

1 General

1.1 GENERAL

- .1 Provide new materials and equipment of proven design and quality and of current models with published ratings for which replacement parts are readily available.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 30 - Health and Safety Requirements.
- .3 Section 01 45 00 - Quality Control.
- .4 Section 01 74 11 - Cleaning
- .5 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .6 Section 01 78 00 - Closeout Submittals.
- .7 Section 01 91 13 - General Commissioning (Cx) Requirements.

1.3 REFERENCED CODES and STANDARDS

- .1 Use following latest editions and amendments in effect at time of Tender Call:

AABC	Associated Air Balance Council
API	American Petroleum Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CEMA	Canadian Electrical Manufacturers Association
CFUA	Canadian Fire Underwriters' Association
CGSB	Canadian General Standards Board
CHVAC	Canadian Heating, Ventilation and Air Conditioning Code (NRC)
CSA	Canadian Standards Association
CUA	Canadian Underwriters' Association
HRA	Heating, Refrigeration and Air Conditioning Institute of Canada
NACE	National Association of Corrosion Engineers
NBC	National Building Code of Canada
NBFU	National Board of Fire Underwriters'
NBS	National Bureau of Standards
NECC	National Energy Code of Canada for Buildings
NFC	National Fire Code of Canada
NS DOL	Nova Scotia Department of Labour
NSC	National Standards of Canada
SAE	Society of Automotive Engineers
TIAC	Thermal Insulation Association of Canada
TIMA	Thermal Insulation Manufacturers Association
UL	Underwriters' Laboratories
ULC	Underwriters' Laboratories of Canada

1.4 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submittals shall be in the metric system and use the same unit as shown in the contract documents.
- .3 Shop Drawings
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia where noted.
 - .2 Submit shop drawings for all equipment listed and for all equipment the contractor wishes to substitute for provided such alternative equipment has prior approval.
 - .3 Work is not to commence until shop drawings have been reviewed by the Departmental Representative.
 - .4 The Departmental Representative's review of these drawings is general. It is not intended to release the Contractor from necessity of furnishing materials and performing the work as required by the plans and specifications.
 - .5 All shop drawings must be checked against the requirements of the plans and specifications by this Contractor prior to submitting them. Drawings not checked will be returned without approval.
 - .6 All shop drawings must be first quality reproductions with all details, lettering, etc. distinct and legible.
 - .7 Shop drawings to show:
 - a) Mounting arrangements.
 - b) Operating and maintenance clearances.
 - .8 Shop drawings and product data accompanied by:
 - a) Detailed drawings of bases, supports, and anchor bolts.
 - b) Acoustical sound power data, where applicable.
 - c) Points of operation on performance curves. (provide complete family of curves)
 - d) Manufacturer to certify current model production.
 - e) Certification of compliance to applicable codes.
 - .9 Upon receipt of product shop drawings by the mechanical contractor he shall review them to ensure that they meet the requirements of the specification in all respects, that they are clear and legible, all options are being provide are clearly indicated and that dimensions, weights, power requirements, quantities and capacities are consistent with the requirements of the plans and specifications. The contractor shall complete Appendix A at the end of this section verifying that he as completed these tasks. The contractor shall then forward the shop drawings through the appropriate channels for final review by the Departmental Representative. Shop drawings that are not accompanied by Appendix A clearly indicating that the contractor has completed this review will not be reviewed by the Departmental Representative and will be returned to the contractor.
 - .10 Equipment of each specification section to be submitted separately
 - .11 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

- .4 Operation and Maintenance Manuals:
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .2 Provide three (3) copies to the Owner of the Maintenance manual. Each copy to be suitable bound, three ring binders containing letter sized pages. Larger pages, suitably folded, or folded in pockets may be used where necessary.
 - .3 Binders shall be no more than 2/3 full leaving room to add material in the future. Where necessary additional binders shall be provided.
 - .4 The Maintenance Manuals shall include the following:
 - .1 Have a title sheet, or sheets, preceding data on which shall be recorded Project name, date, list of contents, and Trade Contractor's name.
 - .2 Be organized into applicable Sections of work with each Section separated by hard paper dividers with plastic covered tabs marked by Section.
 - .3 Contain a list of local (or nearest) representative of each piece of equipment including mail address, e-mail address, web site, and phone number.
 - .4 One (1) copy of each final approved shop drawing on which have been recorded changes made during fabrication and installation.
 - .5 Typed or printed information and notes, and neatly drafted drawings.
 - .6 Maintenance and operating instructions on all building equipment supplied by the Trade Contract.
 - .7 General and specific instructions for the maintenance and operation of automatic and adjustable controls. (see section 25 05 03)
 - .8 Brochures and parts list for all equipment.
 - .9 Sources of supply for all proprietary products used in the work.
 - .10 Lists of supply sources for maintenance of all equipment in the project of which more detailed information is not included above.
 - .11 Lists of recommended spare parts.
 - .12 A Preventive Maintenance schedule.
- .5 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
 - .2 Provide separate tab for MSDS for all hazardous material installed and left stored on site or with the Owner. First page of tab to be an index of MSDS included.
 - .3 Provide separate tab for all equipment startup reports. First page of tab to be an index of reports included.
 - .4 Provide separate tab for copies of all equipment manufacturers warranties. A copy of the warrantee to also be included with the equipment O & M data. First page of tab to be an index of warrantees included.
 - .5 Provide separate tab for copies of all reports used to obtain variances from codes. First page of tab to be an index of variances.
 - .6 Provide an analysis of hydronic systems water after cleaning and treatment of piping.

.7 Include serial number of equipment furnished with serial numbers.

.5 Shop Drawing and Maintenance Manual Submittal Summary

	Shop Drawings						Maintenance Manuals						
	Model No.	Dimension	Service Requirements	Weight	Electrical	Performance Data	Shop Drawing	O & M Data	Start Up Report	As-Built Drawing	Spare Parts List	MSDS	Serial No.
Common Items													
Drain Valves	•	•					•						
Fire Stopping	•					•	•					•	
Flexible Pipe Connection	•	•					•						
Fittings and Valves	•	•		•			•	•					
Pipe Guides and Anchors	•	•					•						
Pipe Hangers and Supports	•	•		•			•						
Pipe Identification	•	•											
Pipe Unions	•						•						
Pipe Insulation		•				•	•						
Plumbing													
Fixtures and Trim	•	•	•	•	•	•	•	•			•	•	
Ventilation													
Dampers – Balancing	•	•					•						
Duct Construction and Proprietary Joints	•	•											
Duct Sealant	•											•	
Flexible Ductwork	•					•	•						
Grilles, Registers, and Diffusers	•	•				•	•	•					
VAV Box	•	•	•	•	•	•	•	•	•		•		•
Heating													
Heating Specialties AAV, Flexible Pipe Connections, Manual Air Vent, Strainer	•	•		•		•	•						
Valves (all Services) – Balancing, Check, Mixing, Shut-off	•	•		•			•	•		1			
Fire Protection													
Sprinklers and Guards	•	•				•	•						
Control													
See Section 25 05 02													

.6 As-Built Drawings:

.1 The Departmental Representative will provide one set of reproducible mechanical drawings for As-Built Drawing purposes. The Contractor shall

- mark thereon all significant changes and deviations from contract documents as work progresses and as changes occur.
- .2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.
- .3 Mark changes on white prints in 'Red'.
- .4 Make available for reference purposes and inspection at all times.
- .5 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of as-built/record drawings.
- .6 Identify each drawing in lower right hand corner in letters at least ½" high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
- .7 Submit to Departmental Representative for approval and make corrections as directed.
- .8 TAB to be performed using as-built drawings.
- .9 Submit completed reproducible as-built/record drawings to Departmental Representative for review.

1.5 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction and occupational health and safety in accordance with Section 01 35 30 – Health and Safety Requirements.

1.6 MAINTENANCE MATERIAL

- .1 Furnish one (1) set of special or proprietary tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Store materials in a clean, dry location protected from damage. Protect equipment from dirt and dust.
- .4 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.

1.8 TEMPORARY HEAT

- .1 Temporary heat for new Construction shall be the responsibility of the General Contractor.

- .2 All costs for temporary heat shall be the responsibility of the General Contractor.

1.9 PROTECTION OF OPENINGS

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

1.10 PAINTING

- .1 Finish painting by others unless specifically noted. Where finish painting is required, prime painting by the appropriate trade contractor.
- .2 Piping is the responsibility of the appropriate trade contractor.
- .3 Apply to hangers, supports and equipment fabricated from ferrous metals at least one (1) coat of corrosion resistant paint before shipment to job site.
- .4 Prime and touch up marred finished paintwork to match original.
- .5 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up. Do not paint over nameplates.
- .6 Patch cuts and paint to match existing conditions.

1.11 DEMONSTRATION OF COMPLETE SYSTEM

- .1 At the conclusion of the job, the Contractor shall review and demonstrate to the Departmental Representative all equipment and their respective functions, operation, and maintenance. Such demonstration shall be provided for such reasonable periods of time as the complexity of the job warrants, and as approved by the Departmental Representative. Such review and demonstration shall be made by an authorized representative of the Contractor, fully knowledgeable of the project, its installation, and operation.
- .2 Provide the Departmental Representative with a schedule of system demonstration at least two (2) weeks prior demonstration
- .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/record drawings, audio visual aids, etc. as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Where deemed necessary, the Departmental Representative may record these demonstrations for future reference.

1.12 CLEANING

- .1 Clean the job site daily. If the site is not cleaned to the Departmental Representative's satisfaction, then the Departmental Representative shall make arrangements for cleaning and charge the cost against the Contract.
- .2 At conclusion of project remove surplus material, rubbish, tools, and equipment.

1.13 DEFINITIONS

- .1 Acceptable Materials - Any product mentioned may be used provided it meets or exceeds the quality, performance capability, and space requirements of the equipment shown and called for on the plans and in the specifications.
- .2 Provide - "supply and install" unless otherwise indicated.
- .3 Standard of Acceptance – Only the product listed may be used unless alternate products are included in an addendum.

1.14 DRAWINGS AND SPECIFICATIONS

- .1 Not intended to show structural details or architectural features.
- .2 Except where dimensioned, indicates general mechanical layouts only. Do not scale.
- .3 If required by the Departmental Representative, provide field drawings to show the relative position of various services. Obtain Departmental Representative review before beginning work.
- .4 The Mechanical Trade Contractor shall check the content of the drawings, specifications and dimensions, and before proceeding, report to the Departmental Representative any error or omission between Mechanical or Electrical and Architectural plans.
- .5 These specifications are to be considered as an integral part of the drawings which accompany them, neither the drawings nor the specifications shall be used alone. Any item which is omitted in one but which is reasonably implied in the other, shall be considered properly and sufficiently specified and must, therefore, be provided under the Contract. The decision of the Departmental Representative shall be final, if interpretation is required.
- .6 Misinterpretation of drawings and specifications shall not relieve the Mechanical Trade Contractor of responsibility.
- .7 All Mechanical Trade Contractors shall make themselves familiar with the overall intended operation of the mechanical systems prior to installation so that all necessary accessories such as dampers, vents, valves, controls, etc., can be installed during the normal progress of the work. Failure to do so will result in the Mechanical Trade Contractor's responsibility in providing such devices, at his expense when the need of such devices becomes apparent during start-up.

1.15 SITE VISITS

- .1 Before commencing work, visit site and verify that requirements of Plans and Specifications are consistent with site conditions.
- .2 Advise Departmental Representative, in writing, of any discrepancies or conflicts.
- .3 No allowance shall be made for failure to include items which a thorough investigation would have shown to be required.

1.16 GUARANTEES

- .1 This Mechanical Trade Contractor shall guarantee all his work free from defects for a period of one (1) year, unless specifically noted otherwise, after final acceptance of such work by the Departmental Representative and shall make good all defects other than normal wear and tear during the life of the guarantee. This Mechanical Trade Contractor shall guarantee all work and equipment supplied by him to work quietly and satisfactorily and to accomplish the work for which it was installed during the life of the above guarantee. At any time during this period, he shall make any necessary changes and adjustments or replacements, to accomplish this at his own expense.
- .2 Submit manufacturers' written guarantees to the Departmental Representative for review.
- .3 Provide copies of all guarantees in a separate tab of the O & M manual.
- .4 Each guarantee shall include:
 - .1 Project name and address.
 - .2 Guarantee time period (commencement date shall be as date shown on Project Final Certificate of Completion unless otherwise indicated).
 - .3 Clear and concise definition of what is guaranteed and remedial action provided.
 - .4 Signatures of Mechanical Trade Contractor and a company officer of the manufacturing firm.
 - .5 Include all extended guarantees (and service contracts) as specified in individual sections.

1.17 PERMITS AND REGULATIONS

- .1 All Mechanical Trade Contractors shall comply with all regulations of authorities having jurisdiction, where applicable, including but not limited to the following:
 - Provincial Department of Labour
 - Provincial Fire Marshal
 - Municipal Plumbing Inspector
 - Provincial Board of Insurance Underwriters
- .2 The Mechanical Trade Contractor shall obtain and pay for any permits required by Local Codes and Regulations and arrange for inspections.

- .3 Any additional materials or labour required to conform to any of these rules and regulations will be furnished under the Contract with no additional cost to the Owner.

1.18 CO-ORDINATION

- .1 Co-ordinate work with other trades to avoid conflict.
- .2 Locate distribution systems, equipment and materials to provide minimum interference and maximum useable space.
- .3 Co-ordinate location of pipe drops / risers with trades erecting walls and ceilings to ensure that all pipes are concealed in walls or ceilings spaces. If space is not available in walls or ceilings, locate pipes so that they can be easily boxed in by the relevant trades. Where pipes are shown rising in concrete block walls, placement of the pipe shall be done in conjunction with the erection of the wall.
- .4 The Mechanical Contractor shall meet regularly with the structural and other relevant trades during the production of coordination drawings to obtain physical dimension, access requirements and preferred location for the services.
- .5 In the event that conflicts arise, the Mechanical Contractor shall work with all other relevant Contractor(s) to ensure that the necessary adjustments are made so that all components fit in the space available with adequate clearance for servicing and removal. If after a thorough effort to fit equipment in a space and provide adequate space for servicing and removal, the Departmental Representative determines that additional space is required, he may request assistance to resolve the issue through the Construction Manager.
- .6 All adjustments or re-routing of the mechanical, electrical and sprinkler systems required to avoid conflict and provide adequate space for servicing and removal of equipment shall be made at the expense of the relevant trade contractor.
- .7 Prepare coordination drawings showing the routing of main ducts, piping mains. Main sprinkler pipe, electrical conduit runs, and sprinkler piping in critical areas shall be shown.
- .8 Rerouting of pipes and ducts to be reviewed by the Departmental Representative.

1.19 ALTERNATES

- .1 Wherever an item or class of material is specified exclusively by trade name of maker or by catalogue reference or under "Acceptable Materials", only such item shall be used.
- .2 The Mechanical Trade Contractor shall note that all layouts on the mechanical drawings are based on the specified equipment and any changes necessitated in service connections, etc., will be done at the Mechanical Trade Contractor's expense. Furthermore, if it is found that the provisions made regarding space conditions are not met, the right is reserved by the Departmental Representative to require installation of the equipment used preparing the layout.

1.20 CUTTING AND PATCHING

- .1 Make every effort to minimize cutting and patching and provide dimensions, locations and other data for bases, sleeves, boxes, etc., to be built in as construction proceeds. Set sleeves and make openings in concrete forms and masonry before placing concrete and masonry.

1.21 PIPE TESTS

- .1 Notice of Tests: Give written notice for a minimum of four (4) working days prior to date when tests will be made.
- .2 Prior Tests: Concealed or insulated work shall remain uncovered until completely tested and approved, but if construction schedule requires, arrange for prior tests on parts of system as approved.
- .3 Acceptance Tests: Conduct in presence of the Departmental representative or representative of the Authorities Having Jurisdiction.
- .4 Costs: Bear all costs in connection with tests conducted.
- .5 Certificates: Obtain acceptance certificates from the authorities having jurisdiction. Work is not considered complete until certificates have been delivered to the Departmental Representative.
- .6 Water Systems: Fill with water and hydraulically test at 1½ times system operating pressure or at 689 kPa, whichever is greatest. Unless otherwise noted maintain test pressures without loss for a four (4) hour period. Use valves to isolate equipment not rated for this pressure. An air test is acceptable for metal piping systems.

1.22 SLEEVES AND ESCUTCHEONS

- .1 Sleeves:
 - .1 Unless otherwise specified, supply pipe sleeves for all points where pipe passes through masonry or concrete walls or floors, fire rated assemblies, and elsewhere as indicated. Sleeve shall be supplied by the Mechanical Sub-Contractor and built-in by the appropriate trade.
 - .2 Where concrete walls or floors are core drilled to accommodate pipe, sleeves are not required except where indicated in sub-paragraph 5 below.
 - .3 Unless otherwise specified, construct sleeve of galvanized sheet steel with lock seam joints of minimum 22 gauge.
 - .4 Use galvanized sch 10 steel pipe sleeves with perimeter fin continuously welded at mid point.
 - .1 Where sleeve extends above finished floor.
 - .2 Pipe penetrations through concrete foundation walls shall be sealed using proprietary pre-manufactured, water-tight seals.
 - .1 Acceptable Products: Link-Seal, Metraflex.
 - .5 In kitchens, washrooms, laboratories, and other wet areas where water from spills or leaks may penetrate the floor slab, extend sleeves 25 mm above the finished floor. This does not apply to concrete slabs on grade. In all other areas, sleeves shall be flush with the finished floor.

- .2 Sizes:
 - .1 Provide approximately 12 mm clearance, all around, between sleeve and pipes or between sleeve and insulation.
 - .2 Through footings, use sleeves large enough to accommodate hub of cast iron soil pipe (where applicable).
 - .3 Where piping passes below footings, provide minimum all round clearance of 50 mm between piping and sleeves. Backfill up to underside of footing with concrete of same strength as footing.
 - .4 Unless otherwise specified, terminate sleeves flush with walls and ceilings.
 - .5 Sleeves shall be sized to accommodate the insulated pipe diameter.
- .3 Unless otherwise indicated for pipes passing through roofs, use galvanized or cast iron sleeves with caulking recess and flashing clamp device. Anchor sleeves in roof construction; caulk between sleeve recess and pipe; fasten roof flashing to clamp device; make watertight durable joint.
- .4 Caulking:
 - .1 Where pipes pass through on grade concrete slab floors, caulk open spaces with non-hardening mastic.
 - .2 Ensure no contact between copper tube or pipe and ferrous sleeve.
- .5 Escutcheons and Plates:
 - .1 Provide on pipes passing through finished walls, partition floors and ceilings.
 - .2 Use chrome or nickel plated brass, either split or solid type, with set screws for ceiling or wall-mounted. For equipment room, use cast iron type.
 - .3 Inside diameter shall fit around finished pipe insulation or uninsulated pipe. Outside diameter shall cover sleeve.
 - .4 Where sleeve extends above finished floor, escutcheons or plates shall be bell shaped to cover the sleeve extension.
 - .5 Secure to pipe or sleeve but not to insulation.
- .6 Penetrations of Fire Separations:
 - .1 Where pipes pass through walls or floors which provide fire separations, seal around openings with ULC or cUL classified fire stop system. Material shall be installed to manufacturers' recommendations by factory trained installers and shall provide a fire rating equal to that of the separation which has been penetrated.
 - .2 Departmental Representative reserves the opportunity for destructive testing of a sample of the installation in order to examine the thickness of sealant and installation of the backing material.
 - .3 Refer to Section 07 84 00 - Fire Stopping.

1.23 DI-ELECTRIC UNIONS

- .1 All connections between steel and copper or brass for pipe 2" and smaller shall be made of di-electric unions, except on all closed systems.

1.24 COMPLETION

- .1 Nothing herein contained can be constructed to relieve the Trade from making good and perfect work in all usual details of construction and in accordance with best standard practice and in strict compliance with provisions of any and all laws and ordinances, and the rules and regulations of any duly constituted public body having jurisdiction over this work.
- .2 This Trade shall be held responsible to provide and furnish all necessary labour and to bear all expenses incidental to the satisfactory completion of the work.

1.25 RELATED WORK PERFORMED BY OTHERS

- .1 Work of other trades not to be supported from mechanical equipment, pipes, ducts, conduits or their supports.

1.26 RELATED WORK PERFORMED BY THIS SECTION

- .1 Work of each sub trade to be supported directly from structure independent of other sub trades unless prior approval obtained from Departmental Representative.

1.27 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in Submittal section above.
- .2 All work to be performed by qualified personal or with appropriate training and qualifications in the field in which they are engaged. Apprentices and labourers shall be under the continuous supervision of a qualified tradesperson.
- .3 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 Submittal section above.
 - .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.

2 EXECUTION

2.1 EXAMINATION

- .1 Do not begin installation until substrates have been properly prepared.
- .2 Conduct tests according to manufacturer's written recommendations to verify that substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt and other foreign substances capable of impairing bond of fire-stopping.
- .3 Verify that items penetrating fire rated assemblies are securely attached, including

sleeves, supports, hangers, and clips.

- .4 Verify that openings and adjacent areas are not obstructed by construction that would interfere with installation of fire-stopping, including ducts, piping, equipment, and other suspended construction.
- .5 Verify that environmental conditions are safe and suitable for installation of fire-stopping.
- .6 If substrate preparation is the responsibility of another installer, notify Departmental Representative of unsatisfactory preparation before proceeding.

2.2 PREPARATION

- .1 Prepare substrates in accordance with manufacturer's instructions and recommendations.
- .2 Install masking and temporary coverings as required to prevent contamination or defacement of adjacent surfaces due to fire-stopping installation.

2.3 INSTALLATION

- .1 Install in strict accordance with manufacturer's detailed installation instructions and procedures.
- .2 Install so that openings are completely filled and material is securely adhered.
- .3 Where fire-stopping surface will be exposed to view, finish to a smooth, uniform surface flush with adjacent surfaces.
- .4 After installation is complete, remove combustible forming materials and accessories that are not part of the listed system.
- .5 Repair or replace defective installations in accordance with manufacturer's recommendations, listed systems details and applicable code requirements.
- .6 At each through penetration, attach identification labels on both sides in location where label will be visible to anyone seeking to remove penetrating items or fire-stopping.
- .7 Clean fire-stop materials off surfaces adjacent to openings as work progresses, using methods and cleaning materials approved in writing by fire-stop system manufacturer and which will not damage the surfaces being cleaned.
- .8 Notify Authority Having Jurisdiction (AHJ) when fire-stopping installation is ready for inspection; obtain advance approval of anticipated inspection dates and phasing, if any, required to allow subsequent construction to proceed.
- .9 Do not cover fire-stopping with other construction until approval of authority having jurisdiction has been received.

2.4 FIELD QUALITY CONTROL

- .1 Departmental Representative will engage an independent testing agency to inspect installed fire-stopping and to prepare reports indicating whether the

installed work complies with the contract documents.

- .2 Notify testing agency at least 7 days prior to date when fire-stopping installation will be ready for inspection; obtain advance approval of general schedule and phasing, if any, required to allow subsequent construction to proceed.

2.5 CLEANING AND PROTECTION

- .1 Remove left over material and debris from Work area. Use necessary means to protect fire protection product(s) before, during, and after installation.
- .2 Touch-up, repair or replace damaged products before Substantial Completion.
- .3 Install identification Labels for Through Penetration: Pressure sensitive self-adhesive vinyl labels, preprinted with the following information:
 - .1 The words "Warning - Through Penetration Fire-stop System - Do not Disturb. Notify Building Management of Any Damage."
 - .2 Listing agency's system number or designation.
 - .3 System manufacturer's name, address, and phone number.
 - .4 Installer's name, address, and phone number.
 - .5 General contractor's name, address, and phone number (if applicable).
 - .6 Date of installation.

2.6 FIRE-STOPPING

- .1 The Contractor shall provide labeling for each through-the-wall or thru the floor penetration.
- .2 Installation shall be completed by qualified Tradesmen, properly trained by the manufacturer and in accordance with the product listing. In lieu of this, the Contractor shall engage the services of a qualified firm/company to complete the fire-stopping.

3 PRODUCTS

3.1 NOT USED

APPENDIX A

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SHOP DRAWINGS

MECHANICAL CONTRACTOR'S REVIEW CONFIRMATION

The Shop Drawings Have Been Reviewed by the Mechanical Contractor and All
Items Are In Conformance with the Plans and Specifications? ☐ Yes ☐ No

Are Specified Model Numbers and/or Options Indicated? ☐ Yes ☐ No

If No, Explain: _____

Confirmed by Contractor: _____

Print Name

Contractor's Signature: _____

Date: _____

Item: _____

Specification Section and Item Number: _____

Drawing Reference: _____

General Contractor: _____

Mechanical Contractor: _____

Mechanical Contractor's Project Representative: _____

Phone Number: _____ Fax Number: _____ E-mail: _____

END OF SECTION

1 General

1.1 RELATED SECTIONS

- .1 Section 21 05 01 – Common Work Results – Mechanical
- .2 Section 23 05 05 – Installation of Pipework
- .3 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment
- .4 Section 23 05 53 – Mechanical Identification
- .5 Section 23 07 16 – Thermal Insulation for Piping
- .6 Section 23 08 02 – Cleaning and Startup of Mechanical Systems

1.2 REFERENCES

- .1 Canadian Federal Legislation.
- .2 Canadian Environmental Protection Act (CEPA), 1988.
- .3 Canadian Environmental Assessment Act (CEAA), 1995.

1.3 EXISTING CONDITIONS AND DOCUMENTATION

- .1 Demolition of spray or trowel-applied asbestos can be hazardous to health. Should material resembling spray or trowel-applied ASBESTOS be encountered in the course of demolition work, stop work and notify the Departmental Representative immediately. Do not proceed until written instructions have been received from the Departmental Representative.
- .2 Hazardous materials (if discovered) removal shall be treated as an additional expense; to be negotiated with the successful Contractor during the demolition phase of this project.
- .3 Drawings indicating the existing conditions are incomplete and have been provided for information and guidance purposes only. The actual extent and condition of components and systems shall be determined by the Contractor during the Tender period.

1.4 PROTECTION

- .1 Protect all existing systems. Be responsible for any damage and make good.

1.5 SUMMARY OF WORK

- .1 Remove, re-locate and/or reinstate existing Mechanical systems to facilitate the Mechanical scope of work described below.
- .2 Comply with the DFO's Waste Reduction Procedure.
- .3 Hazardous Materials shall be removed in accordance with Provincial and/or Federal regulations, standards and guidelines.

- .4 The Contractor is responsible to obtain and pay for all necessary permits and inspections as required by the specifications or local authorities to perform the Work.
- .5 The Contractor shall protect adjacent properties, vehicles and pedestrians. Provide all temporary works and protection for the complete scope including any associated fees.
- .6 The Contractor shall coordinate all work with the work of other trades on site.
- .7 The Contractor shall assume full responsibility for the protection and safe-keeping of all products that are stored on site.
- .8 Do all work in accordance with the requirements of the Halifax Regional Municipality (HRM) and the Province of Nova Scotia.
- .9 Do all work in accordance with the Fire Marshal's office.
- .10 Do all work in accordance with the Nova Scotia Department of Labour.
- .11 Do all work in accordance with the requirements set-forth by the local Nova Scotia Occupational Health & Safety.
- .12 All work must be coordinated with the requirements of the new construction which shall follow the completion of the demolition and disposal of redundant items. Work shall be completed as per Section 01 14 00 – Work Restrictions or as otherwise directed by the Departmental Representative.
- .13 Demolition and disposal shall consist of, but is not necessarily limited to, the items and systems identified in the Project scope of work.

2 PRODUCTS

2.1 EQUIPMENT

- .1 Equipment and heavy machinery used to meet or exceed all applicable emission requirements.
- .2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

3 EXECUTION

3.1 PREPARATION

- .1 Review and thoroughly inspect site with Departmental Representative to verify extent and location of items designated for removal and disposal, recycling and salvage.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.

3.2 DEMOLITION – GENERAL

- .1 Take care not to damage or alter existing services that are to remain.
- .2 At end of each day's work, leave work in safe and stable condition. Protect parts not to be demolished at all times.
- .3 Demolish to minimize dusting.
- .4 Remove and dispose of demolished materials except where noted otherwise and in accordance with the Authorities Having Jurisdiction (AHJ).
- .5 Workers shall have clean hands while working around existing finishes and where clean white cotton gloves when handling existing finishes and building components to prevent soiling or staining of existing finishes.
- .6 Protect flooring under the work with plastic sheeting. Damaged flooring to be patched and repaired to match existing conditions.
- .7 Materials cannot be left on the grounds or within the Buildings. All Contractors and their materials must be accounted for daily. Co-ordinate materials storage on-site. All materials shall be secured.
- .8 See also Section 21 05 01.

3.3 SEQUENCES OF OPERATION

- .1 Schedule demolition to create the least amount of disturbance. Co-ordinate timing of work with the Departmental representative.
- .2 Any equipment, components, etc. deemed salvageable will be removed prior to the demolition.
- .3 Ensure that all debris is immediately taken away and all access and firefighting lanes and parking areas must be kept clear at all times.

- .4 Contractor to ensure all Mechanical systems, (i.e. ductwork, piping, etc.) are all disconnected, and that systems disconnected are not associated with the operational portion of the facility.
- .5 Contractor to ensure ventilation system is operational during occupied hours for floors that are partially or fully occupied. If the ventilation system for an occupied floor has to be disconnected during operating hours, approval must be obtained from Departmental Representative.
- .6 Remove the existing units made redundant by this work.
- .7 Disposal of Material:
 - .1 Dispose of materials not designated for salvage or reuse off site at authorized facilities and in accordance with the requirements of the Nova Scotia Department of Environment and Labour.
 - .2 Do not stockpile debris on site, remove from site immediately.

3.4 RESTORATION

- .1 Restore work areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

3.5 CLEANUP

- .1 Upon completion of work, remove debris, trim surfaces and leave work site clean.
- .2 Use only cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.6 EXISTING PIPING AND EQUIPMENT

- .1 Remove all piping and equipment as indicated on the Drawings in accordance with the AHJ and Provincial Regulations.

END OF SECTION

1 General

1.1 RELATED SECTIONS

- .1 Section 21 05 01 – Common Work Results – Mechanical.
- .2 Section 23 05 53 - Mechanical Identification.

1.2 REFERENCES

- .1 Authority Having Jurisdiction
 - .1 Conform to the requirements of the Authority having Jurisdiction. The Authority having Jurisdiction for this project The Fire Commissioner of Canada.
- .2 National Fire Prevention Association (NFPA)
 - .1 NFPA 13-2007, Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 25-2008, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures and section 21 05 01 – Common Work Results – Mechanical.
- .2 Drawings:
 - .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 Prepare revised drawings at time of turn over to Owner showing 'As-Built' Conditions. Submit to Office of Engineer for review and include revised drawings in Maintenance manual.
- .3 Field Quality Control Submittals:
 - .1 Manufacturer's Field Reports: manufacturer's field reports specified.

1.4 QUALITY ASSURANCE

- .1 Qualifications: 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.

2 Products

2.1 SYSTEM REQUIREMENTS

- .1 Modify existing automatic wet pipe fire suppression sprinkler systems in accordance with plans, specifications, NFPA 13, and requirements of the Authority Having Jurisdiction.
- .2 Include with each system materials, accessories, and equipment building to provide system complete and ready for use.
- .3 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 a consistent pattern as shown on plans. Avoid conflict with ceiling mounted equipment including, but not limited to ceiling grid, lights, diffusers, grilles, and speakers.
- .5 Devices and equipment to be ULC approved for use in wet pipe sprinkler systems.
- .6 Install systems with appropriate earthquake protection.
- .7 Sprinkler Head Location:
 - .1 Sprinkler heads to be located as shown on the Reflected Ceiling Plans (RCP). Where RCP and Sprinkler Plans differ seek clarification from the Office of the Engineer.

2.2 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to NFPA 13.
- .2 Fittings and joints to NFPA 13:
 - .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
 - .2 Provide threaded, grooved-end type fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
 - .3 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.
 - .4 Fittings: ULC approved for use in wet pipe sprinkler systems.
 - .5 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
 - .6 Flexible Sprinkler Fitting
 - .1 Unit to be a ULC listed assembly connecting sprinkler head to sprinkler piping c/w connection nipple, 25 mm braided hose, sprinkler reducing nipple, and support bracket.
 - .2 Maximum permitted length is 1215 mm
 - .3 Minimum hose bend radius to be 50 mm.

- .4 Hose to be capable of 360 degree, total bend.
 - .5 Approved Products: Victaulic VicFlex.
- .3 Pipe hangers:
 - .1 ULC listed for fire protection services in accordance with NFPA.

2.3 SPRINKLER HEADS

- .1 General: to NFPA 13 and ULC listed for fire services.
- .2 Sprinkler Head Type: material, finish, orientation, k value, required protection, and temperature rating shown on drawings.

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.
- .2 Acoustic Tile Ceilings
 - .1 Refer to Architectural reflected ceiling plans (RCP).
- .3 Shield sprinkler heads with protective covering while painting and other dirty work is in progress. Upon completion of painting / dirty work, remove protective covering from sprinkler heads. Replace sprinkler heads which have been painted or cannot be cleaned.

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 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 1400 kPag for a 2 hour period with no leakage or reduction in pressure.
 - .2 Flush piping with potable water in accordance with NFPA 13.
 - .3 Piping above suspended ceilings: tested, inspected, and reviewed by consultant before installation of ceilings.
 - .4 Formal Tests and Inspections:
 - .1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.
 - .2 Submit written request for formal inspection at least 15 days prior to inspection date.
 - .3 Repeat required tests as directed.
 - .4 Correct defects and make additional tests until systems comply with contract requirements.
 - .5 Furnish appliances, equipment, instruments, connecting devices, and personnel for tests.
 - .6 Authority of Jurisdiction will witness formal tests and approve systems before they are accepted.
- .2 Site Tests:
 - .1 Testing to be witnessed by Authority Having Jurisdiction.

END OF SECTION