

Part 1 General

1.1 REFERENCES

- .1 Canadian Urethane Foam Contractors' Association Inc. (CUFCA)
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 South Coast Air Quality Management District (SCAQMD), California State SCAQMD Rule 1113-11, Architectural Coatings.
- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101-07, Fire Endurance Tests of Building Construction and Materials.
 - .2 CAN/ULC-S102-10, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .3 CAN/ULC-S705.1-01 and amendments, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification
 - .4 CAN/ULC-S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.
- .5 American Association of Textile Chemists and Colorists
 - .1 AATCC Test Method 127-2008, Water Resistance: Hydrostatic Pressure Test

1.2 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 three copies 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 Standards Council of Canada accredited testing laboratory, indicating determined values of specified performance characteristics and physical properties and compliance with requirements.
 - .2 Provide the CCMC Evaluation Report and the manufacturer's documentation confirming material has been evaluated and conforms to CAN/ULC S705.1-01.
 - .3 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.

- .4 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures, ventilation requirements, minimum and maximum pass thicknesses, re-occupancy criteria.
- .5 Manufacturer's Field Reports: submit manufacturer's written reports within three days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.
- .6 Credentials: submit names, certifications, training and experience of personnel involved in equipment and component set-up, component mixing and spray-foam application.
- .7 Submit proof of License of the Contractor by CUFCA (Canadian Urethane Foam Contractors Association Inc.) prior to commencing the work.

1.3 QUALITY ASSURANCE

- .1 Contractor and applicators to conform to CUFCA Quality Assurance Program.
- .2 Qualifications:
 - .1 Installer: person specializing in sprayed insulation installations with five years documented experience, training to CAN/ULC S705.2-05 and certified as having required licenses and competencies by manufacturer and CUFCA (Canadian Urethane Foam Contractors Association) SPA Quality Assurance Program.
 - .2 Contractor performing work under this section must be licensed under the SPF Quality Assurance Program (QAP) used by CUFCA (Canadian Urethane Foam Contractors Association). The contractor shall, under the QAP Licensing Agreement and as required by the CAN/ULC S705.2-05, only purchase and install, for this project, only material that conforms to the requirements of CAN/ULC S705.1-01.
 - .3 Manufacturer: company with minimum five years experience in producing of material used for work required for this project, with sufficient production capacity to produce and deliver required units without causing delay in work.
- .3 Mock-up:
 - .1 Construct mock-up in accordance with [Section 01 45 00 - Quality Control](#).
 - .2 Construct mock-up of spray applied polyurethane insulation, including substrate, at:
 - .1 Intersection of a crawlspace front wall, sidewall and floor, extending minimum 610 mm in all four directions.
 - .2 Intersection of a crawlspace front wall and sidewall and a first floor assembly, extending minimum 610 mm in all three directions.
 - .3 Arrange for observation and determination of approval of mock-up by Departmental Representative before proceeding with sprayed insulation work.
- .4 Health and Safety Requirements: worker protection:
 - .1 Protect workers as recommended by CAN/ULC-S705.2 and manufacturer's recommendations:
 - .2 Workers must wear NIOSH-approved full face or hood-type supplied air respirator, MDI (methylene diphenyl diisocyanate)-resistant gloves, MDI-

resistant long-sleeve coveralls or full body suit with hood, MDI-resistant fitted boots/booties, when applying foam insulation.

- .3 Workers must not eat, drink or smoke while applying foam insulation.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with [Section 01 61 00 - Common Product Requirements](#).
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Materials are to be delivered in original containers and packaged with appropriate MSDS and labels.
 - .4 Containers shall be marked as required by the CAN/ULC S705.1-01 Material standard. The “use before” date shall be included on the drum label.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials in accordance with [Section 01 74 21 - Construction/Demolition Waste Management and Disposal](#).

1.5 SITE CONDITIONS

- .1 Ventilate area during application in accordance with CAN/ULC-S705.2, during the time period determined in accordance with CAN/ULC-S705.1, and 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, unpolluted, safe working conditions.
- .3 Prior to spray-applied polyurethane application, install existing caps on supply air ducts discharging into crawlspace; mechanically fasten and seal with foil tape.
- .4 Arrange with Departmental Representative for shut-down of dwelling unit furnace and air distribution fan during ventilation period.
- .5 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .6 Protect adjacent surfaces, equipment and devices from damage by overspray, fall-out, and dusting of insulation materials.
- .7 Apply insulation only when all surfaces and ambient temperatures are within manufacturers' prescribed limits.

Part 2 Products

2.1 MATERIALS

- .1 Insulation: spray polyurethane to CAN/ULC-S705.1.
- .2 Primers: in accordance with manufacturer's recommendations for surface conditions.
 - .1 Maximum VOC limit 100 g/l to SCAQMD Rule 1113.
- .3 Spray Applied Polyurethane Substrate
 - .1 Spunbonded polyolefin sheet material made from 100% polyethylene.
 - .2 Flexible, non-woven, non-perforated fabric-like material.
 - .3 Minimum water vapour permeance: 3000 ng/(Pa·s·m²) to ASTM E-96 B.
 - .4 Minimum water penetration resistance: 280 cm to ATTC 127.
- .4 Mastic tape: double-sided, pressure sensitive, butyl rubber, mastic tape; 0.9 mm thick, 1.7 kg per 30.5 m, 38 mm width, peel strength 84.5 N, shear strength 138 N.

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 APPLICATION

- .1 Cover vapor barrier material with spunbonded polyolefin material as substrate for spray applied polyurethane foam insulation. Extend spunbonded polyolefin material up crawlspace walls and columns 508 mm to cover vapour barrier material.
- .2 Install spunbonded polyolefin material tightly against polyethylene ground cover material. Bridging of polyolefin material not permitted.
- .3 Join lap joints of spunbonded polyolefin as follows:
 - .1 Install single row of double sided mastic tape on bottom sheet at 100 mm from edge of bottom panel.
 - .2 Lap adjoining top sheet 750 mm and press into mastic tape.
- .4 Apply insulation to clean and dry surfaces in accordance with CAN/ULC-S705.2 and manufacturer's printed instructions.
- .5 Apply insulation only when surfaces and environmental conditions are within limits prescribed by the material manufacturer and in accordance with CAN/ULC S705.2.
- .6 Apply insulation to substrates approved by manufacturer.
- .7 Use primer where recommended by manufacturer.

- .8 Apply sprayed foam insulation in multiple passes, in accordance with manufacturer's recommendations and site-specific conditions, to achieve total thickness. Passes shall be not less than 15mm and not greater than 50mm. During Pre-Construction Meeting advise Departmental Representative of planned thickness of each pass.
- .9 Allow each lift to sufficiently cool before applying next pass.

3.3 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 and CAN/ULC-S705.2-05.
- .2 Installer's Field Services:
 - .1 Conduct on-site daily inspection, measurement and testing in accordance with CAN/ULC S705.2-05. Forward to the Departmental Representative copies of the Daily Work Record upon request.
 - .2 At the start of each day measure and record internal temperature during reaction process of initial pass. Provide measurement data to Departmental Representative.
 - .3 Measure and record thickness of cured foam at nine locations within each crawlspace: one measurement each wall and five measurements on floor. Record location of measurement and measured thickness on drawings provided by Departmental Representative.

3.4 CLEANING

- .1 Proceed in accordance with [Section 01 74 11 - Cleaning](#).
- .2 Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened.
- .3 On 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 ASTM
 - .1 ASTM E-1745-2011 Standard Specification for Plastic Water Vapor Retarders Used in Contact With Soil or Granular Fill under Concrete Slabs
 - .2 ASTM E-154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, On Walls, or as Ground Covers.
 - .3 ASTM E-96 Standard Test Method for Water Vapor Transmission of Materials
 - .4 ASTM D-882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting
 - .5 ASTM D-1709 Standard Test Methods for Impact Resistance of Plastic Fill by the Free Falling Dart Method
 - .6 ASTM D-2582 Puncture-Propagation Resistance of Plastic Film and Thin Sheeting
 - .7 ASTM D-1004 Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting

1.2 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:
 - .1 Product characteristics.
 - .2 Performance criteria.
 - .3 Limitations.
 - .4 Product samples.
 - .3 Submit three copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).
- .4 Quality assurance submittals:
 - .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 and comply with written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

1.3 QUALITY ASSURANCE

- .1 Mock-Ups:
 - .1 Construct mock-ups in accordance with [Section 01 45 00 - Quality Control](#).

- .2 Construct in-situ mock-up of sheet vapour barrier installation including one ground lap joint, one inside corner, one crawlspace floor pipe penetration, one column and at termination on foundation wall. Mock-up may be part of finished work.
- .3 Mock-up will be used to judge workmanship, substrate preparation, and material application.
- .4 Locate where indicated.
- .5 Arrange for observation and determination of approval of mock-up by Departmental Representative before proceeding with vapour barrier work.
- .2 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials in accordance with [Section 01 74 21 - Construction/Demolition Waste Management and Disposal](#).

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with [Section 01 47 15 - Sustainable Requirements: Construction](#).

2.2 SHEET VAPOUR BARRIER

- .1 Polyethylene membrane:
 - .1 0.254 mm thick to ASTM D-2103.
 - .2 Maximum water vapour permeance: 1.149 ng/(Pa·s·m²) to ASTM E-96
 - .3 Minimum puncture resistance: 900 grams to ASTM D-1709
 - .4 Minimum tensile strength: 7.8 kN/m to ASTM D-882

2.3 ACCESSORIES

- .1 Joint sealing tape: vapour impermeable pressure sensitive adhesive tape; consisting of same material as vapour barrier material, pressure sensitive adhesive and release paper; recommended by vapour barrier manufacturer; 50 mm wide for lap joints, penetrations and repairs.
- .2 Acoustic Sealant: synthetic rubber, single component, non-skinning, non-hardening; compatible with vapour retarder material; approved by polyethylene vapour retarder manufacturer.
- .3 Mastic tape: double-sided, pressure sensitive, butyl rubber, mastic tape; 0.9 mm thick, 1.7 kg per 30.5 m, 38 mm width, peel strength 84.5 N, shear strength 138 N.

Part 3 Execution

3.1 INSTALLATION

- .1 Remove and dispose of existing polyethylene film and sheathing tape.
- .2 Install sheet vapour retarder on floor of crawlspace. Extend vapour retarder material up crawlspace walls and columns 406 mm. Seal perimeter of vapour retarder to concrete surfaces with double sided mastic tape.
- .3 Seal vapour retarder material at all pipes penetrating the crawlspace ground.
- .4 Install sheet vapour retarder material tight against all surfaces including at wall-wall, wall-floor and column-floor intersections. Bridging of material not permitted.
- .5 Use sheets of largest practical size to minimize joints.
- .6 Inspect for continuity. Repair punctures and tears with joint sealing tape before work is concealed.

3.2 PERIMETER SEALS

- .1 Seal perimeter of sheet vapour barrier as follows:
 - .1 Apply continuous bead of sealant to concrete substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.
 - .3 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.
 - .4 Seal perimeter edge of vapour barrier to concrete walls and columns with double sided mastic tape.

3.3 LAP JOINT SEALS

- .1 Seal lap joints of sheet vapour barrier as follows:
 - .1 Install two rows of double sided mastic tape, spaced 100 mm apart, on bottom sheet, at 700 mm from edge of bottom sheet.
 - .2 Lap adjoining top sheet 750 mm and press into mastic tape.
 - .3 Apply joint sealing tape over edge of top sheet.

3.4 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 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-2011, Fire Tests of Fire stop Systems.

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.
- .2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
- .4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.
 - .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.3 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 three copies of 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: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with

specifications for specified performance characteristics and physical properties.

- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and environmental conditions.
- .4 Installer Credentials: submit name, training and experience of installer personnel.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: person having demonstrated competency in fire stopping and smoke sealing installations, including training and documented experience on a minimum of three projects having similar requirements within the last three years.
- .2 Pre-Installation Meeting: during Pre-Construction Meeting:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building sub-trades.
 - .4 Review installation instructions and warranty requirements.
 - .5 Present approach and work plan.
 - .6 Establish procedure for arranging entry into tenant occupied spaces.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with [Section 01 61 00 - Common Product Requirements](#).
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.
- .2 Storage and Protection:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse, recycling or disposal in accordance with [Section 01 74 21 - Construction/Demolition Waste Management and Disposal](#).

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with [Section 01 47 15 - Sustainable Requirements: Construction](#).

2.2 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 and not to exceed opening sizes for which they are intended and conforming to specified special requirements described in PART 3.
 - .2 Fire stop system rating: FT
- .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 2010.
- .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 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 or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

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 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

- .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 un-penetrated 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 SPECIAL REQUIREMENTS

- .1 Location of special requirements for fire stopping and smoke seal materials at openings and penetrations in fire resistant rated assemblies are as follows:
 - .1 Movement: 100/50% (extension/compression).
 - .2 Crawlspace demising wall penetrations: FT rated system having a fire-resistance rating of not less than one hour.
 - .3 First floor assembly penetrations: Smoke seal system that provides protection against the spread of smoke or other products of combustion for a period of not less than 30 minutes.

3.5 SEQUENCES OF OPERATION

- .1 Proceed with installation only when submittals have been reviewed by Departmental Representative .

3.6 FIELD QUALITY CONTROL

- .1 Observation: notify Departmental Representative when ready for observation and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

3.7 CLEANING

- .1 Proceed in accordance with [Section 01 74 11 - Cleaning](#).
- .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 SCHEDULE

- .1 Fire stopping and smoke sealing:
 - .1 Fire stop existing penetrations through demising crawlspace walls by utilities and services where the existing firestopping does not provide a fire stop with an FT rated system having a fire resistance rating of one hour or greater.
 - .2 Smoke seal penetrations through the first floor assembly that would otherwise allow smoke or other products of combustion to directly move from the crawlspace to occupied spaces.

END OF SECTION