

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 04 05 19 – Masonry anchorage and reinforcing
- .2 Section 07 26 00 - Vapour retarders.
- .3 Section 08 44 13 - Glazed aluminum curtain walls.
- .4 Section 09 21 16 - Gypsum Board Assemblies.
- .5 Section 09 22 16 - Non-structural Metal Framing

1.2 REFERENCES

- .1 Canadian Urethane Foam Contractors Association (CUFCA)
- .2 Green Seal (GS)
 - .1 GS-11, Standard for Paints and Coatings.
- .3 South Coast Air Quality Management District (SCAQMD)
 - .1 SCAQMD Rule 1113-13, Architectural Coatings.
- .4 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM C518-15, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - .2 ASTM C1338-14, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
 - .3 ASTM D1621-10, Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
 - .4 ASTM D1622-14, Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 - .5 ASTM D1623-09, Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
 - .6 ASTM D2126-15, Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
 - .7 ASTM D2842-97, Standard Test Method for Surface Strength of Paper (Wax Pick Method).
 - .8 ASTM D6226-15, Standard Test Method for Open Cell Content of Rigid Cellular Plastics.
 - .9 ASTM E 96-15, Test Methods for Water Vapour Transmission of Materials.
- .5 Underwriters Laboratories of Canada (ULC).
 - .1 CAN/ULC-S101-14, 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.
 - .3 CAN/ULC-S705.1-15, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density.

- .4 CAN/ULC-S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Application.
- .5 CAN/ULC-S770-15, Standard test method for determination of long term thermal resistance of closed-cell thermal insulating foams.
- .6 CAN/ULC-S774-14, Standard Laboratory Guide for the Determination of Volatile Organic Compound Emissions from Polyurethane Foam.
- .6 Canadian Urethane Foam Contractors Association (CUFCA).
 - .1 Quality Assurance Program.
 - .2 Sprayed Polyurethane Foam – Certified Installer – Manual.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section [01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
- .3 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Test reports: submit certified test reports for insulation from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .2 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.
 - .3 Submit laboratory report on compatibility and adhesion between various products used: polyurethane, coatings, membranes, all other substrates.
- .4 Manufacturer's inspection reports
 - .1 Field inspection reports by manufacturer: Submit no later than three (3) days after inspections set out in FIELD QUALITY CONTROL in Part 3, with copies of manufacturer's written reports indicating that work complies with prescribed criteria.

1.4 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Installer doing work under this section must be trained and accredited by CUFCA.
- .3 Contractor conducting work under this section must hold a licence in good standing from certifying organization CUFCA (Canadian Urethane Foam Contractors Association).
 - .1 Provide to CUFCA a copy of insulation contractor's certification licence, names of polyurethane installers and a copy of their accreditations.
- .4 Mock-up:

- .1 Construct mock-up 10 m² minimum, of sprayed insulation including one inside corner, one outside corner, one openings and the overall typical project characteristics. Mock-up may be part of finished work.
- .5 Provide a copy of daily quality control reports as required under CAN/ULC-S705.2.
- .6 Role of manufacturer's representative:
 - .1 Verify substrate prior to commencement of work, during application and upon completion.
 - .2 Provide technical assistance to installer and assist with proper installation of insulation.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements
 - .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

1.6 SITE CONDITIONS AND PROTECTION MEASURES

- .1 Ventilate area in accordance with Section 01 51 00 - Temporary Utilities.
- .2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hour after application to maintain non-toxic, nonpolluted, safe working conditions.
- .3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.
- .5 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
- .6 For spraying in inhabited buildings:
 - .1 Delineate and isolate work area.
 - .2 All ventilation conduit openings to be sealed prior to spraying.
 - .3 Install exhaust fan for air exfiltration outside building.
 - .4 Work area to be under negative pressure, at minimum exfiltration rate of 0.3 ACH (air change per hour).
 - .5 Work area to be kept under negative pressure for minimum of 24 hours.
- .7 Protect adjacent surfaces from damage that may be caused by projection.

Part 2 Products**2.1 INSULATION**

- .1 Sprayed on insulation: sprayed polyurethane foam closed-cell, to CAN/ULC S705.1, TYPE 2.
 - .1 Density: ASTM D1622 minimum : 33 Kg/m³
 - .2 Thermal resistance: ASTM C518, 180 j /23⁰C minimum 1,17 / 25mm RSI
 - .3 Long term thermal resistance: CAN/ULC S770 minimum 1,05 / 25mm RSI
 - .4 Dimensional stability: ASTM D 2126 (% change in volume, 28-day free sample), -200C Min., -0.03%, 70⁰C, H.R.>97 +/- 3% Max. +9.8%, 80⁰C, Max. +2.9%.
 - .5 Flame spread: CAN/ULC S102 Max. 200 IPF
 - .6 Smoke development: CAN/ULC S102 Max 396 IDF
 - .7 Compressive resistance: ASTM D1621 minimum 195 KPa
 - .8 Tear resistance: ASTM D1623 minimum 355 KPa
 - .9 Open cells: ASTM D6226 < 1%
 - .10 Water absorption: ASTM D2842 Max. 0.8%
 - .11 Mould resistance: ASTM C1338 minimum, no growth
 - .12 VOC: CAN/ULC S 774, max. 1 day
- .2 Insulation applied by injection: semi-rigid dual-component low-density polyurethane foam for application by injection, in accordance with CAN/ULC S705.1.
 - .1 Density: ASTM-D-1622, 8.08 kg/m³
 - .2 Water absorption (%): ASTM D-2842, 74%
 - .3 Heat resistance: ASTM C-518, 0.61 / 25mm RSI (180 days at 23°C)
 - .4 Dimensional stability: ASTM D-2126 % variation in volume (28 days)

-20°C min.	0.8%
70°C max.	-2.3% (90% HR)
- .3 Primers: in accordance with manufacturer's recommendations for surface conditions.
- .4 Thermal barrier: Portland cement based cementitious fireproofing approved by Underwriters Laboratories (ULC).
 - .1 Density: 384 kg/m³
 - .2 Bond strength : 2441 kg/m²

2.2 EQUIPEMENT

- .1 Spray equipment must comply with CAN/ULC S705.2 and manufacturer's recommendations.

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 datasheets.

3.2 VERIFICATION

- .1 Verify if work already carried out is ready for work under this section. Report any discrepancy or non-compliant component. Do not begin work until corrective measures have been applied.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
- .2 Ensure that all work to be performed before application of insulation is completed. This work includes, but is not limited to, the following:
 - .1 Masonry links;
 - .2 Furring, blockings, rough frames, backs of fasteners, recessed items;
 - .3 Coating, membrane, flashing, counter-flashing;
 - .4 Mechanical restraints;
 - .5 Mechanical and electrical work;
 - .6 Firewall;
 - .7 Primer.
- .3 In accordance with CAN/ULC-S705.2 and requirements below, check these conditions:
 - .1 Surfaces to be covered with foam thermal insulation must be free of moisture, frost, oil, rust or other foreign matter that may hamper product adhesion. In case of doubt, apply primer.
 - .2 Ensure full curing of substrates: concrete, mortar, coatings, membranes, primers or any other surfaces, before foam is sprayed.
 - .3 Ensure that adhesion of membranes and coatings to various substrates is adequate, taking account of weather conditions when membranes, coatings and sprayed insulation are applied.
- .4 Oily surfaces such as Z bars, steel deck, curtain wall purlin and mullion to be primed as described in CAN/ULC-S705.2, Section A 1.7.
- .5 Comply with acceptable moisture content for each material.

3.3 APPLICATION

- .1 Prime galvanized metal surfaces (sous-entremises) and others as recommended by manufacturer.
- .2 Drill hollow structural elements to allow the injection of insulation where indicated.
- .3 Temporarily brace doors and windows to prevent warping of frames due to expansion of sprayed in place insulation.
- .4 Apply insulation so as to ensure continuous heat protection to building items and empty spaces.
- .5 Follow recommendations in CAN/ULC-S705.2 regarding use of primer.

- .6 Apply insulation on clean, dry surfaces and when weather conditions meet requirements in CAN/ULC-S705.2 and in manufacturer's instructions.
- .7 Apply insulation when only when surface temperatures of substrate and ambient air are above -20°C .
- .8 Project insulation in successive layers each at least 15 mm and at most 50 mm thick.
- .9 Carefully adjust insulation on items to be covered and around electrical boxes, pipes, air ducts and framing running through it.
- .10 Do not apply insulation less than 75 mm from chimneys, steam ducts, recessed lighting or other heat sources.
- .11 In places where plastic foam insulation is exposed in shaft and depending on the details to the drawings, cover the insulation with a thermal barrier continues according to regulations and the requirements of the manufacturer.
- .12 Do not enclose insulation until installation work has been inspected and approved by Departmental Representative.

3.4 TOLERANCE

- .1 Apply product so as to have average total thickness of $\pm 6\text{mm}$ as indicated in drawings. Perform at least one inspection for every 150 m^2 of application surface.
- .2 Average is based on result of nine readings on a surface of 1 m^2 .

3.5 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 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.

3.6 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Clean adjacent surfaces.

END OF SECTION