SECTION 07216 – CUFCA SPRAY POLYURETHANE FOAM AIR BARRIER SYSTEM

**PART 1 – GENERAL**

* 1. **Scope:**

All work done as part of Section 07 27 36 must conform to Contract and Division 1 Requirements.

* 1. **Work Included**

The work of this section shall include all labour, materials, equipment and installation methods required for installation of the CUFCA SPF Air Barrier System. The work includes the primary air/vapour barrier components as well as accessory products necessary to the building’s environmental separation (building wall envelope). The work includes but is not limited to the following:

* + 1. Closed cell, medium density spray applied polyurethane foam insulation (ccMDSPF) applied to concrete, concrete block, exterior grade gypsum, plywood and other components of the environmental separator.
		2. Self-Adhering Transition membranes at perimeter of all rough openings, dissimilar materials, roof tie-ins, interface between structural components (beams, columns and sheathing) and control and/or expansion joints.
		3. Primers and sealants necessary to the performance of the ccMDSPF and the self-adhering membrane materials.
		4. Formed metal insulation stops at rough openings, control and expansion joints, and at horizontal and vertical cavity wall firestopping.
	1. **Related Work:**
		1. Section 04 20 00 – Masonry Work
		2. Section 06 10 00 – Rough Carpentry
		3. Section 07 20 00 – Thermal Insulation
		4. Section 07 24 00 – Exterior Insulation and Finishing Systems
		5. Section 07 52 00 – Modified Bituminous Membrane Roofing System
		6. Section 07 84 00 – Fire Stopping
		7. Section 07 86 00 – Smoke Seals
		8. Section 07 90 00 – Joint Protection
		9. Section 08 11 00 – Metal Doors and Frames
		10. Section 08 50 00 – Windows
		11. Section 08 44 00 – Curtain Wall and Glazed Assemblies
		12. Section 09 20 00 – Gypsum Board
		13. Division 15 – Mechanical
		14. Division 16 – Electrical
	2. **References:**
		1. CAN/ULC-S705.1.01: Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Material Specification.
		2. CAN/ULC-S705.2.05: Spray Applied Rigid Polyurethane Foam, Medium Density – Application Specification.
		3. ULC-S718-13: Standard for Site Quality Assurance Program for Spray Polyurethane Foam
	3. **Test Results:**
		1. Submit all test results for all materials used prior to commencing any air barrier system work. The following submittals at a minimum:
			1. Test results for sprayed polyurethane foam material being used as part of the CUFCA SPF Air Barrier System. SPF material must meet or exceed all performance criteria as listed in 2.1 Spray-in-Place Polyurethane Foam Insulation. SPF material should also be listed as a CUFCA SPF Air Barrier System approved product.
			2. Test results for all air barrier components including self-adhering transition membranes, self-adhering through wall flashings, membrane fastening devices, metal closure materials, etc. All materials must be listed as an approved component of the CUFCA Air Barrier System.
			3. A copy of the photo identification of the CUFCA SPF Air Barrier System installer(s). CUFCA Certified Installer must be listed as of “current standing” by CUFCA.
			4. A copy of the certified CUFCA Contractor certificate demonstrating “current standing” within the Canadian Urethane Foam Contractors’ Association.

* 1. **Mock-Ups:**
		1. Create a 5m2 sample (minimum) of the proposed air barrier system. The sample area should contain representative self-adhering membrane applications including dissimilar materials, rough openings and through-wall flashings. The sample must demonstrate the interface between spray foam and associated air barrier system products.
		2. Using the sprayed-in-place polyurethane foam and self-adhering membrane sample, all required daily tests must be performed to demonstrate compliance with the CUFCA SPF Air Barrier System. The following tests must be demonstrated (and done on a daily basis thereafter):
			1. SPF core density test
			2. SPF adhesion/cohesion test
			3. Self-adhering transition test

The results of the tests must be recorded on the CUFCA SPF Air Barrier System Daily Work Sheet and submitted for approval.

* 1. **Protective Measures:**
		1. Ensure all structures are well protected, in accordance with the manufacturer’s recommendations.
		2. Protect all adjacent surfaces and equipment against any damage that may be caused by spray foam overspray beyond prescribed limits.
		3. Neutralize any and all liquid waste products in accordance with CAN/ULC-S705.2 disposal methods. Ensure all solid waste products are also disposed of in accordance with CAN/ULC-S705.2 disposal procedures.
	2. **Delivery, Storage and Handling:**

All air barrier system materials are to be delivered and stored in their original packaging bearing the manufacturer’s name, quantity, CCMC Evaluation Listing number, manufacturer date and expiry date (if applicable), and other pertinent technical information.

* 1. **Quality Assurance:**
		1. All auxiliary air barrier materials must be installed by, or supervised by, a certified CUFCA SPF Air Barrier System installer. Certified Installer Photo ID must be available upon request.
		2. All transition membrane materials must be installed by, or supervised by, a certified CUFCA SPF Air Barrier System installer. Certified Installer Photo ID must be available upon request.

Daily Testing— The CUFCA SPF Air Barrier System requires the installer to perform tests on the self-adhered transition membranes, any liquid-applied membranes and the sprayed polyurethane foam.

Self-adhered transition membranes require adhesion testing using COM-TEN Industries Series 301N1M equipment (or equivalent). The minimum testing requirements for the self-adhered transition membranes are:

One test per 100m2 of wall area, including a per project minimum of:

* + - One test of roof tie-ins (if applicable)
		- One test of beam/column interface (if applicable)
		- Two tests of base flashings (if applicable)
		- Two tests of rough openings (if applicable)
		- All control and/or expansion joints (if applicable)
		1. All polyurethane spray foam insulation must be installed by, or supervised by, a certified CUFCA SPF Air Barrier System installer. Certified Installer Photo ID must be available upon request.

* + 1. All polyurethane spray foam insulation daily testing and administration required for the CAN/ULC-S705.2 compliance is required as part of the CUFCA SPF Air Barrier System. Daily work records are to be submitted to the CUFCA office to ensure compliance. The daily inspection requirements for polyurethane foam used as an air barrier material within the CUFCA SPF Air Barrier System include:
* Density check – every day, every project, every batch.
* Adhesion/Cohesion – every day, every project, every batch.
* Environmental tests – daily checks of humidity, wind speed, substrate temperature and ambient temperature.
	+ 1. Transition membranes are to be tested using the COM-TEN Series 301N1M equipment (or equivalent) to ensure a minimum adhesion of 110 kPa. Tests are not required for mechanically fastened materials.

* + 1. Every CUFCA SPF Air Barrier System project is subject to inspection by a CUFCA Certified Auditor. The number of inspections required is directly proportional to the size of the project and/or the requirements of the Consultant. At a minimum, a CUFCA SPF Air Barrier System must provide CUFCA certified audited inspections based on the following criteria:

**Project Size Required Inspection Inspection Intervals**

Up to 500m2 One 10 to 50% completion

501 to 1500m2 Two 10 and 50% completion

1501 to 2500m2 Three 10, 50 and 90% completion

Over 2501m2 Four 10, 50, 75 and 90% completion

* + 1. It is a requirement of every CUFCA SPF Air Barrier System project to include a CUFCA Third Party Warranty. However, the building owner must receive a CUFCA Third Party Warranty on all CUFCA SPF Air Barrier System projects. Thus, the CUFCA contractor must fill out the warranty registration form (and submit to the CUFCA office) prior to beginning a CUFCA SPF Air Barrier System project.
		2. All daily work records must be available to the Consultant upon request.
		3. Authorities related to the application of the CUFCA Air Barrier System, including but not limited to, material manufacturers, CUFCA auditors and Code officials shall be provided access to jobsite and daily work records upon request.
	1. **Environmental Requirements:**
		1. Apply spray polyurethane foam insulation only if the surface and ambient air temperatures are within the manufacturer’s prescribed limits (i.e. -200C to +350C). For transition membranes, strict adherence to the manufacturer’s prescribed limits is required.
		2. Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials. WHMIS guidelines are also to be used regarding labelling and provision of Material Safety Data Sheets (MSDS).
	2. **Surface Preparation:**
		1. Surfaces must be clean and dry as required by CAN/ULC-S705.2. The substrate must be free of all frost, dust, oil, grease, oxidization, or any other element that may affect adhesion of the air barrier system components.
		2. All transition membranes must be installed prior to the application of the spray polyurethane foam insulation. Transition membranes must be those certified for use within the CUFCA SPF Air Barrier System. All membranes must be installed in accordance with manufacturer’s guidelines.

* + 1. All of the following construction elements must be completed prior to application of the CUFCA SPF Air Barrier System:
			1. Installation of masonry anchoring system.
			2. Installation of opening closures (wood or metal).
			3. Installation of any electrical or mechanical penetrations.
			4. Roofing membranes or waterproofing materials.
			5. Air/vapour barrier transition membranes.
			6. Sub-girt framing members for exterior cladding.
			7. Protection of adjacent areas.
	1. **Conditions of Use:**
		1. Follow manufacturer’s written instructions when spraying polyurethane foam material (refer to manufacturer’s technical data sheet when required).
		2. Manufacturer’s recommendations should be adhered to with regard to ambient and substrate temperature limitations. Never spray polyurethane foam when there is a 170C difference between ambient and substrate temperatures without the written approval of SPF material manufacturer.

**PART 2 – PRODUCTS**

**2.1 Spray-in-Place Polyurethane Foam Insulation**

All polyurethane spray foam insulation products are to be approved (listed) by the CUFCA SPF Air Barrier System. SPF materials are to be closed cell, medium density spray polyurethane foam (ccMDSPF).

* + 1. ccMDSPF materials must meet or exceed the following criteria:
			1. Blowing Agent -HFO SolsticeTM by Honeywell.
			2. LTTR R-Value (CAN/ULC-S770) -2.0 K-m2/W RSI @50mm (R12)
			3. Compressive Strength (ASTM D1621) -195 kPa
			4. Core Density (ASTM D-1622) -33 kg/m3
			5. Open Cell Content (ASTM D-6226) - less than 1%
			6. Tensile Strength (ASTM D1623) - 355 kPa
			7. Vapour Permeance (ASTM E-96) - 37ng/Pa\*s\*m2
			8. Dimensional Stability (ASTM D-2126) - 9.8% volume change @ 700C, 97% RH
			9. Water Absorption (ASTM D-2842) - 0.8% by volume
			10. Flame Spread (CAN/ULC-S102) - 200
	1. **Spray-in-Place Polyurethane Foam Insulation Primers**

Manufacturer’s guidelines on the use of ccMDSPF primers must be adhered to when installing SPF materials. All metal surfaces are to receive a primer recommended primer (by SPF manufacturer).

* 1. **Self-Adhering Transition Membranes**

All self-adhering products are to be approved (listed) by the CUFCA SPF Air Barrier System. Self-adhering transition membranes must be SBS modified bitumen complete with a cross-laminated polyethylene film.

* + 1. Self-adhering transition membranes must meet or exceed the following criteria:
			1. Thickness - 1.0mm (40mils)
			2. Air Leakage (ASTM E283-91) -less than 0.005 L/s\*m2 @ 75 Pa
			3. Vapour Permeance (ASTM E-96) - 49 ng/Pa\*m2
			4. Elongation (ASTM D412 modified) - 200%
			5. Tensile Strength (ASTM D882) - 3.4 MPa @ 5000 psi
			6. Puncture Resistance (ASTM E154) -178N minimum
	1. **Self-Adhering Through-Wall Flashing Membranes**

All self-adhering products are to be approved (listed) by the CUFCA SPF Air Barrier System. Self-adhering through-wall flashing membranes must be SBS modified bitumen complete with a cross-laminated polyethylene film.

* + - 1. Thickness - 1.1mm (49mils)
			2. Air Leakage (ASTM E283-91) - less than 0.005 L/s\*m2 @ 75 Pa
			3. Vapour Permeance (ASTM E-96) - 2.8 ng/Pa\*m2
			4. Elongation (ASTM D412 modified) - 200%
			5. Tensile Strength (ASTM D882) - 3.95 MPa @ 5000 psi
			6. Puncture Resistance (ASTM E154) - 180N minimum
	1. **Self-Adhering Membrane Primers**

Manufacturer’s guidelines on the use of self-adhering primers must be adhered to when installing membrane materials. Primers must be consistent with the self-adhered membrane being installed. No alternative primers can be used with a self-adhering membrane without the written approval of the membrane manufacturer.

* 1. **Metal Closures**

When required, metal closures will be installed at all rough openings where insulation terminates. Closures shall be 18 ga. galvanized steel manufactured to the ASTM Z275 standard or aluminum zinc alloy coated steel manufactured to the ASTM AZ150 standard. The dimensions of the closure are specific to the thickness of the spray foam and the cavity. The closure shall extend 12mm beyond the foam thickness and be within 12mm of the inner wythe of the veneer. The closures shall be fastened to masonry/concrete with Tapcon screws. When installing to metal studs, self-tapping sheet metal screws, non-corrosive finish, of adequate length to penetrate the sheathing and stud framing by 12mm shall be used.

* 1. **Auxiliary Air Barrier Materials**

Materials used to ensure the continuity of the CUFCA SPF Air Barrier System shall be checked for compatibility with other materials. The SPF and membrane manufacturers shall give written confirmation that the materials are compatible with their products. Auxiliary air barrier materials may include – sealants, housewraps, tape, fastening bars, fasteners and sheet metal.

**2.7 Cavity Wall Firestopping**

* + 1. **Horizontal Firestopping**

When the cavity wall air space is greater than 25mm, a preformed metal angle comprising of 18ga. steel core zinc coating, as stipulated in ASTM A525 (galvanized steel G-90) shall be installed every 3 meters. Dimensions must be sufficient to allow the horizontal section to extend 12mm beyond the sprayed polyurethane foam surface. The remaining space between the metal firestopping and the inner wythe of the veneer shall be filled with 50% compressed mineral fiber.

* + 1. **Vertical Firestopping**

When the cavity wall air space is greater than 25mm, a preformed metal angle comprising of 28ga. steel core zinc coating, as stipulated in ASTM A525 (galvanized steel G-90) shall be installed every 20 meters. Dimensions must be sufficient to allow the vertical section to extend 12mm beyond the sprayed polyurethane foam surface. The remaining space between the metal firestopping and the inner wythe of the veneer shall be filled with 50% compressed mineral fiber.

**PART 3 – EXECUTION**

* 1. **Preparation**
		1. Ensure all surfaces are clean, dry and free of oil, wax, grease, dirt, excess mortar, rust, oxidation and other contaminants.
		2. Ensure new concrete has cured for a minimum of 14 days.
		3. All joints with a span greater than 12mm must be covered with sheet metal or filled with mortar before applying self-adhering membranes or sprayed polyurethane foam.
		4. Prime all surfaces that are to receive self-adhering transition membranes at rates suggested by manufacturer. Allow primer to ‘tackup’ for approximately 30 minutes prior to application of the self-adhering membrane.
		5. Prime all sheet metal surfaces that are to receive sprayed polyurethane foam with a primer suggested by the SPF manufacturer.
		6. Install metal closures around rough openings and any other areas where a foam stop is required.
		7. Install cavity wall firestopping when air space is greater than 25mm.
	2. **Transition Membrane Application**

Install transition membranes control joints, wall penetrations, connections between dissimilar materials (i.e. concrete block to sheathing), beams, rough openings, roof parapets and any and all other connections that may experience differential movement. When installing transition membranes:

* + 1. Only apply membranes to primed surfaces.
		2. Roll self-adhering membranes with a steel or polypropylene hand roller to ensure full contact.
		3. Connect to all window, door and parapet blocking connections by mechanically fastening with a metal bar or strap.
		4. Lap sheet membrane a minimum of 75mm on each connection substrate and overlap a minimum of 50mm at joints.
	1. **Spray-in-Place Polyurethane Foam Insulation Application**

All spray applied polyurethane foam insulation must be installed in accordance with the CAN/ULC-S705-2 Application Standard and the requirements of the CUFCA SPF Air Barrier System. When installing spray polyurethane foam:

* + 1. Install to a tolerance of +6mm/-0mm in relation to the specified thickness.
		2. Avoid the formation of sub-layer air pockets when installing SPF.
		3. Avoid spraying foam on any surfaces other than those indicated. Use drop sheets or masking tape to protect other surfaces.
		4. Once fully cured, remove all overspray from non-prescribed surfaces.
		5. Repair all spray foam damaged by other trades.
		6. Ensure the completed spray foam will be covered by finishes within 6 months of installation. Exposure to UV rays beyond 6 months will have a detrimental effect on the SPF’s physical properties. A manufacturer representative will need to be consulted on any foam exposed beyond 6 months.
		7. Do not spray polyurethane foam any closer than 75mm from chimneys, lighting fixtures and other heat sources. Do not spray the inside of any electrical junction boxes.
		8. When installing the system below temperatures of 100C, self-adhering membranes specifically formulated for cold applications must be used. If proper adhesion is not achieved, the membranes will require mechanical fastening.
		9. All mechanical fixtures should be covered with polyurethane foam to reduce thermal bridging.
		10. Spray polyurethane foam cannot be sprayed at temperatures below -200C or above 350C. The SPF manufacturer needs to be consulted on all applications when there is a significant difference in temperature between the ambient and substrate. Only with manufacturer’s written approval can foam be sprayed when there is a difference of 170C.
	1. **Site Testing**
		1. The certified installer shall conduct daily tests required by the CUFCA SPF Air Barrier System and CAN/ULC-S705.2.
		2. The certified install shall complete the daily work record and record the results of all testing. The daily work record shall be kept on site for routine inspection. Copies of the daily work record shall be forwarded to the Consultant upon request. Copies of the daily work record must be submitted to the CUFCA office.
		3. All costs incurred for daily testing are the responsibility of the Certified CUFCA SPF Air Barrier System Contractor.
	2. **CUFCA Third Party Inspection**
		1. CUFCA third party site inspection is a requirement of the CUFCA SPF Air Barrier System. The certified contractor is responsible to arrange for all testing requirements based on the size of the project.
		2. If the inspection reveals any installation defects, the CUFCA licensed Contractor shall immediately rectify all defects at his/her cost.

END OF SECTION 07216