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1. GENERAL

1.1 WORK INCLUDED

- .1 Work in this section includes supply and spray application of polyurethane foam according to indications on drawing and this section.
- .2 Work that is the subject of this section includes labour, materials, tools and equipment required to perform insulation work as described in drawings and specifications and in accordance with provisions in related sections. Generally speaking, work pertains to insulation of a portion of walls located in water inlet room in basement of Building 19.

1.2 RELATED WORK

- .1 Final clean-up – Section 01 74 11

1.3 SCOPE OF WORK

- .1 Insulation of surfaces specified on drawings or indicated in details to include adjacent insets, projections, corners, holes, voids and other similar surfaces contained in general surfaces to insulate, in order to provide complete, continuous and uninterrupted insulation.

1.4 COMPLIANCE WITH STANDARDS

- .1 Contractor responsible for work in this section to coordinate work with other contractors working on site.
- .2 Perform insulation work according to schedule established by General Contractor in terms of constraints relating to other contractors' work.

1.5 REFERENCES

- .1 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101-04, Standard Methods of Fire Endurance Tests of Building Construction and Materials
 - .2 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
- .2 CAN/ULC S705.1-01, Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Material – Specification
- .3 CAN/ULC S705.2-05, Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Application
- .4 Canadian Urethane Foam Contractors Association Inc. (CUFCA), “ Installation manual for the application of sprayed on polyurethane foam.”
- .5 CCMC Evaluation Report 12380-R, Insulation material
- .6 CCMC Evaluation Report 13244-L, Spray-applied polyurethane foam
- .7 CCMC Evaluation Report 12893-R, Air barrier material
- .8 CNRC Report A-3136.1, Investigation of water vapour permeance on concrete blocks and gypsum board insulated with spray-applied polyurethane foam insulation.
- .9 CAN/ULC – S770-09, Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams
- .10 CNRC Report A-3136.1, Investigation of water vapour permeance on concrete blocks and gypsum board insulated with spray-applied polyurethane foam insulation.

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1.6 TECHNICAL DATA SHEETS AND MOCK-UPS

- .1 Submit, in accordance with general requirements and for all products used, technical data sheets, mock-ups and test results certifying product compliance with specified physical properties and standards.
- .2 Submit manufacturer's certification of polyurethane foam system compliance with modified National Building Code / NBC 2010.

1.7 QUALITY ASSURANCE

- .1 Installer who performs work addressed in this section to have at least six (6) years of experience.
- .2 At Departmental Representative's request, apply insulation to section of walls at least 5 m² in size, which represents typical characteristics of entire project; this mock-up may be part of finished work. Wait twenty-four (24) hours to allow Departmental Representative to inspect mock-up before covering. Proceed with applying other exterior building envelope components only after receiving Departmental Representative's authorization.

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver and store materials in original packaging, bearing name of product and manufacturer, expiration date, weight, associated standards and certifications, as well as any other relevant technical references.
- .2 Deliver and store materials within manufacturer's recommended temperature range.
- .3 Dispose of waste foam insulation daily in location designated by Departmental Representative and decontaminate empty drums in accordance with foam manufacturer's instructions, as stipulated in standard CAN/ULC S705.2-05.

1.9 APPLICATION REQUIREMENTS

- .1 Perform work of this section when surface and ambient air temperatures are within range specified in manufacturer's technical bulletin.
- .2 Perform work of this section when ambient air relative humidity is less than 80%.
- .3 Prepare oily or greasy surfaces with primer and/or according to manufacturer's recommendations.
- .4 Prime metal fastening components if (ambient and substrate) temperature is less than 5 °C.
- .5 At start of work and throughout execution, allow manufacturer's representatives or designated persons to access construction site to provide any necessary technical assistance.

1.10 PROTECTION

- .1 Provide adequate ventilation in zone where insulation will be applied, in order to ensure safe working environment.
- .2 Protect workers according to manufacturer's recommendations and standards.
- .3 Protect adjacent surfaces and equipment from damage by overspray, splashing and drifting of spray foam insulation.
- .4 Remove foam waste from site daily to location designated by Departmental Representative, and de-contaminate empty barrels in accordance with insulation manufacturer's instructions.

1.11 INSPECTION AND TEST LABORATORY

- .1 Departmental Representative may mandate and assume costs to have an independent laboratory inspect and analyze polyurethane foam insulation products and application, as well as finished product.

- .2 Allow representatives mandated by Departmental Representative to access construction site and provide samples or allow sampling as required.
- .3 Follow laboratory's recommendations along with insulation product manufacturer's instructions, as applicable.

2.0 PRODUCTS

2.1 ENVIRONMENTAL REQUIREMENTS

- .1 Follow manufacturer's recommendations. Product to contain no CFCs, HCFCs or ozone-depleting substances; zero ODS.
- .2 Insulation to be sprayed on building to at least contain a total of 18% recycled products from a post-consumer and post-industrial source. Percentage to be calculated according to weight of recycled products compared to weight of spray system.
- .3 Insulation to include renewable content, e.g.: soybeans, flax or sunflowers.

2.2 MATERIALS

- .1 Spray-applied polyurethane foam insulation to CAN/ULC S705.1-01 (including modifications 1 & 2), in accordance with following performance objectives:

		Test	Objecti	Result	Unit
.1	Density:	ASTM D1622	Min.	33	Kg/m3
.2	Thermal resistance	ASTM c518, 180J/23O C	Min.	.17/25 mm	RSI
.3	Long-term resistance	CAN/ULC S 770	Min.	1.04/25 mm	RSI
.4	Dimensional stability	ASTM D-2126			
		-20 OC	Min.	-0.03	%
		70 OC R.H. 97 ±3%	Max.	+9.8	%
		80 OC	Max.	+2.9	%
.5	Flame spread rating	CAN/ULC S 102-03	Max.	200	IPF
.6	Smoke emission	CAN/ULC S 102-03	Max.	396	IDF
.7	Compressive strength	ASTM D1621	Min.	195	KPa
.8	Tensile strength	ASTM D1623	Min.	355	KPa
.9	Open-cell content	ASTM D2856	Min.	6.0	%
.10	Water absorption	ASTM D2842	Min.	0.8	%
.11	Air barrier materials	CCMC 07273 (25 mm)	Max.	69	Ng / P
.12	Mould resistant	ASTM C1338	Min.	No growth	
.13	V.O.C. CAN/ULC S 774	Max	1		

- .2 Reference product: Airmetic 0223 by Demilec, or approved equivalent.

2.3 PRIMERS

- .1 Primers for oily metal and PVC surfaces: to insulation manufacturer's recommendations:
 - .1 Primer for metal surfaces: LSC 517 by Lepage, red in colour.
- .2 Primers: to insulation manufacturer's recommendations and standard CAN/ULC S-705.2-05, taking into account different surfaces to insulate.

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2.4 EQUIPMENT

- .1 Spraying equipment: to CAN/ULC S705.2-05 and manufacturer's recommendations.

3.0 EXECUTION

3.1 VERIFICATIONS

- .1 Verify that work already completed is ready to receive work of this section. Notify Departmental Representative of any anomaly or non-compliance. Perform work only once all corrective actions have been implemented.
- .2 Verify surface conditions according to provisions of CAN/ULC S705.2-05:
 - .1 Surfaces to be covered with foam insulation to be free of excess humidity, gel, oil, rust and all other foreign matter that could have a negative impact on product bond.
 - .2 Ensure substrates (concrete, mortar, primers or other potential surfaces) have cured completely before spraying foam.
 - .3 Ensure membranes and coatings on different substrates have adequately adhered, taking into account climatic conditions when applying thermal insulating material.
 - .4 Comply with acceptable humidity content for various materials.
 - .5 Follow manufacturer's recommendations when special conditions arise.
- .3 Ensure that all work to be performed before insulating is complete. This work includes, but is not limited to:
 - .1 Furring, blocking, rough bucks, nailing strips, encased items
 - .2 Coating, membrane, flashing, counter-flashing, mechanical fasteners
 - .3 Priming

3.2 INSTALLATION

- .1 Priming: to CAN/ULC S705.2-05.
- .2 Apply insulation to clean and dry surfaces, to CAN/ULC S705.2-05 and manufacturer's instructions.
- .3 Spray foam in successive layers at least 15 mm (5/8") thick, but no more than 50 mm (2") thick, to obtain final thickness of 25 mm \pm 6 mm on walls, as indicated on drawings.
- .4 Cooperate with other trades and provide, in timely manner, all relevant information pertaining to executing work of this section.
- .5 Verify that empty space is sufficient to receive required thickness of insulation.
- .6 Apply insulation so as to obtain even surface, free of gaps and voids.
- .7 Spray insulation with appropriate equipment as recommended by insulation manufacturer.
- .8 Ensure equipment is clean and in perfect working order; immediately remove defective equipment from construction site or repair on-site.
- .9 Apply and/or spray to strict recommendations of manufacturer of products used.
- .10 Departmental Representative to require presence of manufacturer's technical representative at start of work, in order to ensure and approve application method and results to obtain. Mock-up of work on site will be used for this purpose. Departmental Representative reserves right at any time during work to require manufacturer's technical representative to be present, in case of doubt regarding application method for a specific task and/or if certain tasks require application processes other than that commonly recommended by insulation manufacturer.

3.3 FIELD QUALITY CONTROL

- .1 At Departmental Representative's request, foam insulation manufacturer to prepare field quality control report.

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3.4 TOLERANCES

- .1 Apply product to obtain average thickness (9 measurements over 1 m² surface) of ± 6 mm (1/4”), as indicated on drawings. Perform at least one (1) verification every 150 m² of surface sprayed.
- .2 Apply insulation so insulating value is uniform over entire surface, as stipulated in 2005 N.B.C., article 9.25.2.3.1).

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 National Research Council of Canada (NRC)
 - .1 National Building Code – Canada 2015 (NBC)

1.2 DEFINITIONS

- .1 Fire stop material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Technical data sheets
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for: Include product characteristics, performance criteria, physical size, limitations and finish.

Part 2 Product

2.1 MATERIALS

- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115, not to exceed opening sizes for which they are intended.
 - .2 Fire stop system rating: (Refer to drawings.)
- .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 access to disassembled installations 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 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .10 Sealants for vertical joints: non-sagging.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and technical data sheets.

3.2 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
 - .1 Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation.
- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 EXECUTION

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.

3.4 SPECIFIC REQUIREMENTS

- .1 Special requirements for fire stopping and smoke seal materials at openings and penetrations in fire resistant rated assemblies are as follows:
 - .1 No dust generation
 - .2 Movement
 - .3 East of access to disassembled installations

3.5 WORK SEQUENCE

- .1 Proceed with installation only when submittals have been reviewed by Departmental Representative.
- .2 Mechanical pipe insulation: fire stop system component.
 - .1 Ensure pipe insulation installation precedes fire stopping.

3.6 FIELD QUALITY CONTROL

- .1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
- .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 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 construction site visits, to review work, as directed in PART 1 – QUALITY ASSURANCE.

3.7 CLEAN UP

- .1 Clean in accordance with Section 01 74 11 – Clean Up.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.8 LOCATION OF FIRE STOP ASSEMBLIES

- .1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
 - .2 Edge of floor slabs at curtain wall and precast concrete panels.
 - .3 Top of fire-resistance rated masonry and gypsum board partitions.
 - .4 Intersection of fire-resistance rated masonry and gypsum board partitions.
 - .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
 - .6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
 - .7 Around mechanical and electrical assemblies penetrating fire separations.

END OF SECTION