reports: manufacturer's field reports specified.
- .4 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 piping, as well as other deliverables for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, in accordance with ANSI/NFPA 13.

**1.3 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: company or person specializing in sprinkler system design and installation.

**DRY PIPE SPRINKLER SYSTEMS**

**1.4 ENGINEERING DESIGN CRITERIA**

- .1 Design system in accordance with ANSI/NFPA 13, using following parameters:
  - .1 Hazard:
    - .1 To suit occupancy as indicated.
  - .2 Pipe size and layout:
    - .1 Hydraulic design.
    - .2 Sprinkler head layout: to ANSI/NFPA 13.
  - .3 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 ANSI/NFPA 13.
  - .4 Zoning:
    - .1 System zoning as indicated.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

**1.6 MAINTENANCE**

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

**Part 2 Products**

**2.1 PIPE, FITTINGS AND VALVES**

- .1 Pipe:
  - .1 Ferrous: Hot-dipped galvanized steel, welded or seamless wall pipe, Schedule 40; ASTM A 53.
- .2 Fittings and joints to ANSI/NFPA 13:
  - .1 Ferrous:
    - .1 NPS 2 or Smaller: Galvanized, 150 lb, threaded malleable iron, banded fittings and galvanized steel couplings; ASME B16.3 dimensions, ASTM A 197 material, ASTM A 153 galvanizing, and ASME B1.20.1 threads.
    - .2 NPS 2-1/2 and Larger: Galvanized grooved joint.
- .3 Auxiliary valves:
  - .1 ULC listed for fire protection service.
  - .2 Up to NPS 2: bronze, screwed ends, OS & Y gate.

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- .3 NPS 2 1/2 and over: cast iron, flanged or roll grooved ends, indicating butterfly valve.
- .4 Swing check valves.
- .5 Ball drip.
- .6 Tamper devices wired back to fire alarm panel.
- .4 Pipe hangers:
  - .1 ULC listed for fire protection services.
- 2.2 SPRINKLER HEADS**
  - .1 General: to ANSI/NFPA 13 and ULC listed for fire services.
- 2.3 SPRINKLER HEAD TYPE A**
  - .1 Upright bronze.
- 2.4 SPRINKLER HEAD TYPE B**
  - .1 Pendant chrome link and lever type.
- 2.5 SPRINKLER HEAD TYPE C**
  - .1 Pendant chrome glass bulb type.
- 2.6 SPRINKLER HEAD TYPE D**
  - .1 Recessed chrome type with ring and cup.
- 2.7 SPRINKLER HEAD TYPE E**
  - .1 Flush chrome link and lever type.
- 2.8 SPRINKLER HEAD TYPE F**
  - .1 Side wall chrome link and lever type.
- 2.9 AUXILIARY SUPERVISORY SWITCHES**
  - .1 General: to ANSI/NFPA 13 and ULC listed for fire service.
  - .2 Valves:
    - .1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.
  - .3 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.

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**2.10 PRE-ACTION /DELUGE ALARM VALVE**

- .1 ULC listed.
- .2 Cast iron, flanged 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 Test valve and associated piping.
  - .5 Drain valve.
  - .6 Electrical tripping device.
  - .7 Shut off valve - OS & Y with tamper-proof device wired back to fire alarm panel.

**2.11 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 in accordance with instruction sheet furnished with dry pipe valve.
- .4 Piping: ferrous, NPS 3/4 screwed joints and fittings, to ANSI/NFPA 13.

**2.12 PRESSURE GAUGES**

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

**2.13 RELIEF VALVE**

- .1 ULC listed.

**2.14 SPARE PARTS CABINET**

- .1 For storage of maintenance materials, spare sprinkler heads and special tools.
- .2 Construct to sprinkler head manufacturers standard.

DRY PIPE SPRINKLER SYSTEMS

**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 NFPA 25.
- .2 Testing to be witnessed by authority having jurisdiction.
- .3 Install water gong as indicated.
- .4 Install fire department connection[s] as indicated.
- .5 Install spare parts cabinet as indicated.
- .6 Pressure gauges:
  - .1 Location:
    - .1 On water side and [air] [nitrogen] 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.
- .7 Valve identification:
  - .1 Identify drain valve, by-pass valves and main shut-off valve and all auxiliary valves.

**3.3 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 - 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.

**3.4 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.

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- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**