Evaluation Report CCMC 14230-R
WALLTITE® XL01

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1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that "WALLTITE® XL01," when used as a thermal insulation in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code (NBC) of Canada 2010 and 2015:

- Clause 1.2.1.1.(1)(b) of Division A, as an alternative solution that achieves at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the following applicable acceptable solutions:
  - Article 5.9.1.1., Compliance with Applicable Standards (NBC 2015)
  - Article 5.10.1.1., Compliance with Applicable Standards (NBC 2010)
  - Clause 9.25.2.2.(1)(g), Insulation Materials (NBC 2010)
  - Clause 9.25.2.2.(1)(h), Insulation Materials (NBC 2015)
  - Article 9.25.2.5., Installation of Spray-Applied Polyurethane (NBC 2010 and NBC 2015)

This opinion is based on CCMC's evaluation of the technical evidence in Section 4 provided by the Report Holder.

2. Description

"WALLTITE® XL01" is a spray-applied, rigid polyurethane foam of medium density that has a closed-cell structure. The foaming system consists of two components that must be labelled with "CCMC 14230-R" and the following information:

- Isocyanate (Component A): "Elastospray® 8000A"; and
- Resin (Component B): "WALLTITE® XL01."

The two components are mixed on-site by a BASF Canada Inc.-qualified installer (see Section 3.2) with fixed-ratio positive displacement equipment.

This product is referred to as a 'high-lift' spray polyurethane foam whereby a thick layer of "WALLTITE® XL01" can be applied in a single pass. The product is installed at a maximum nominal thickness of 127 mm and a minimum nominal thickness of 50 mm. This installation method differs from the method described in CAN/ULC-S705.2-05, "Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Application," which specifies a 50-mm maximum nominal thickness for spray foam installed in a single pass.

The final cured product has a density of 32.25 kg/m^3 and is available in the following colour:

- Dark purple

At 50-mm thick, the design long-term thermal resistance (LTTR) value is 1.87 (m^2·K)/W. See Table 4.1.1 for estimated LTTR values at higher thicknesses.

The product is available in winter grade and regular grade formulations.

3. Conditions and Limitations

CCMC's compliance opinion in Section 1 is bound by "WALLTITE® XL01" being used in accordance with the conditions and limitations set out below.

3.1 General

- The cured polyurethane foam must have a minimum nominal thickness of 50 mm and a maximum nominal thickness of 127 mm. Any product sprayed to a thickness greater than 140 mm (maximum nominal thickness plus a field safety margin of 13 mm) must be removed from the substrate immediately(1) after application and the substrates sprayed again.

Note:

(1) IMPORTANT: spraying to a thickness greater than 140 mm may result in spontaneous combustion or poor foam quality.

- The application of the foam in multiple passes is beyond the scope of this evaluation.
- The polyurethane foam can be applied on the substrates listed in Table 4.2.1. Substrates must be clean, dry, and free of grease, frost, dust, rust and other contaminants that may affect the adhesion performance of the foam to the substrate.
- Below-grade (exterior side of foundation wall) and attic applications are beyond the scope of this evaluation.
- As required in Article 9.25.2.3., Installation of Thermal Insulation, of Division B of the NBC 2010 and NBC 2015, the insulation shall have a reasonably uniform insulation value over the entire face of the insulated area.
- The assessment of the fire hazard-peak temperature reached during foam application is only valid for the tested substrates specified in Table 4.4.1 and for foam applied in a single pass with a maximum nominal thickness of 127 mm.
- The peak temperatures of the thick single pass may affect the performance and durability of materials and equipment in contact with the foam (such as ducts and pipes). The performance of such components is beyond the scope of this evaluation. The measured maximum temperature of the foam while curing is specified in Table 4.4.1 for designers, builders, authorities having jurisdiction (AHJ), and other users to verify the potential fire hazard on utility services installed in the wall prior the foam installation. To lower the risk of damage—especially when installing over materials that may melt (i.e. polyethylene vapour/air barrier) —it is important to consider the timeframe in which the foam will reach ambient temperature. Additional details are provided in Table 4.4.1.
- The interior side of the polyurethane foam insulation must be covered with an approved thermal barrier as per:
    - Article 3.1.4.2., Protection of Foamed Plastics, of Division B of the NBC 2010 or NBC 2015;
    - Article 3.1.5.12., Combustible Insulation and its Protection, of Division B of the NBC 2010;
    - Article 3.1.5.15., Foamed Plastic Insulation, of Division B of the NBC 2015; or
    - Article 9.10.17.10., Protection of Foamed Plastics, of Division B of the NBC 2010 or NBC 2015.
- When applicable, the exterior surface of an exterior wall containing this insulation shall be designed in accordance with Section 9.10, Fire Protection, of Division B of the NBC 2010 or NBC 2015, or Section 3.2, Building Fire Safety, of Division B of the NBC 2010 or NBC 2015. The product shall not be used in exposed interior or exterior locations.
- The insulation must be kept away at least 75 mm (or as required by building regulations and safety codes) from heat-emitting devices (such as recessed lighting fixtures and chimneys). The insulation shall not be used inside electrical outlets or junction boxes.
- For retrofit construction, the time to occupancy is 25 hours when installed with the requisite ventilation of the segregated retrofit area as per CAN/ULC-S705.2. Additional details are provided in Note 3 of Table 4.1.1.
- When the product is installed in an exterior insulation sheathing-type application, the low air and water vapour-permeance value of the product requires that the wall assembly conform to Table 9.25.5.2., Ratio of Outboard to Inboard Thermal Resistance, of Division B of the NBC 2010 or NBC 2015.
- The product must not be installed after the expiry date printed on the label of each container. The product has a shelf life of four (4) months from the date of manufacture.
- The substrate temperatures are −15°C to 5°C for the winter grade formulation and 0°C to 40°C for the regular grade formulation. The appropriate formulation shall be chosen for the specific temperature conditions of application in consultation with BASF Canada Inc.
- The installation of the product must conform to the general requirements of CAN/ULC-S705.2-05, the manufacturer's specific installation instructions for their proprietary high-lift product and Sections 3.1 and 3.2 of this Evaluation Report.

- The continuous in-service temperature of the insulation must not exceed the range of −60°C to 80°C.

  The building envelope in which this product is installed must conform to the requirements of Division B of the NBC 2010 or NBC 2015 for vapour barrier, air barrier and dampproofing (interior below-grade walls).
- The product must be protected from ultraviolet radiation within 90 days of installation.
- The installation must be carried out by certified installers in accordance with the manufacturer's instruction manual, which must be available at the job site at all times during the installation for review by the building official.
- The components, "Elastospray® 8000A" isocyanate and "WALLTITE® XL01" resin, must have their respective containers (i.e., drums) identified by the phrase "CCMC 14230-R."

3.2 Qualified Installers

This is a site-manufactured product whereby BASF Canada Inc. requires that only specific qualified installers be authorized to install their proprietary spray-applied polyurethane insulation in buildings. In accordance with BASF Canada Inc.'s site quality assurance program (SQAP), the certification organization (CO) Caliber Quality Solutions Inc. (Caliber) has been commissioned to license the specified installers and issue them the requisite Caliber identification card. All specified installers must have a Caliber identification card.

3.3 Third-Party Site Auditing of Qualified Installers

As part of their SQAP, BASF Canada Inc. also stipulates that site audit inspections be conducted by site inspectors licensed by Caliber. Upon completion of the site audit, Caliber will report the product's conformity results and any corrective action required, if necessary, to BASF Canada Inc. Building officials who would like site-audit inspections to be conducted on specific building sites can contact Caliber at:

Caliber Quality Solutions Inc. (Caliber)
120 Eglington Avenue East, Suite 1000
Toronto, ON M4P 1E2

Tel.: 888-572-7435
Web site: www.caliberqa.com

4. Technical Evidence

The Report Holder has submitted technical documentation for CCMC's evaluation. Testing was conducted at laboratories recognized by CCMC. The corresponding technical evidence for this product is summarized below.

The following were the key performance requirements for the evaluation:

- **Material qualification**:
  - Foam basic properties per CAN/ULC-S705.1 requirements except for the sample preparation. Samples were sprayed at the maximum nominal thickness of 127 mm using a single pass instead of two passes of 30-mm each nominal thickness as specified in CAN/ULC-S705.1. Foam application of regular formulation at 23°C was used for testing as required in CAN/ULC-S705.1.
  - Key physical properties in high- and low-temperature applications.
- **Adhesion performance:** foam adhesion strength to different substrates (the manufacturer-selected substrates were wood, gypsum, and concrete). Foam application of regular formulation at high surface temperature was considered a worst-case scenario.
- **Foam uniformity:** foam cells uniformity when sprayed in different wall cavity dimensions. Foam application of regular formulation at high surface temperature and at maximum nominal thickness was considered a worst-case scenario.
- **Fire hazard:** maximum temperature achieved in the foam due to exothermic reaction (high internal temperature generated while curing). Foam application of winter grade formulation at lowest surface temperature was considered a worst-case scenario by the manufacturer.

4.1 Material Requirements

4.1.1 Physical Properties from Ambient Temperature Application

The basic properties of the product's regular formulation, when sprayed over polyethylene board having a surface temperature of 23°C, are presented in Table 4.1.1. Test specimens used for Table 4.1.1 were extracted from the central area of foam samples sprayed at a nominal 127-mm thickness.

Table 4.1.1 Physical Properties of the Product

Property		Unit	Requirement	Result
Air permeance for a 25-mm-thick specimen		L/(s·m^2)	≤ 0.020	0.0022
Apparent core density		kg/m^3	≥ 28.0	32.25
Compressive strength		kPa	≥ 170	232
Dimensional stability, without substrate volume change at:	**−20°C**	%	−1	0.6
	80°C		+8	1.3
	70°C, 97 ± 3% RH		+14	1.6
Surface burning characteristics for a 100-mm-thick specimen	**Flame-spread rating[1]**	–	≤ 500	240
Open-cell content volume		%	≤ 10	1.2
Initial thermal resistance for a 50-mm-thick specimen (after 13 days at 23°C)		(m^2·K)/W	Declare	2.46
Long-term thermal resistance (LTTR)[2] at	**125 mm**	(m^2·K)/W	Declare	4.84
	100 mm			3.77
	75 mm			2.81
	50 mm			1.87
Tensile strength		kPa	≥ 200	425
Volatile organic emissions (VOC)[3]		hrs	≤ 30 days	25
Water absorption by volume		%	≤ 4.0	0.73
Water vapour permeance (WVP) for a 50-mm-thick specimen	**Specimen with bottom skin intact (top skin removed)**	ng/(Pa·s·m^2)	≤ 60	40
Fungi resistance		–	No growth	None

Notes to Table 4.1.1:

(1) The published value is based on average results from three specimens (3) tested with skin intact for comparison purposes. For compliance with Part 9, Housing and Small Buildings, of Division B of the NBC 2010 and NBC 2015, flame-spread rating is not required. When the product is installed in other than Part 9 buildings, the flame-spread rating must be determined in compliance with the requirements of Part 3 of Division B of the NBC 2010 or NBC 2015.

(2) Testing was conducted in compliance with CAN/ULC-S770-09, "Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams."

(3) For retrofit construction (e.g., occupied buildings), the time to occupancy is one (1) day when installed with the requisite ventilation of the segregated retrofit area as per CAN/ULC-S705.2. CAN/ULC-S705.2 requires that the ventilation rate be no less than 0.3 air changes per hour within the working area during the application of the product and that the working area be isolated during spraying. The same ventilation rate is required after the product has been sprayed and for the time period of 25 hours shown in Table 4.1.1.

4.1.2 Physical Properties in High-Temperature Application

The air permeance and water vapour permeance of the product's regular formulation, when sprayed over polyethylene board having a surface temperature of 40°C, are presented in Table 4.1.2. Test specimens used for Table 4.1.2 were extracted from foam samples sprayed at a nominal 127-mm thickness.

Table 4.1.2 Physical Properties of the Product in High-Temperature Application

Property		Unit	Requirement	Result
Air permeance for a 26.2-mm-thick specimen		$L/(s \cdot m^2)$	≤ 0.020	0.0018
Water vapour permeance (WVP) for a 50-mm-thick specimen	**Specimen with bottom skin intact (top skin removed)**	$ng/(Pa \cdot s \cdot m^2)$	≤ 60	59

4.1.3 Physical Properties in Low-Temperature Application

The initial and long-term thermal resistance of the product's winter grade formulation, when sprayed over concrete tiles having a surface temperature of −15°C, are presented in Table 4.1.3. Test specimens used for Table 4.1.3 were extracted from foam samples sprayed at a nominal 60-mm thickness.

Table 4.1.3 Physical Properties of the Product in Low-Temperature Application

Property		Unit	Requirement	Result
Initial thermal resistance for a 50-mm-thick specimen (after 13 days at 23°C)		$(m^2 \cdot K)/W$	Report value	2.42
Long-term thermal resistance (LTTR)(1) at	**125 mm**	$(m^2 \cdot K)/W$	Report value	5.16
	100 mm			3.99
	75 mm			2.87
	50 mm			1.85

Note to Table 4.1.3:

(1) Testing was conducted in compliance with CAN/ULC-S770-09.

4.2 Adhesion Requirements

The adhesion strength of the product's regular formulation, when sprayed over wood, gypsum and concrete substrates having a surface temperature of 40°C, is presented in Table 4.2.1. Foam samples were sprayed at a nominal 127-mm thickness.

Table 4.2.1 Adhesion Strength to Substrate

Property		Unit	Requirement	Result
Adhesion strength(1) over:	**Exterior gypsum board**	kPa	≥ 2.6	214
	OSB			207
	Plywood			116
	Concrete slab			207
	Wood			275

Note to Table 4.2.1:

(1) Testing was conducted in compliance with ASTM D1623.

4.3 Foam Uniformity

The average cell size of the product's regular formulation, when sprayed in wood frame cavities made of oriented strandboard (OSB) sheathing and 89-mm × 140-mm wood studs spaced at 600 mm on centre (o.c.), 400 mm o.c. and 300 mm o.c., are presented in Table 4.3.1. The substrate surface temperature was 40°C. Foam sample thicknesses were 125 mm to 135 mm.

Table 4.3.1 Foam Uniformity – Summary of Cell Sizes

Property		Unit	Requirement	Result
Average cell sizes	**Panel with two cavities of 600 mm o.c.**	mm	< 0.5	Pass[(1)]
	Panel with three cavities of 400 mm o.c.	mm	< 0.5	Pass[(2)]
	Panel with four cavities of 300 mm o.c.	mm	< 0.5	Pass[(3)]

Notes to Table 4.3.1:

(1) Tiny cells of less than 0.5 mm wide were mostly observed with some occasional isolated cells of 8-mm wide.

(2) Tiny cells of less than 0.5 mm wide were mostly observed with some occasional isolated cells of 6-mm wide.

(3) Tiny cells of less than 0.5 mm wide were mostly observed with some occasional isolated cells of 12-mm wide.

4.4 Material Temperature Requirements Due to Exothermic Reaction

The maximum temperature and amount of time required for the product's winter grade formulation to cool down when sprayed over wood and gypsum substrate with a surface temperature of 5.3°C are presented in Table 4.4.1. Spraying over concrete substrate was not part of the testing protocol since this type of substrate is a non-combustible material. Foam sample thicknesses were 125 mm to 127 mm.

Table 4.4.1 Material Temperature Requirements Due to Exothermic Reaction

Property			Unit	Requirement	Result
Maximum recorded temperature at any place in the foam	**OSB substrate**		°C	< 200	176.5
	Gypsum substrate				178.5
Temperatures in the foam vs. time			°C	Temperature vs. time must be decreasing after the peak[(1)]	Pass
Maximum recorded temperature at wood frame – foam interface	**OSB substrate**		°C	< 170	42.9
	Gypsum substrate				62.7
Maximum recorded temperature at substrate – foam interface:	**Wood material and gypsum board**	**OSB substrate**	°C	< 170	135.1
		Gypsum substrate			102.2
	Melting material		°C	Foam temperature must be less than melting temperature of the material[(2)]	n/a
	Non-combustible materials		–	Not required	n/a
Timeframe for the foam	**OSB substrate**		hr:min	Report value	06:16[(3)]

Property		Unit	Requirement	Result
temperature to cool down to 21°C	**Gypsum substrate**			06:46[3]
Effect of maximum recorded temperature on electrical wires	**OSB substrate[4]**	–	No damage to the electrical wire jacket where maximum foam temperature is reached	159°C[4] was recorded near the wire, and no visual effect was observed on the wire jacket

Notes to Table 4.4.1:

(1) Any subsequent temperature peak must be lower than the initial peak.

(2) Any material such as ABS, polypropylene and polyethylene over which the foam will be sprayed must have a softening temperature reasonably higher than 178.5°C. Softening temperature of such materials must be determined using a recognized test method.

(3) Construction material such as a polyethylene vapour barrier sheet may be affected by the foam temperature if installed too early following the foam installation. The timeframe for the foam to reach ambient temperature must be considered to lower the risk of damaging any materials that may melt, being installed against the foam afterwards.

(4) A minimum of 140-mm-thick foam was sprayed in a wood frame cavity made of OSB sheathing and 38-mm × 140-mm wood studs. Two electrical wires (12 AWG and 14 AWG) were installed in the cavity at different depths before the foam application. The maximum recorded temperatures near the wires were 159°C and 140°C.

Report Holder

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Toronto, ON M9W 1K1

Tel.: 866-474-3538
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Site-Finished Product

The foam insulation is a site-finished product.

Plant(s) – Raw Materials

Blackie, AB
Toronto, ON

Disclaimer

This evaluation is issued by the Canadian Construction Materials Centre (CCMC), a program of the Construction Research Centre at the National Research Council of Canada (NRC). The evaluation must be read in the context of the entire CCMC Registry of Product Evaluations and Certifications and the legislated applicable building code in effect.

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