Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Divisions 21, 22, 23, 25 and 26.

1.2 REFERENCES

.1 American National Standards Institute/National Fire Protection Association (ANSI/NFPA).

.1 NFPA 101, Life Safety Code.

.2 American Society for Testing and Materials International (ASTM).

.1 ASTM E 2174, Standard Practice for On-site Inspection of Installed Fire Stops.

.3 Underwriter’s Laboratories of Canada (ULC)

.1 CAN/ULC-S101, Standard Methods of Fire Endurance Tests of Building. Construction and Materials.

.2 CAN/ULC-S102, Standard Test Method for Surface Burning Characteristics of Building Materials.

.3 CAN/ULC-S115, Fire Tests of Firestop Systems.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:

.1 Shop drawings shall include:

.1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.

.2 Construction details should accurately reflect actual job conditions.

.3 Data sheets:

.1 Submit product data and specifications and the manufacturer's documentation. Specify product characteristics, performance criteria, dimensions, constraints and finishing.

.4 Samples:

.1 Submit a sample of each firestop, smoke control system and any other accessories must be submitted for approval.

.5 Test reports:

.1 According to CAN/ULC-S101 on the fire resistance of building elements and to CAN/ULC-S102 on the surface Burning Characteristics.

.2 Submit test reports issued by independent testing laboratories, certifying that the products, materials and fire equipment meet the requirements specified in physical characteristics and performance criteria.

.6 Certificates:

.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.7 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

.8 Manufacturer's Field Reports:

.1 Submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 CLOSEOUT SUBMITTALS

.1 Required maintenance sheets must be supplied for inclusion in the operations and maintenance manual, in compliance with section 01 78 00 - Closeout submittals.

.2 Maintenance sheets:

.1 Maintenance sheets must include or specify the following information:

.1 A description of equipment including the manufacturer’s name, type, model number, year of fabrication as well as power, output or capacity;

.2 Details pertaining to the operation, maintenance and upkeep of equipment;

.3 A list of recommended spare parts.

1.5 WORK REQUIRED

.1 The contractor must supply the necessary personnel, equipment and services for the installation of firestops and smoke control systems pertaining to piping and ducts required for the mechanical system which penetrate walls and floors requiring a fire resistance rating.

1.6 QUALITY ASSURANCE

.1 Work pertaining to this section must be performed by a specialized business enterprise, approved by the firestop manufacturer and which employs qualified, certified and experienced personnel in the application of firestops and installation of smoke control systems.

.2 The work performed must be top quality work according to the best engineering practices and in strict compliance with written manufacturer’s specifications.

.3 In such cases where the manufacturer does not supply ULC- or UL-approved assemblies of firestop elements or a derivative of similar elements, or one subject to other tests, drawings of these elements will be presented to local authorities having jurisdiction in these matters for approval before installation.

.4 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.

.1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins;

.2 Twice during progress of Work at 25% and 60% complete;

.3 Upon completion of Work, after cleaning is carried out.

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 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer and ULC markings.

.2 Storage and Protection:

.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Waste must be sorted and recycled in compliance with section 01 74 21 - Construction/demolition waste management and disposal.

Part 2 PRODUCTS

2.1 GENERAL

.1 All products used in facilities measure against firestop must be officially approved "cUL", "ULC" and "FM" and must be labeled as such.

2.2 MATERIAL

.1 Firestop systems and smoke control systems:

.1 Must be asbestos free and capable of maintaining an efficient barrier and conform to the relevant flame, smoke and gas ratings in compliance with standard CAN-S115, and not exceed the opening dimensions for which they are designed.

.2 Firestop and smoke control assemblies: ULC certified, in compliance with standard CAN-S115.

.3 The fire rating of firestops must not be inferior to the fire ratings of adjoining floors and walls in compliance with architectural plans.

.2 Service penetration assemblies: systems tested to CAN-ULC-S115.

.3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115

.4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.

.5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.

.6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.

.7 Firestop devices:

.1 Highly sensitive devices for plastic pipes, made of an expanding intumescent material when exposed to temperatures of 149 °C or more. The material must expand up to 25 times its original volume in order to seal the opening created by the plastic pipe

.2 Devices must be certified in compliance with standard CAN4-S115-M, and in compliance with a differential pressure test performed in 50 Pa and offering one to two hours fire resistance.

.8 Coating: the most stringent manufacturer's recommendations must be followed for specific material used for base coats and top coats.

.9 Water (if applicable): must be potable, clean and free of dangerous quantities of harmful substances

.10 Mineral wool: rockfibre and clinker glued with a heat resistant binder. Maximum operating temperature of 1,035 °C. Material must have a near neutral pH content.

.11 Compacting and reinforcing material and anchoring and support devices: in compliance with the manufacturer's recommendations and systems installed and approved by authorities having jurisdiction.

.12 Sealers and vertical joints: free of deflections, in compliance with ULC assembly tests.

Part 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with requirements, recommendations and manufacturer's written data, including product technical bulletins, instructions for handling, storage and implementation of products and indications data sheets.

3.2 PREPARATORY WORK

.1 Dimensions and conditions of spaces to be filled must be inspected in order to establish the exact thickness of required insulations and materials to be installed. Base coats and surfaces must be dry and free of rime.

.1 Ensure surfaces are clean, dry and frost.

.2 Prepare surfaces that are placed in contact with the fire and smoke materials, according to the manufacturer's instructions.

.3 Ensure the integrity of the insulation around pipes and duct penetrations through fire walls, including the vapor barrier.

.4 Overflows and over-coatings must be cleaned appropriately and stains must be cleaned from adjoining surfaces.

3.3 INSTALLATION

.1 Firestop and smoke control material and components must be installed in compliance with the manufacturer's specifications to ensure a fire rating no less than the fire rating of the adjoining walls and floors.

.2 Sleeves must be installed in openings for mechanical services penetrating through walls and floors.

.3 Joints and openings must be sealed to ensure an integral and continuous firestop separation.

.4 Temporary forms must be supplied and removed only after materials have sufficiently matured and are strong enough.

.5 Visible surfaces must be smoothed with a trowel to obtain a smooth finish.

3.4 SCHEDULING OF WORK

.1 Proceed with the implementation only when documents/samples submitted have been reviewed by the Departmental Representative.

.2 Achieve fire protection floor before putting in place interior walls.

.3 Bonding to a metal support: the fire protection must be done before the implementation of any projection retardant coating, for the purpose of insurance bond required

.4 Insulation of piping mechanical systems consisting of a certified fire protection set.

.1 Make sure the insulation of piping is installed before the fire stopping.

3.5 QUALITY CONTROL ON SITE

.1 Inspections: Before conceal or cover materials or firestop inform the Departmental Representative that the works are ready for inspection.

.2 Inspections made by the manufacturer:

.1 Obtain written report from manufacturer verifying compliance of Work specified criteria in regard to the handling, implementation, application products and the protection and cleaning of the work, then report submit this report in accordance with Article DOCUMENTS / ITEMS TO SUBMIT, PART 1.

.2 The manufacturer shall make recommendations regarding the use of the product, and make periodic visits to check if the implementation was carried out according to its recommendations.

.3 Provide site visits in accordance with article QUALITY ASSURANCE, PART 1

3.6 SITE CONDITIONS

.1 Temperatures, relative humidity and humidity content of base coats must be in compliance with the manufacturer’s specifications for the application and drying procedures of firestop material and smoke control systems.

.2 Ongoing work must be protected against any possible damages, defacement or dirt stemming from other building trades work.

.3 All defects must be corrected upon work completion and site conditions must be returned in perfect condition.

3.7 VERIFICATION

.1 All firestop surfaces to be sealed must be checked. A written report must be issued to the contractor, for any non-conforming or unsatisfactory condition, before the work begins.

.2 Acceptable surface conditions must be achieved before the work begins.

3.8 MIXING

.1 Materials must be mixed in strict compliance with the manufacturer’s specifications.

.2 All components have to be mixed and prepared by qualified personnel.

3.9 MATURING OF COATINGS

.1 Coatings must be left to mature in compliance with the manufacturer's specifications.

.2 Materials should not be covered until the maturing process is complete.

3.10 INSPECTION OF THE WORK

.1 The departmental representative must be advised when the work is ready for inspection before the work is covered by a fire protection enclosure or control material or any other services penetrating the firestop partitions.

.2 Inspection of firestop penetrations must be performed in compliance with standard ASTM E 2174.

3.11 CLEANING

.1 All excess material or waste must be removed. Adjoining surfaces must be immediately cleaned after installation.

.2 Temporary barriers must be removed after completion of the work.

3.12 TESTS

.1 Simulation tests pertaining to smoke penetration must be performed.

.2 Any defects must be corrected upon detection of any smoke penetration through joints or openings such as specified in the present section and tests must be performed again at no additional costs to the owner.

.3 The simulating product must not be toxic or staining and must supply a smoke screen 80 mg/m³ in thickness with an acceptable level of air concentration of 50 ppm.

.4 Smoke must be generated at a rate of 4 seconds/2.8 m³ while maintaining the smoke screen until the inspection is finished.

3.13 LOCATION OF FIRESTOP SETS

.1 Provide protection firestop and smoke barrier to building components having a fire resistance including the places listed below:

- .1 Crossings walls and masonry walls, concrete and gypsum with a degree of fire resistance.
- .2 Crossings floor slabs, ceilings and roofs with a degree of fire resistance.
- .3 Access openings and crossing walls firestop formed in for later use.
- .4 Around pipes and other mechanical and electrical equipment through walls firestop.
- .5 Rigid ducts with section greater than 129 cm^2: Fire protection performed by means of a line of material provided between the light cutting angle of the retaining and the firestop wall, and between the retaining bracket and the conduit, on both of side of the partition firestop.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL

.1 These specifications are based on the National Master Specifications (NMS). However, it has been adapted to take project features into consideration.

.2 In these sections, drawings and specifications refer to construction drawings and specifications issued with Contract documents.

.3 This section includes common requirements for all sections of Divisions 21, 22, 23 and 25 and is a complement to all Contract clauses, to all general clauses, and to all other applicable clauses of architectural, electrical and structural specifications.

.4 These specifications do not contain necessarily detailed specifications for the design, for construction, or for all equipment parts and components, and installations. If not available, the Contractor shall observe generally accepted techniques and manufacturer's recommendations.

.5 All discrepancies between drawings and general specs or other trades with electrical drawings and specs shall be brought to the attention of the Departmental Representative before submission close date. The later shall provide supplementary information as necessary by addendum.

.6 These mechanical specifications apply to the general contractor as well as other contractors. Construction manager shall assume general responsibility and good coordination of his works and coordination with other contractors.

.7 All systems shall be complete, fully operational and containing all equipment and accessories required delivering at completion of work fully functional places in conformity to applicable codes and standards.

1.2 SCOPE OF WORK

.1 More precisely, the work of the Mechanical Contractor consists of, but not limited to, provision, installation, and connection of following equipment:

.1 Networks and ventilation equipment including:

.1 Modification to VA-1 air system, including:

.1 Removal of two supply air grilles in the fire pump room;

.2 Partial demolition of the supply duct of the fire pump room;

.3 Fire dampers removal of the supply duct to the wall of the fire pump room;

.4 Replacement of the new fire dampers;

.5 Replacement of the supply duct of the fire pump room;

.6 Restoration of the supply grilles of the fire pump room;

.7 The thermal insulation of ductwork;

.8 Replacement of two access doors next to regulation dampers;.

.9 To move two pipe hangers.

.2 Automatic regulation, including:

.1 The temporary displacement of the probe part and the humidity sensor of the washing pumps room

.2 Moving back at the same place the probe part and the humidity sensor of the washing pumps room after the mounting of the new wall.

1.3 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 73 00 - Execution Requirements.

.5 Section 01 74 11 - Cleaning.

.6 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.7 Section 01 78 00 - Closeout Submittals.

.8 Section 09 91 23 - Interior Painting.

.9 Section 23 05 00 - Common Work Results - HVAC.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit documents and samples in accordance with section 01 33 00 - Submittal Procedures.

.2 Shop drawings to show:

.1 Mounting arrangements;

.2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

.1 Detailed drawings of supports, and anchor bolts;

.2 Manufacturer to certify current model production;

.3 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.

1.5 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, Departmental Representative before final inspection.

.3 Operation data to include:

- .1 Operation instruction for systems and component;
- .2 Description of actions to be taken in event of equipment failure;
- .3 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 Approvals:

- .1 Submit three (3) copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
- .2 Make changes as required and re-submit as directed by Departmental Representative.

.6 Additional data:

- .1 Prepare and insert into Operation and Maintenance Manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

- .1 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 reproducible, revising reproducible to show work as actually installed.
- .3 Use different colour waterproof ink for each service.
- .4 Make available for reference purposes and inspection.

.8 As-built drawings:

- .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
- .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Departmental Representative for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

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

1.6 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with section 01 45 00 - Quality Control.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with section 01 35 29.06 - Health and Safety.

1.7 MAINTENANCE

.1 Furnish spare parts in accordance with section 01 78 00 - Closeout Submittals as follows:

.1 Two (2) fusible for fire damper in addition to final operating set.

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

.3 Furnish one (1) commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 PAINTING REPAIRS AND RESTORATION

.1 Perform painting works in accordance with section 09 91 23 - Interior Painting.

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

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - 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 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.

3.5 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 RELATED REQUIREMENTS

.1 Section 21 05 01 - Common Work Results - Mechanical.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with section 01 33 00 - Submittal Procedures.

.2 Shop drawings:

.1 Submit product data and instructions and manufacturer documentation. Data sheets should indicate product characteristics, performance criteria, dimensions, finish and limitations.

.3 Shop drawings:

.1 Indicate the following on the drawings:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.2 Submit the following documents with the shop drawings and specifications:

.1 Detailed drawings of supports, and anchor bolts.

.2 Manufacturer to certify current model production.

.3 Certification of compliance to applicable codes.

.3 In addition to transmittal letter referred to in section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.4 Erection drawings:

.1 General:

.1 Erection drawings consist of plans drawn to scale, showing the position of equipment, conduits, piping, faucets and others, with sections and details required, including dimensions of equipment, conduits and pipes, locations of ducts, openings, anchorages and supports, relative positions with structural, architectural, and other mechanical and electrical works, position of access doors, and clearances required for operation and maintenance.

.2 Prepare and submit erection drawings in order to coordinate the work of the various trades of construction. Erection drawings are required for at least the following works:

.1 HVAC work located in places where space is congested with equipment;

.2 Expected ducts, openings drillings in walls;

.3 Anchors;

.4 All supports;

.5 In places as described in HVAC specification sections;

.6 This clause is not restrictive. Erection drawings may be required in areas deemed necessary by the Departmental Representative.

.3 Erection drawings must show clearly and precisely all the work involved, those of the discipline and those made by others.

.2 Preparation:

.1 Prepare drawings at an appropriate scale but not smaller than 1:50.

.2 Prepare erection drawings and coordinate with other mechanical and electrical trades.

.3 All erection drawings shall be prepared with the latest AutoCAD version in the form of file .DWG files, sepia, and paper, in the quantity required. AutoCAD layers of each trade shall meet PWGSC CADD standards.

.4 Receive erection drawings from other mechanical and electrical divisions and incorporate them with the HVAC erection drawings to form the global erection drawings. Ensure full coordination of global erection drawings and submit to the Departmental Representative for verification. If necessary, review the drawings and resubmit to ensure proper coordination and avoid incompatibilities.

.1 At the request of the Departmental Representative, submit the overall erection drawings printed with different colors to distinguish the work of different trades.

.2 Verification of erection drawings by Departmental Representative is limited to ensure that the technical requirements are met (VCF, grills, insulation, etc.). Departmental Representative does not check the quality of the coordination prepared by the Contractor.

.3 The Contractor shall allocate in his work plan a minimum of ten working days for verification of erection drawings by Departmental Representative

1.3 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for incorporation into manual specified in section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Sheets: provide instructions on the operation and maintenance, which will be incorporated into the Operation and Maintenance Manual.

.3 Operation and maintenance manual approved by and final copies deposited with, the Departmental Representative before final inspection.

.1 Operation data to include:

.1 Operation instructions for systems and components.

.2 Description of actions to be taken in event of equipment failure.

.3 Colour coding chart.

.2 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.

.3 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Approvals:

.1 Submit three (3) copies of draft Operation and Maintenance Manual to the Departmental Representative for approval. Submission of individual data will not be accepted unless directed by the Departmental Representative.

.2 Make changes as required and re-submit as directed by the Departmental Representative.

.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.

.6 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 and low voltage control wiring.

.2 Transfer information weekly to reproducible, revising reproducible to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.7 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 As-built drawings, annotations, changes and signatures must be written with a red ink pencil.

.4 Submit to Departmental Representative for approval and make corrections as directed.

.5 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.6 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

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

1.4 QUALITY ASSURANCE

.1 Quality assurance: in accordance with section 01 45 00 - Quality Control.

.2 Health and Safety: Do construction occupational health and Safety in accordance with section 01 35 29.06 - Health and Safety.

1.5 MAINTENANCE SUBMITTALS

.1 Furnish as follow maintenance submittals in accordance with section 01 78 00 - Closeout Submittals.

.1 Two () fire damper links to final operating set.

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

1.6 DELIVERY, STORAGE, AND HANDLING

.1 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 PRODUCTS

2.1 ACCESS DOORS

.1 All HVAC equipment installed to be accessible and to have the required clearance.

.2 A access doors to access equipment and Fire damper. Resetting the fire damper must be done without the need for removal of the grid

Part 3 EXECUTION

3.1 INSPECTION

.1 Verification of Conditions: Before installing, make sure that the state of the surfaces / supports previously implemented under other sections or contracts is acceptable and can perform the work in accordance with manufacturer's written instructions

.1 Make a visual inspection of surfaces/substrates in the presence of the Departmental Representative.

.2 Immediately notify the Departmental Representative of unacceptable conditions detected.

.3 Start the installation work only after correcting unacceptable conditions and received the written approval of the Departmental Representative.

3.2 PAINTING REPAIRS AND RESTORATION

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged.

3.3 CLEANING SYSTEMS

.1 Clean the inside and outside of all the elements, devices and systems, and vacuum inside the ducts.

3.4 FIELD QUALITY CONTROL

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

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - 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.

3.5 DEMONSTRATION

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

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

.3 Use operation and maintenance manual, as-built drawings, as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

3.6 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 RELATED REQUIREMENTS

.1 Section 21 05 01 - Common Work Results - Mechanical.

.2 Section 23 05 00 - Common Work Results for HVAC.

.1 Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

.2 Section 26 05 00 - Common work results for electrical.

.3 Section 26 05 29 - Hangers and supports for electrical systems.

.4 Section 26 50 00 - Lighting.

1.2 REFERENCES

.1 Canadian Standards Association(CSA)/CSA International.

.1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 National Building Code of Canada (NBC) - 2005.

1.3 DEFINITIONS

.1 Priority Two (P2) Buildings: buildings in which life safety is of paramount concern. It is not necessary that P2 buildings remain operative during or after earthquake activity.

.2 SRS: acronym for Seismic Restraint System.

1.4 DESCRIPTION

.1 SRS fully integrated into, and compatible with:

.1 Noise and vibration controls specified elsewhere.

.2 Structural, mechanical, electrical design of project.

.2 Each Contractor is responsible of seismic restraint systems for their discipline.

.3 During seismic event, SRS to prevent systems and equipment from causing personal injury and from moving from normal position.

.4 Designed by Professional Engineer specializing in design of SRS and registered in Province of Quebec.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with section 01 33 00 - Submittal Procedures.

.2 Submit design data and details of seismic protection systems with a certificate with seal of recognition headings engineer for following:

- .1 Full details of design criteria.
- .2 Working drawings (prepared to same standard of quality and size as documents forming these tender documents), materials lists, schematics, full specifications for components of each SRS to be provided.
- .3 Design calculations (including restraint loads resulting from seismic forces in accordance with National Building Code, detailed work sheets, tables).
- .4 Separate shop drawings for each SRS and devices for each system, equipment.
- .5 Identification of location of devices.
- .6 Schedules of types of SRS equipment and devices.
- .7 Details of fasteners and attachments to structure, anchorage loadings, attachment methods.
- .8 Installation procedures and instructions.
- .9 Design calculations including restraint loads to NBC and Supplement.
- .10 Detailed design of SRS including complete working drawings prepared to same standard of quality and size as Contract Documents, materials lists, design calculations, schematics, specifications.

.3 Submit additional copy of shop drawings and product data of seismic protection systems to Structural Engineer for review of connection points to building structure.

.4 Quality assurance submittals: submit following in accordance with section 01 33 00 - Submittal Procedures.

- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.
  - .1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

.5 Closeout Submittals:

- .1 Provide maintenance data including monitoring requirements for incorporation into manuals specified in section 01 78 00 - Closeout Submittals.

1.6 QUALITY ASSURANCE

.1 Health and Safety:

- .1 Do construction occupational health and safety in accordance with section 01 35 29.06 - Health and Safety Requirements.

1.7 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.

.2 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 PROTECTION LEVEL

.1 Install anchorage and seismic stabilization devices for ventilation duct, equipment, reservoirs and piping (other than fire protection piping), as to « ASHRAE, A Practical Guide to Seismic Restraint » and norm ANSI/SMACNA 001.

.1 Protection level for the building:

.1 SHL-« C » for ducts and pipes.

.2 SHL-« B » for equipments.

.2 Install anchorage and seismic stabilization devices for fire protection piping as to NFPA 13. Protection level is $V_p = 0.5\ W_p$.

Part 2 PRODUCTS

2.1 SRS MANUFACTURER

.1 Seismic protection devices and systems must be provided by a single manufacturer with experience in the field.

2.2 GENERAL

.1 SRS to provide gentle and steady cushioning action and avoid high impact loads.

.2 SRS to provide gentle and steady cushioning action and avoid high impact loads. SRS to restrain seismic forces in every direction

.3 Fasteners and attachment points to resist same load as seismic restraints.

.4 SRS of Piping systems compatible with:

.1 Expansion, anchoring and guiding requirements.

.2 Equipment vibration isolation and equipment SRS.

.5 SRS utilizing cast iron, threaded pipe, other brittle materials not permitted.

.6 Attachments to RC structure:

.1 Use high strength mechanical expansion anchors.
.2 Drilled or power driven anchors not permitted.

.7 Seismic control measures not to interfere with integrity of fire stopping.

.8 Stabilize all accessories installed in suspended ceilings: diffusers and light fixtures.

2.3 STEEL ANGLE

.1 To AISI.

.1 Minimum tensile strenght: Fu = 410 MPa.
.2 Yield stress Fy = 300 MPa.

2.4 C-CHANNEL

.1 To ASTM A1011/A1011M GR 33 and CSA G40.20/G40.21.

2.5 STRUCTURAL PIPING

.1 To ASTM A53/A53M, type E or S, grade B.

2.6 CABLE

.1 To ASTM A603 or ASTM A475 with at least seven strands and cover with a class A layer.

.2 Connecting parts: To ASCE 96 and able to support 110 % of cable maximum stress.

2.7 BOLTS

.1 To ASTM A307, grade A, hexagon head.

2.8 SRS FOR STATIC EQUIPMENT, SYSTEMS

.1 Floor-mounted equipment, systems:

.1 Anchor equipment to equipment supports.
.2 Anchor equipment supports to structure.
.3 Use size of bolts scheduled in approved shop drawings.

.2 Suspended equipment, systems:

.1 Use one or combination of following methods:
.1 Install tight to structure.

.2 Cross-brace in every direction.

.3 Brace back to structure.

.4 Slack cable restraint system.

.2 SCS to prevent sway in horizontal plane, "rocking" in vertical plane, sliding and buckling in axial direction.

.3 Hanger rods to withstand compressive loading and buckling.

2.9 SLACK CABLE RESTRAINT SYSTEM (SCS)

.1 Use elastomer materials or similar to avoid high impact loads and provide gentle and steady cushioning action.

.2 SCS to prevent sway in horizontal plane, "rocking" in vertical plane, sliding and buckling in axial direction.

.3 Hanger rods to withstand compressive loading and buckling.

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 Attachment points and fasteners:

.1 To withstand same maximum load that seismic restraint is to resist and in every direction.

.2 Attachment points and fasteners:

.1 Check that the anchor bolts, pin diameter, recess depth in the concrete and seld length, are conform to the drawings submitted for approval.

.2 Bolt to the frame or structure all the material that is not insulated against the transmission of vibrations.

.3 The oblong openings for adjusting bolts are prohibited.

.4 Small pipes may be rigidly secured to larger pipes for restraint purposes, but not reverse.

.5 Anchorage points in concrete slabs: to ASTM-E488 and manufacturer’s recommendations.

.3 Slack Cable Systems (SCS):

.1 Connect to suspended equipment so that axial projection of wire passes through centre of gravity of equipment.

.2 Tighten attachment point to manufacturer’s recommendation.

.3 Use appropriate grommets, shackles, others hardware to ensure alignment of restraints and to avoid bending of cables at connection points.

.4 Orient restraint wires on ceiling hung equipment at approximately 90 degrees to each other (in plan), tie back to structure at maximum of 45 degrees to structure.

.5 Adjust restraint cables so that they are not visibly slack but permit vibration isolation system to function normally.

.6 Tighten cable to reduce slack to 40 mm under thumb pressure. Cable not to support weight during normal operation.

.4 Install SRS at least 25 mm from equipment, systems, services.

.5 Miscellaneous equipment not vibration-isolated:

.1 Bolt through house-keeping pad to structure.

.6 Co-ordinate connections with other disciplines.

.7 Brace equipments regardless of ducts and pipes.

.8 Never install two types of bracing in the same direction.

.9 Suspension rod less than 300 mm: no stabilisation required for equipments.

.10 Installation: minimum of 45o to horizontal and maximum 60o to horizontal.

.11 Transverse seismic restraint system installation: perpendicular to piping or duct direction with a maximum angle variation of 2.5°.

.12 Longitudinal seismic restraint system installation: parallel to piping or duct direction with a maximum angle variation of 2.5°.

.13 For each duct or pipe straight section: install at least two transverse seismic restraint devices and systems and at least one longitudinal seismic restraint device and system.

.14 Install transverse and longitudinal seismic restraint devices and systems at a maximum distance of 100 mm of a vertical support, which must be reinforced if required.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.

.2 Manufacturer's Field Services: consisting of product use recommendations and periodic site visits to review installation, scheduled as follows:

.1 After delivery and storage of Products.

.2 After preparatory work is complete but before installation commences.

.3 Twice during the installation, at 25% and 60% completion stages.

.4 Upon completion of installation.

.3 Submit manufacturer's reports to Departmental Representative within 3 days of manufacturer representative's review.

.2 Inspection and Certification:

.1 SRS: inspected and certified by Seismic Engineer upon completion of installation. Provide a certificate with seal of recognized engineer in the field.

.2 Provide written report to Departmental Representative with certificate of compliance.

.3 Commissioning Documentation:

.1 Upon completion and acceptance of certification, hand over to Departmental Representative complete set of construction documents, revised to show "as-built" conditions.

3.4 DOCUMENTS REQUIRED FOR COMMISSIONING

.1 Once certification is complete and the report is accepted, submit to the Departmental Representative a complete copy of the project file revised and annotated to show the conditions after execution.

3.5 DUCT INSTALLATION

.1 Seismic restraint systems installation and design: to « ASHRAE, A Practical Guide to Seismic Restraint » and ANSI/SMACNA 001.

.2 Stabilize rectangular ventilation ducts with a surface of 0.55 m² and greater and round ventilation ducts with a diameter of 700 mm and greater.

.3 A wall can serve as a transverse seismic restraint device or system if the duct is firmly attached at its perimeter.

.4 Install mechanical restraints to the following:

.1 Vertical stabilization:

.1 Regular supports.

.2 Transverse stabilization: 9.1 m.

.3 Longitudinal stabilization: 18.3 m.

3.6 ELECTRICAL INSTALLATION

.1 Do the installation and design of the earthquake-resistant systems as per the “ASHRAE, A Practical Guide to Seismic Restraint” manual.

.2 Provide supports with longitudinal and transversal bracing, rigid type or cables.

.3 Do not stabilize material with hanging supports of 305 mm in length or less.

.4 Stabilize electric conduits of 35 mm nominal diameter and above, indoor.

.5 Stabilize electric conduits of 63 mm nominal diameter and above, outdoor.

.6 Install the mechanical restraint devices at the follow frequency:

.1 For the transversal stabilization: 9.1 m;
.2 For the longitudinal stabilization: 18.3 m.

3.7 RIGID RODS ANDTIE POINTS

.1 Use rods of appropriate diameter and which complies with requirements of seismic support manufacturer.

.2 Vertical, lateral and longitudinal rods must be installed according to support manufacturer's recommendations.

3.8 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

Part 1 GENERAL

1.1 REFERENCES

.1 Canadian Gas Association (CGA)

.1 CSA/CGA B149.1-05, Natural gas and propane installation code.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3-92, Identification of Piping Systems.

.3 National Fire Protection Association (NFPA)

.1 NFPA 13-2013, Standard for the Installation of Sprinkler Systems.

.2 NFPA 14-2003, Standard for the Installation of Standpipe and Hose Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.2 Submittals: in accordance with section 01 33 00 - Submittal Procedures.

.3 Product data to include paint colour chips, other products specified in this section.

.4 Samples:

.1 Submit samples in accordance with section 01 33 00 - Submittal Procedures.

.2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.3 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with section 01 33 00 - Submittal Procedures.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 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.

.2 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.

.2 Dispose of unused paint and coating material at official hazardous material collections site approved by Departmental Representative.

.3 Do not dispose of unused paint coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

Part 2 PRODUCTS

2.1 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size #	Sizes (mm)	Number of lines	Height of letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: use size # 5.

.2 Equipment in Mechanical Rooms: use size # 9.

.5 Identification for PWGSC Preventive Maintenance Support System (PMSS):

.1 Use arrangement of Main identifier, Source identifier, Destination identifier.

.2 Equipment in Mechanical Room:

.1 Main identifier: size # 9.

.2 Source and Destination identifiers: size # 6.

.3 Terminal cabinets, control panels: size # 5.

.3 Equipment elsewhere: sizes as appropriate.

2.2 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Departmental Representative.

2.3 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.4 LANGUAGE

.1 Identification in English and French.

.2 Use one nameplate and label for both languages.

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 TIMING

.1 Provide identification only after painting has been completed.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and CSA registration plates as required by respective agency.

.3 Identify systems, equipment to conform to PWGSC PMSS.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.10 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.5 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

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 21 05 01 - Common Work Results - Mechanical.

.1 Section 23 05 00 - Common Work Results for HVAC.

.2 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

.1 ANSI/ASHRAE/IESNA 90.1-04, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM B209M-07, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).

.2 ASTM C335-05, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411-05, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C547-07, Specification for Mineral Fiber Pipe Insulation.

.6 ASTM C553-02, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.7 ASTM C612-04, Specification for Mineral Fiber Block and Board Thermal Insulation.

.8 ASTM C795-03, Specification for Thermal Insulation for Use with Austenitic Stainless Steel.

.9 ASTM C921-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.3 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).

.4 Canadian General Standards Board (CGSB).

.1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.5 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-03, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - means "not concealed" as previously defined.

.3 Insulation systems - insulation material, fasteners, jacket, and other accessories.

.2 The thickness of insulation is to cover all components of the element to be insulated, such as reinforcements, side rails, "T" joints, flanges, etc.

1.4 SUBMITTALS

.1 Submit documents and samples in accordance with section 01 33 00 - Submittal Procedures.

.2 Samples:

.1 Submit for approval:

.1 Complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix typewritten label beneath sample indicating service.

1.5 QUALIFICATIONS

.1 Installer : specialist in performing work of this section, and have at least three (3) years successful experience in this size and type of project, qualified to standards or member of TIAC.

.2 Work must be done by skilled workers in insulation.

1.6 QUALITY ASSURANCE

.1 Quality of work: To National Insulation Standards (2005) from Thermal Insulation Association of Canada (TIAC).

.2 The Contractor responsible for the installation of mechanical insulation shall keep a copy of this manual quality standard as a reference.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 To CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Thermal conductivity ("k" factor) not to exceed specified values at 24 °C mean temperature when tested in accordance with ASTM C335.

.2 Insulation type **D-1**: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma.

.1 Maximum "k" factor: 0.0337 W/m•°C at 24 °C mean temperature.

.2 Maximum temperature: 120 °C.

.3 Acceptable products: Manson AK Board FSK; Owens Corning; Knauf. Replacement materials or products: approved by addendum according to Instructions to bidders.

.3 Insulation type **D-2**: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma.

.1 Mineral fibre: to ASTM C553.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: 0.035 W/m•°C at 24 °C mean temperature.

.4 Maximum temperature: 120 °C.

.5 Density: 24 kg/m^3.

.6 Acceptable products: Manson AK Board FSK; Owens Corning; Knauf. Replacement materials or products: approved by addendum according to Instructions to bidders.

2.3 JACKETS

.1 Canvas:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Insulation adhesive: compatible with insulation.

.3 Acceptable products: Fattal Thermocanvas; Owens Corning; Knauf. Replacement materials or products: approved by addendum according to Instructions to bidders.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

.4 ULC Listed Canvas Jacket:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.5 Outdoor Vapour Retarder Mastic:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m^2.

.6 Tape: self-adhesive, aluminum, reinforced, 75 mm wide minimum.

.7 Contact adhesive: quick-setting.

.8 Canvas adhesive: washable.

.9 Tie wire: 1.5 mm stainless steel.

.10 Banding: 19 mm wide, 0.5 mm thick stainless steel.

.11 Facing: 25 mm stainless steel hexagonal wire mesh stitched on both faces of insulation or one face of insulation with expanded metal lath on other face.

.12 Fasteners: 4 mm diameter pins with 35 mm diameter or square clips, length to suit thickness of insulation.

Part 3 EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS

.1 Pressure test ductwork systems complete, witness and certify.

.2 Ensure surfaces are clean, dry, and free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer’s instructions and as indicated.

.3 Use two (2) layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Ensure hangers, and supports are outside vapour retarder jacket.

.5 Hangers and supports in accordance with section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum two (2) rows each side.

3.3 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: conform to following table:

NETWORKS AND EQUIPMENTS	INSULATION THICKNESS mm	INSULATION TYPE
.3 The complete supply air ducts.	50	D-2

3.4 FINISHING

.1 Exposed air ducts located inside the building: canvas jacket.

3.5 CLEANING

.1 Clean in accordance with section 01 74 11 - Cleaning.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 21 05 01 - Common Work Results - Mechanical.

.1 Section 23 05 00 - Common Work Results for HVAC.

.2 Section 23 05 49 01 - Seismic Restraint Systems (SRS) - Type P2 Buildings.

.3 Section 23 05 53 01 - Mechanical Identification.

.4 Section 23 33 00 - Air Duct Accessories.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM A480/A480M-03c, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

.2 ASTM A635/A635M-02, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.

.3 ASTM A653/A653M-03, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.5 National Fire Protection Association (NFPA).

.1 NFPA 90A-02, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B-02, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.3 NFPA 96-01, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition 1995 and Addendum No. 1, 1997.

.2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.

.3 IAQ Guideline for Occupied Buildings Under Construction 1995, 1st Edition.

1.3 SUBMITTALS

.1 Submit documents and samples in accordance with section 01 33 00 - Submittals Procedures.

.2 Shop drawings and data sheets:

.1 Shop drawings and specifications shall include the following

.1 Sealants;

.2 Fittings and accessories;

.3 All conduits 1:25

.3 Submit sealing test report for approval prior to installation of insulation.

1.4 QUALITY ASSURANCE

.1 Certification of Ratings:

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

Part 2 PRODUCTS

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure	SMACNA Seal Class
500 Pa	B (SMACNA)

.2 Seal classification:

.1 Class B: longitudinal seams, transverse joints and connections made airtight with sealant, tape or combination thereof.

2.2 SEALANT

.1 Transverse joints:

.1 Round and rectangular ducts with clip joints or linchpin joint:

.1 Adhesive laminated tape kraft/canvas/aluminum ULC approved.

.1 Acceptable products: MACtac FSK; Venture Tape FSK. Replacement materials or products: approved by addendum according to Instructions to bidders.

.2 Flanged and T joints.

.1 Sealing tape.

.1 Acceptable products: Ductmate 440 Gasket tape. Replacement materials or products: approved by addendum according to Instructions to bidders.

.2 Longitudinal joints:

.1 Round ducts.

.1 Adhesive laminated tape kraft/canvas/aluminum ULC approved.

.1 Acceptable products: MACtac FSK. Replacement materials or products: approved by addendum according to Instructions to bidders.

.2 Rectangular ducts.

.1 Sealant in tube.

.1 Acceptable products: Mulco-Butyle; Ductmate n° 5511M. Replacement materials or products: approved by addendum according to Instructions to bidders.

.3 General:

.1 For service temperature higher than -7 °C.

.1 Sealant: Sealant for air ducts, water based, ULC approved, having a flame spread rating of not more than 25 and a smoke density rating of not more than 50, which can be used in a range of operating temperatures from -7 ° C to 93 ° C.

.1 Acceptable products: Duro Dyne DWN. Replacement materials or products: approved by addendum according to Instructions to bidders.

.2 For service temperature lower or equal to -7 °C.

.1 Sealant: sealant for air ducts, polymer-based, fireproof, oil resistant and can withstand temperatures from -30 ° C to 93 ° C.

.1 Acceptable products: Duro Dyne S-2; Foster 30-02; 3M, EC-800. Replacement materials or products: approved by addendum according to Instructions to bidders.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

.1 Acceptable products: Duro Dyne FT-2. Replacement materials or products: approved by addendum according to Instructions to bidders.

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:

.1 Rectangular: standard radius. Centreline radius: 1.0 times width of duct.

.2 Round: smooth radius. Centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:

.1 To 400 mm: with single thickness turning vanes.

.2 Over 400 mm: with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch:

.1 90° entry on branch: with balancing damper on branch closest to main duct.

.2 45° entry on branch: Centreline radius 1.0 times width of duct and with balancing damper on branch closest to main duct.

.2 Round main and branch:

.1 Enter main duct with conical connection.

.5 Transitions:

.1 Diverging: 20° maximum included angle.

.2 Converging: 30° maximum included angle.

.6 Offsets:

.1 90° elbows or radiused elbows, as indicated.

.7 Obstruction deflectors: maintain full cross-sectional area.

.1 Maximum included angles: as for transitions.

2.6 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation.

.2 Fire stopping material and installation must not distort duct.

2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.

.2 Design criterion: for a pressure of 500 Pa.

.3 Thickness, fabrication and reinforcement: to ASHRAEand SMACNA.

.4 Joints:

.1 Joints in accordance with ASHRAE and SMACNA for the following uses:

.1 Ducts for which the largest dimension is equal to or less than 1 200 mm or 900 mm diameter.

.2 Prefabricated flanged joints, trademark, for air ducts, for the following uses:

.1 Ducts for which the largest dimension is more than 1 200 mm or 900 mm diameter.

.2 Acceptable products: Ductmate Canada. Replacement materials or products: approved by addendum according to Instructions to bidders.

2.8 HANGERS AND SUPPORTS

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.1 Maximum size duct supported by strap hanger: 500 mm.

.2 Hanger configuration: to ASHRAE and SMACNA.

.3 Hangers: galvanized steel angle with galvanized steel rods to ASHRAE and SMACNA and following table:

DUCT SIZE (mm)	ANGLE SIZE (mm)	ROD DIAMETER (mm)
Up to 750	25 x 25 x 3	6
751 to 1 050	40 x 40 x 3	6
1 051 to 1 500	40 x 40 x 3	10
1 501 to 2 100	50 x 50 x 3	10

DUCT SIZE (mm)	ANGLE SIZE (mm)	ROD DIAMETER (mm)
2 101 to 2 400	50 x 50 x 5	10
2 401 and over	50 x 50 x 6	10

.4 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.

.1 Acceptable products: Myatt fig. 485. Replacement materials or products: approved by addendum according to Instructions to bidders.

.2 For steel joist: manufactured joist clamp or steel plate washer.

.1 Acceptable products: Anvil fig. 61 or 86 for joist clamp, and Anvil fig. 60 for steel plate washer. Replacement materials or products: approved by addendum according to Instructions to bidders.

.3 For steel beams: manufactured beam clamps.

.1 Acceptable products: Anvil fig. 60. Replacement materials or products: approved by addendum according to Instructions to bidders.

Part 3 EXECUTION

3.1 GENERAL

.1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE and SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.Insulate strap hangers 100 mm beyond insulated duct. Ensure diffuser is fully seated.

.3 Support risers in accordance with ASHRAE and SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with as follows:

DUCT SIZE (mm)	SPACING (mm)
Up to 1 500	3 000
1 501 and over	2 500

3.3 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturer’s recommendations.

.3 Seal all openings in ducts, such as openings for instrumentation, the linkage of registers, coils, etc. using a sealer or a neoprene or silicone gasket, while allowing normal movement of equipment installed in the ducts.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 21 05 01 - Common Work Results - Mechanical.

.2 Section 23 05 00 - Common Work Results for HVAC.

.1 Section 23 31 13 01 - Metal Ducts - Low Pressure to 500 Pa.

1.2 REFERENCES

.1 Canadian Standard Association (CSA).

.1 CSA B228.1, Pipes, Ducts and Fittings for Residential Type Air-Conditioning.

.2 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).

.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

.3 Underwriters Laboratories of Canada (ULC).

1.3 SUBMITTALS

.1 Submit documents and samples in accordance with section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:

.1 Flexible connections;

.2 Duct access doors;

.3 Turning vanes;

.4 Instrument test ports.

.3 Test Reports:

.1 Certification of ratings: 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 Certificates:

.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions:

.1 Submit manufacturer's installation instructions.

.6 Manufacturer's Field Reports:

.1 Manufacturer's field reports specified.

1.4 CLOSEOUT SUBMITTALS

.1 Submit maintenance and engineering data for incorporation into manual specified in section 01 78 00 - Closeout Submittals.

1.5 QUALITY ASSURANCE

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting one (1) week prior to beginning work of this Section and on-site installations:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with section 01 35 29.06 - Health and Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).

.4 Separate for reuse and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan (WMP).

.5 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

Part 2 PRODUCTS

2.1 GENERAL

.1 Manufacture in accordance with:

.1 CSA B228.1;

.2 SMACNA - HVAC, Duct Construction Standard.

2.2 ACCESS DOORS IN DUCTS

.1 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.2 Gaskets: neoprene, 20 mm x 10 mm.

2.3 TURNING VANES

.1 Factory or shop fabricated, single thickness or double thickness with trailing edge, to recommendations of SMACNA and as indicated.

2.4 INSTRUMENT TEST

.1 1.6 mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

.5 Acceptable products: IP1 or IP2 from Duro Dyne. Replacement materials or products: approved by addendum according to Instructions to bidders.

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 data sheet.

3.2 INSTALLATION

.1 Access Doors and Viewing Panels:

- .1 Size:
  - .1 300 mm x 300 mm for servicing entry.
  - .2 As indicated.
- .2 Servicing access door location:
  - .1 Fire and smoke dampers.
  - .2 Elsewhere as indicated.

.2 Instrument Test Ports:

- .1 General:
  - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .2 Locate to permit easy manipulation of instruments.
- .3 Install insulation port extensions as required.
- .4 Locations:
  - .1 For traverse readings:
    - .1 Inlets and outlets of fan systems.
    - .2 And as indicated.
  - .2 For temperature readings:
    - .1 Downstream of junctions of two converging air streams of different temperatures.
    - .2 And as indicated.

.3 Turning vanes:

- .1 Install in accordance with recommendations of SMACNA and as indicated.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services

.1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.

.2 Manufacturer's Field Services: 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, at stages listed:

.1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.

.2 Twice during progress of Work at 25% and 60% complete.

.3 Upon completion of the Work, after cleaning is carried out.

.4 Obtain reports, within three (3) days of review, and submit, immediately, to Departmental Representative.

3.4 CLEANING

.1 Perform cleaning operations as specified in section 01 74 11 - Cleaning.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 21 05 01 - Common Work Results - Mechanical.

.2 Section 23 05 00 - Common Work Results for HVAC.

.3 Section 23 31 13 01 - Metal Ducts - Low Pressure to 500 Pa.

1.2 REFERENCES

.1 American National Standards Institute/National Fire Protection Association (ANSI/NFPA).

.1 ANSI/NFPA 90A-2002, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.3 Underwriters Laboratories Inc. (UL).

.1 UL-555, Standard for Safety Fire Dampers.

.4 Underwriters Laboratories of Canada (ULC).

.1 CAN4-S112-M1990, Fire Test of Fire Damper Assemblies.

.2 CAN4-S112.2-M84, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies.

.3 ULC-S505-1974, Fusible Links for Fire Protection Service.

1.3 SUBMITTALS

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Product Data:

.1 Indicate the following:

.1 Fire dampers.

.2 Fusible links.

.3 Design details of break-away joints.

.3 Certificates:

.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Instructions:

.1 Submit manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in section 01 78 00 - Closeout Submittals.

1.5 QUALITY ASSURANCE

.1 Health and Safety Requirements

.1 Do construction occupational health and safety in accordance with section 01 35 29. 06 - Health and Safety Requirements.

.2 Certificates:

.1 Catalogue or published ratings those obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.6 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with section 01 78 00 - Closeout Submittals.

.2 Provide following:

.1 Two (2) fusible links of each type.

1.7 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.

1.8 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling in accordance with section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 PRODUCTS

2.1 FIRE DAMPERS

.1 Fire dampers: listed and bear label of ULC, meet requirements of Fire Commissioner of Canada (FCC), ANSI/NFPA 90A and authorities having jurisdiction. Fire damper assemblies' fire tested in accordance with CAN4-S112.

.2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.

.3 Top hinged: multi-blade hinged or interlocking type; guillotine type; sized to maintain full duct cross section.

.4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.

.5 Fire dampers must be as specified in SMACNA, (Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems) with high pressure tightness:

.1 For rectangular ducts: type B or C

.6 Fire dampers with a factory installed sleeve: minimum thickness of sleeve to SMACNA and UL standard 555.

.7 Equip fire dampers with galvanized steel sleeve or frame installed disruption ductwork or impair damper operation.

.8 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform to ULC.

.9 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.

.10 40 x 40 x 3 mm retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced

.11 Retaining angles: provided with damper, on full perimeter of fire damper, on both sides of fire separation.

.1 Sleeves less than 1200 mm: galvanized steel sheet retaining angles 40 mm x 40 mm x 2.8 mm.

.2 Sleeves 1200 mm and greater: galvanized steel sheet retaining angles 40 mm x 40 mm x 3 mm.

.12 Protection time: to CNB and authorities having jurisdiction, but not less than 1.5 hours.

.13 Acceptable products: Controlled Air Manufacturing Ltd; Nailor; Penn Ventilator Canada Ltd.; Ruskin (Kerr-Hant); AMI. Replacement materials or products: approved by addendum according to Instructions to bidders.

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 Installation: to ANSI/NFPA 90A, ULC and « Basic Fire Damper Installation Details », SMACNA.

.2 Maintain integrity of fire separation.

.3 Fire dampers in duct each time they passed through a fire wall of the building, as:

.1 Walls of fire pump room;

.2 Locations indicated on drawings;

.4 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.

.5 Install access door adjacent to each damper.

.6 Co-ordinate with installer of firestopping.

.7 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.

.8 Install break-away joints of approved design on each side of fire separation.

.9 Installation: to SMACNA (Fire, Smoke and Radiation Damper, Installation Guide for HVAC Systems), Section Basic Fire Damper Installation Details.

.1 Wall installation: « Case 2: Vertical Fire Damper Installation ».

.2 Installation other than indicated in articles 9.1 are not accepted.

3.3 CLEANING

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

END OF SECTION