



## Evaluation Report CCMC 12416-R StoTherm ci Lotusan, StoTherm ci Classic, StoTherm ci Essence Exterior Insulation and Finish Systems

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### 1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “StoTherm ci Lotusan, StoTherm ci Classic, StoTherm ci Essence”, when used as an exterior wall cladding that is designed to be a weather barrier and provide thermal insulation in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code 2015:

Clause 1.2.1.1.(1)(a), Division A, as an acceptable solution from Division B:

- Clause 3.1.4.2.(1)(c), Protection of Foamed Plastics
- Article 3.1.5.5., Combustible Cladding on Exterior Walls
- Clause 3.1.5.15.(2)(a), Foamed Plastic Insulation
- Clause 3.2.3.8.(1)(b), Protection of Exterior Building Facade
- Sentence 5.6.1.1.(1) Required Protection from Precipitation
- Sentence 5.9.4 Exterior Insulation Finish System
- 9.25.2.2.(d) Thermal Insulation, Polystyrene, Boards and Pipe Covering
- Sentence 9.27.1.1.(5) Exterior Insulation Finish System
- Article 9.27.2.1. Minimizing and Preventing Ingress and Damage
- Sentence 9.27.2.2.(1)(e) Minimum Protection from Precipitation Ingress
- Sentence 9.27.2.3.(1) First and Second Plane of Protection
- Sentence 9.27.13. Exterior Insulation Finish System
- Article 9.27.3.1. Elements of the Second Plane of Protection
- CAN/ULC-S716.1-12, “Standard for Exterior Insulation and Finish Systems (EIFS) – Materials and Systems.”

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

Ruling No. 95-03-022 (12416-R) authorizing the use of this product in Ontario, subject to the terms and conditions contained in the Ruling, was made by the Minister of Municipal Affairs and Housing on 95-03-22 pursuant to s.29 of the Building Code Act, 2005 (see Ruling for terms and conditions). This Ruling is subject to periodic revisions and updates.

### 2. Description

The products are non-loadbearing exterior insulation and finish systems (EIFS) that can be assembled in panels under factory-controlled conditions, or field-applied. The systems are composed of the following key components:

- a water resistive barrier (WRB),
- an adhesive,
- an insulation board, and
- a coating system (lamina<sup>1</sup>).

*(1) The lamina refers to all the coats (base coats and finish coat) that are applied to the outer face of the insulation board together with the glass-fibre mesh reinforcement.*

The following describes the different components of the systems:

## **Substrate**

For applications falling under the scope of this Report, the substrate can be brick, masonry, monolithic concrete walls, and/or cementitious panels, glass-mat-surfaced gypsum boards, plywood or oriented strand board (OSB) over wood or steel framing. Gaps between the sheathing boards of framed walls must not exceed 3.0 mm.

## **Water Resistive Barrier (WRB)<sup>2</sup>**

*(2) The water resistive barrier (WRB) is a coating that is installed to provide, along with other built-in features, the second line of defence against water infiltration reaching the structure. The WRB must be applied in accordance with the products' installation manuals.*

*In systems with a WRB consisting of a coating, the continuity of the second plane of protection across joints and junctions at openings, penetrations and expansion joints must be maintained through accessories such as self-adhering membranes, tapes, etc., as specified by the manufacturer, prior to the installation of these systems. Furthermore, in order to provide the intended level of protection against water infiltration, the coating (WRB) must be installed in a two-coat application in which the first coat must have sufficient time to cure before the second coat is applied.*

“StoGuard<sup>®</sup>” the StoGuard coating system consists of two components: Sto Gold Fill with StoGuard Mesh or Sto Detail Mesh and Sto Gold Coat, which are fluid applied over approved substrates to provide a monolithic air and moisture barrier.

Sto Gold Fill is a water-based, flexible trowel-applied joint compound that bridges sheathing joints and protects rough openings.

Sto Gold Coat is a ready-mixed, water-based flexible coating for direct application to vertical above-grade wall sheathing, concrete, and concrete masonry.

“StoFlexyl” is a grey polymer-modified coating that is supplied in 19 L pails, and mixed on site with 50% by weight, Type GU Portland cement. SoFlexyl is applied in a continuous layer over the substrate and wrapped around the framing and penetration to achieve a minimum wet thickness of 1.5 mm.

“StoWatertight Coat” a two-component, polymer-modified waterproof coating that is supplied in 19 L pails, mixed on site with the wet component, mixed with a grey or white powder component. Sto Watertight Coat is applied in a continuous layer over the substrate and wrapped around the framing and penetration to achieve a minimum wet thickness of 1.5 mm.

## **Adhesive<sup>3</sup>**

“Sto BTS<sup>®</sup> Plus” – a one component, polymer-modified, cement-based dry powder material used as an adhesive, supplied in a 21.3 kg bag. The material is mixed with 4.7 L to 6.2 L of clean water per 21.3 kg bag. Sto BTS<sup>®</sup> Plus is applied as an adhesive to the inward surface of the Sto insulation board using the appropriate notched trowel. For smooth substrates such as sheathing, use a stainless steel trowel with U-shaped notches 13 mm X 13 mm, 64 mm o/c. For uneven substrate such as some concrete masonry, use a trowel with square notches 16 mm X 16 mm, 32 mm o/c. As a base coat, the product is applied in a single continuous layer over the insulation board to achieve a minimum thickness of 1.6 mm.

“Sto Primer / Adhesive” An acrylic-based emulsion packaged in 19 L pails to which an equal amount by volume of Type GU Portland Cement is added and mixed with electric drill and paddle to a uniform consistency. For smooth substrates such as sheathing, use a trowel with U-shaped notches 13 mm x 13 mm, 64 mm o/c. For uneven substrates such as some concrete masonry, use a trowel with square notches 16 mm x 16 mm, 32 mm o/c, or directly to the substrate using Sto Corp.'s M-8 spray pump and trowel with the appropriate notched trowel as noted above. As a base coat, the product is applied in a single continuous layer over the insulation board to achieve a minimum thickness of 1.6 mm.

“Sto Primer / Adhesive B” A one-component, polymer-modified, cement-based, dry powder material used as an adhesive, supplied in a 23 kg bag. The material is mixed with 4.7 L to 6.2 L of clean water per 23 Kg bag. Sto Primer / Adhesive B is applied as an adhesive to the surface of the Sto Corp. insulation board using the appropriate notched trowel. For smooth substrates such as sheathing, use a trowel with U-shaped notches 13 mm X 13 mm, 64 mm o/c. For uneven substrates such as some concrete masonry, use a trowel with square notches 16 mm X 16 mm, 32 mm o/c, or directly to the substrate using Sto Corp.'s. M-8 spray pump and trowel with the appropriate notched trowel as noted above. As a base coat, the product is applied in a single continuous layer over the insulation board to achieve a minimum thickness of 1.6 mm.

(3) Adhesives are used for bonding the insulation to the substrate coated with the WRB. They are, in general, available in the following forms: a dry powder mix requiring the addition of water on site, or a wet paste that requires the addition of cement on site, or a form that does not require any additives. Certain adhesives are also used as base coats, as in the case with all noted adhesives. Consequently, the description of base coats has been placed in this section.

## Insulation

“Sto EPS Insulation Board” and “Sto ProD EPS Insulation Board” are manufactured and packaged by Sto Corp. qualified and licensed manufacturers / molders. The expanded polystyrene foam insulation boards are aged by air for a minimum of five weeks or kiln-dried.

“Sto EPS Insulation Board” is a typical flat EPS board.

“Sto ProD EPS Insulation Board” has drainage pathways cut into the insulation that conform with clause 9.27.13.1.(1)(b).

The two insulation boards must conform to the following:

- CAN/ULC-S701-11, “Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering,” Type 1 or Type 2;
- minimum board thickness of 25 mm
- maximum board thickness:
  - as designed, when used in combustible construction, and
  - 165 mm, when used in noncombustible construction meeting NBC 2015, Division B, Article 3.1.5.5 for StoTherm Systems when applied over minimum 2x6 wood framing covered with minimum 12.7mm gypsum sheathing.
  - 140 mm, when used in noncombustible construction meeting NBC 2015, Division B, Clause 3.2.3.8.(1)(b) for StoTherm Systems
- maximum board size of 600 mm × 1200 mm;
- nominal density of 16 kg/m<sup>3</sup>
- flame-spread rating: 25 - 500, per CAN/ULC-S102.2-11, “Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.”

## Synthetic Coating System (Lamina)

The synthetic coating system (lamina) consists of the reinforcing mesh, which is embedded with the base coat, a primer and a finish coat.

### Base Coat<sup>4</sup>

“Sto BTS® Plus” – see description in the Adhesive section

“Sto Primer / Adhesive” – see description in the Adhesives section.

“Sto Primer / Adhesive B” – see description in the Adhesives section.

When used as a base coat, the above are applied with a stainless steel trowel to the entire surface of the insulation to a uniform dry rendered thickness of nominal 1.6 mm. The base coat thickness is thicker when more than one layer of reinforcing mesh is incorporated into the lamina.

(4) The thickness of the base coat required depends on the number of layers and the type of reinforcing mesh used. The base coat thickness is thicker when more than one layer of reinforcing mesh is incorporated into the lamina. The final thickness of the base coat must be sufficient to fully embed the reinforcing mesh in the base coat and with no mesh colour visible.

## Reinforcing Mesh

An alkali-resistant, interwoven glass-fibre reinforcing fabric, having a minimum 142 g/m<sup>2</sup> nominal weight, that is used with the Sto Corp. base coat and Sto Flexyl. The mesh is yellow or where noted, - white, is available in rolls 240mm wide and 970 m wide, and is available in six grades of strength.

- |                     |   |
|---------------------|---|
| - Sto Detail Mesh:  | 142 g/m <sup>2</sup> , 240 mm wide          |
| - Sto Mesh:         | 153 g/m <sup>2</sup> , 970 mm wide          |
| - Sto 6oz Mesh:     | 203 g/m <sup>2</sup> , 970 mm wide          |
| - Sto Intermediate: | 373 g/m <sup>2</sup> , 970 mm wide          |
| - Sto Armor Mat:    | 508 g/m <sup>2</sup> , 970 mm wide          |
| - Sto Armor Mat XX: | 678 g/m <sup>2</sup> , 970 mm wide          |
| - StoGuard® Mesh:   | 142 g/m <sup>2</sup> , 107 mm & 240 mm wide |

## Primer

“*Sto Primer Smooth*” is a water-based acrylic smooth primer that provides uniform substrate absorption and finish colour and is supplied in a 19 L pail. Sto Primer is applied to the dry base coat by brush, roller or spray, providing approximately a 0.1-0.15 mm wet thickness.

“*Sto Primer Creativ*” is a water-based acrylic primer. It is supplied in 19 L pails. Sto Primer Creativ is applied to the dry base coat by brush, roller or spray, providing approximately a 0.1-0.15 mm wet thickness.

“*Sto Primer Sanded*” is a water-based acrylic sanded primer that provides uniform substrate absorption and finish colour and is supplied in 19 L pails. Sto Primer Sanded is applied to the dry base coat by brush, roller or spray, providing approximately a 0.1-0.15 mm wet thickness.

*Note: Primer is typically required for spray or roller-applied finishes.*

## Finish Coat

“*Stolit® Lotusan*” is an acrylic-based textured finish with graded marble aggregate, packaged in 19 L pails. It is factory or store-tinted to the desired colour. Finish texture and thickness is from 1.0 – 1.5 mm depending on the texture selected.

“*Stolit®*” is a ready-mix, acrylic-based, textured emulsion finish coat, supplied in 19 L pails. It is factory or store-tinted to the desired colour. *Stolit®* is applied by a stainless steel trowel or is spray-applied to a thickness of 1.0 mm to 3.0 mm depending on the texture selected.

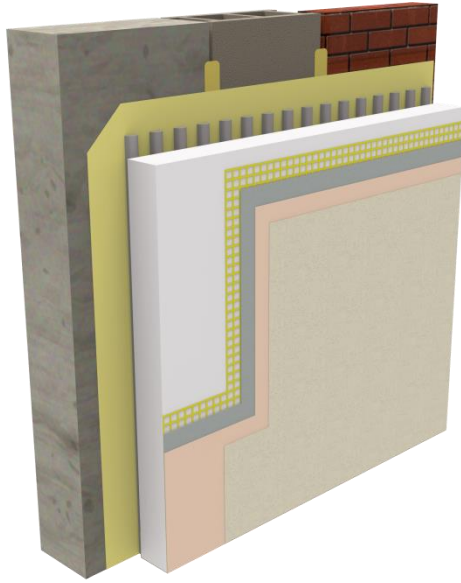
“*StoSilco® Lit*” is a ready-mix, acrylic-based, silicone-enhanced, textured emulsion finish coat, supplied in 19 L pails. It is factory or store-tinted to the desired colour. *StoSilco® Lit* is applied by a stainless steel trowel or is spray-applied to a thickness of 1.0 mm to 1.5 mm, depending on the texture selected.

“*Sto Essence Finish*” is an acrylic-based textured finish with graded marble aggregate and DPR technology, packaged in 19 L pails. It is factory or store-tinted to the desired colour. Finish texture and thickness is from 1.0 – 1.5 mm depending on the texture selected.

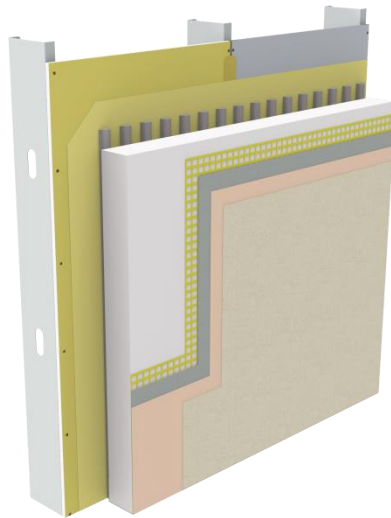
## Sto EIFS Elements

**Table 2.1 “Sto Exterior Insulation Finish Systems”**

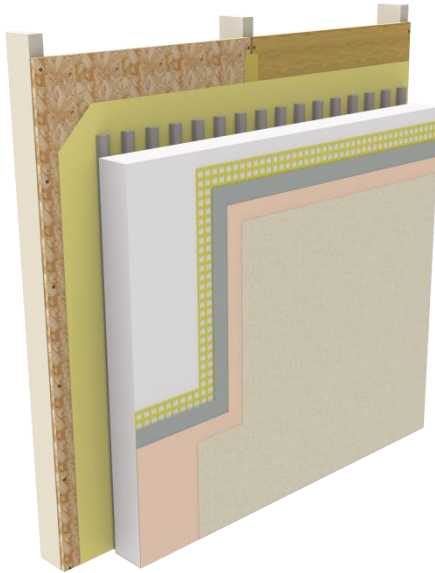
System	Distinctive System Components					
	Intended Substrate	Water Penetration Barrier	Adhesive	Insulation	Base Coat	Finish Coat
StoTherm ci Lotusan	<ul style="list-style-type: none"> <li>• Glass Mat Gypsum</li> <li>• Cement Board</li> <li>• Concrete</li> <li>• Masonry</li> </ul>	<ul style="list-style-type: none"> <li>• StoGuard</li> <li>• Sto Flexyl</li> <li>• Sto Watertight Coat</li> </ul>	<ul style="list-style-type: none"> <li>• Sto BTS Plus</li> </ul>	<ul style="list-style-type: none"> <li>• Flat EPS</li> <li>• Geometrically defined EPS “ProD”</li> </ul>	<ul style="list-style-type: none"> <li>• Sto BTS Plus</li> </ul>	<ul style="list-style-type: none"> <li>• Stolit Lotusan®</li> </ul>
	<ul style="list-style-type: none"> <li>• Plywood/OSB</li> </ul>	<ul style="list-style-type: none"> <li>• StoGuard</li> </ul>				
StoTherm ci Classic	<ul style="list-style-type: none"> <li>• Glass Mat Gypsum</li> <li>• Cement Board</li> <li>• Concrete</li> <li>• Masonry</li> </ul>	<ul style="list-style-type: none"> <li>• StoGuard</li> <li>• Sto Flexyl</li> <li>• Sto Watertight Coat</li> </ul>	<ul style="list-style-type: none"> <li>• Sto BTS Plus</li> </ul>	<ul style="list-style-type: none"> <li>• Flat EPS</li> <li>• Geometrically defined EPS “ProD”</li> </ul>	<ul style="list-style-type: none"> <li>• Sto BTS Plus</li> </ul>	<ul style="list-style-type: none"> <li>• Stolit</li> <li>• StoSilco® Lit</li> </ul>
	<ul style="list-style-type: none"> <li>• Plywood/OSB</li> </ul>	<ul style="list-style-type: none"> <li>• StoGuard</li> </ul>				
StoTherm ci Essence	<ul style="list-style-type: none"> <li>• Glass Mat Gypsum</li> <li>• Cement Board</li> <li>• Concrete</li> <li>• Masonry</li> </ul>	<ul style="list-style-type: none"> <li>• StoGuard</li> <li>• Sto Flexyl</li> <li>• Sto Watertight Coat</li> </ul>	<ul style="list-style-type: none"> <li>• Sto Primer Adhesive B</li> </ul>	<ul style="list-style-type: none"> <li>• Flat EPS</li> <li>• Geometrically defined EPS “ProD”</li> </ul>	<ul style="list-style-type: none"> <li>• Sto Primer Adhesive B</li> </ul>	<ul style="list-style-type: none"> <li>• Sto Essence DPR Finish</li> </ul>
	<ul style="list-style-type: none"> <li>• Plywood/OSB</li> </ul>	<ul style="list-style-type: none"> <li>• StoGuard</li> </ul>				
StoTherm ci Essence	<ul style="list-style-type: none"> <li>• Glass Mat Gypsum</li> <li>• Cement Board</li> <li>• Concrete</li> <li>• Masonry</li> </ul>	<ul style="list-style-type: none"> <li>• StoGuard</li> <li>• Sto Flexyl</li> <li>• Sto Watertight Coat</li> </ul>	<ul style="list-style-type: none"> <li>• Sto Primer Adhesive</li> </ul>	<ul style="list-style-type: none"> <li>• Flat EPS</li> <li>• Geometrically defined EPS “ProD”</li> </ul>	<ul style="list-style-type: none"> <li>• Sto Primer Adhesive</li> </ul>	<ul style="list-style-type: none"> <li>• Sto Essence DPR Finish</li> </ul>
	<ul style="list-style-type: none"> <li>• Plywood/OSB</li> </ul>	<ul style="list-style-type: none"> <li>• StoGuard</li> </ul>				



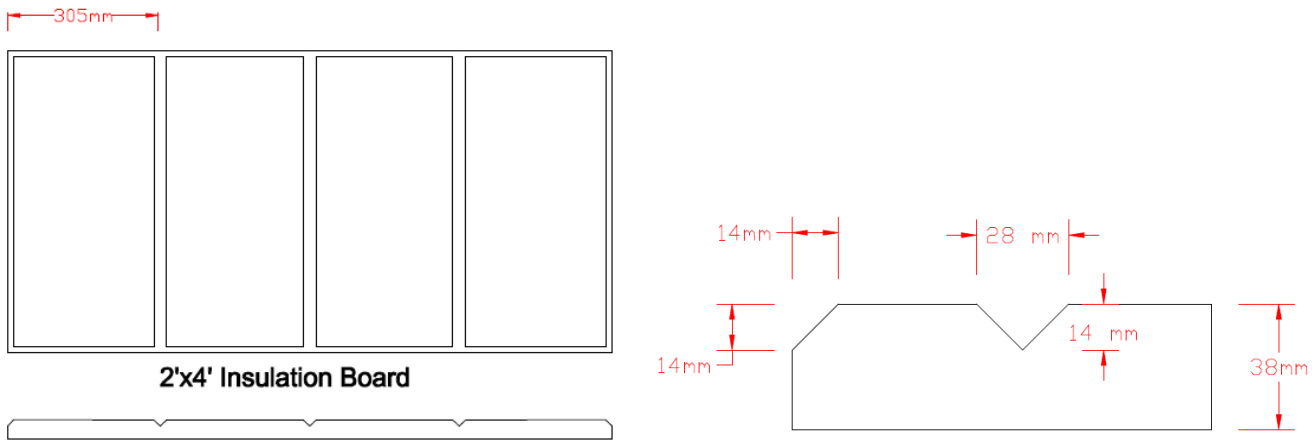
**Figure 1. “StoTherm ci” over concrete, concrete masonry unit and masonry**



**Figure 2. “StoTherm ci” over glass mat gypsum or cement board over steel framing**



**Figure 3. “StoTherm ci over wood based sheathing over wood framing**



**Figure 4. Geometrically Defined Drainage Insulation Board, “Sto ProD EPS Insulation Board”**

### 3. Conditions and Limitations

CCMC’s compliance opinion in Section 1 is bound by the “StoTherm ci Lotusan, StoTherm ci Classic and StoTherm ci Essence Exterior Insulation Finish Systems” being used in accordance with the conditions and limitations set out below.

- The products are intended to be used as an exterior insulation and finish wall systems applied directly to vertical walls of brick, masonry, monolithic concrete walls, and/or cementitious, glass-mat surfaced gypsum, plywood or OSB sheathing boards installed over wood or steel framing
- Gaps between the sheathing boards of framed walls shall not exceed 3.0mm
- The products are acceptable for use on new and existing exterior, vertical walls. The systems are not acceptable for use on horizontal surfaces. (Note: The present limitation doesn’t include protected soffit applications)
- When the products are part of a prefabricated panel system that incorporates structural components, the prefabricated panel system shall be designed by a professional engineer or architect in accordance with manufacturer’s criteria and the requirements of the NBC 2015.
- The products are not suitable for use as a structural sheathing for bracing purposes.
- The products are not intended for use as a below-grade insulation and should terminate at least 200 mm above grade level.
- When used in coastal areas for residential occupancies for buildings falling under the scope of Part 9 of Division B of the NBC 2015, the products must be installed in conjunction with a capillary break conforming to Sentence

9.27.2.2.(1)(e), Minimum Protection from Precipitation Ingress, of Division B of the NBC 2015. Coastal areas are defined in the NBC 2015 in sentence 9.27.2.2.5.

- The WPB coating must be installed in a two-coat application.
- The continuity of the second plane of protection across joints and junctions at openings, penetrations and expansion joints must be maintained through accessories such as self-adhering membranes, tapes, etc., as specified by the manufacturer, prior to the installation of these systems.
- The use of the products with the adhesive indicated in Table 2.1 is limited to geographical areas where the wind design value is  $Q_{50} < 1.0$
- The possibility of moisture accumulation within the wall construction is mainly a function of the ability of the wall assembly to deflect bulk water entry; the physical properties of the cladding being installed and its impact on the thermal, air leakage and vapour diffusion characteristics of the existing wall. The potential of moisture accumulation as a result of the addition of materials is very specific to the existing wall construction being retrofitted. Therefore, must be in accordance with the NBC 2015, Division B, Appendix Note A-5.1.2.1(1), Application (environmental separation), of Division B of the NBC 2015.
- When the systems are used in new construction, the design of the inboard/outboard insulation of the systems shall be in accordance with the requirements of Section 9.25., Heat Transfer, Air Leakage and Condensation Control of Division B of the NBC 2015.
- When the systems are used in retrofit construction, the addition of thermal insulation onto existing exterior walls will increase the thermal efficiency and air tightness of the wall. Deficiencies in flashing and other elements in the building assembly, including mechanical systems, may result in detrimental effects of moisture accumulation as highlighted in Appendix Note A-9.25.2.4.(3)., Loose-Fill Insulation in Existing Wood-Frame Walls, of Division B of the NBC 2015. As a result, existing exterior walls that are intended to be retrofitted with EIFS must meet the requirements of the NBC 2015 for heat transfer, air leakage and condensation control.
- The products can provide additional thermal insulation to the wall assembly in retrofit construction with no detrimental effects if properly designed and installed with knowledge of the existing wall configuration and performance.
- The products alone may not provide the full amount of the required wall insulation. The thermal resistance of the wall system shall conform to the energy requirements of the applicable building code. The wall system may have to conform to the National Energy Code of Canada for Buildings.
- The polystyrene thermal insulation blocks shall be aged for a minimum of five weeks or kiln-dried before installation in accordance with CAN/ULC-S701-Annex B “Aging” requirements -before cutting into insulation boards.
- When used in combustible construction, the polystyrene insulation must be protected from the inside of the building in accordance with Clause 3.1.4.2.(1)(c), Protection of Foamed Plastics, 9.10.17.10.(1)(c), Protection of Foamed Plastics of Division B of the NBC 2015.
- When used in noncombustible constructions, the polystyrene insulation must be protected from the inside of the building in accordance with Sentences 3.1.5.15.(2) and (3) of Division B of the NBC 2015.
- The systems should be kept at least 50 mm, or as required in building regulations and safety codes, from heat-emitting devices, such as recessed light fixtures and chimneys.
- The requirements of the NBC 2015 regarding fire stops shall be implemented.
- The polystyrene thermal insulation must have a flame-spread rating of not more than 500 when tested in accordance with the requirements of CAN/ULC-S102.2-11, “Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.”
- Movement joints are required to accommodate expansion and contraction of building materials due to thermal changes, moisture, wind, gravity, vibration and seismic activity. Expansion joints in the cladding must be used in the following situations:
  - At joints that occur in the substrate
  - At any abutment of the system with other materials
  - Where changes in substrate might create deflection or movement.
  - Where significant structural movement occurs
  - Where deflections in excess of  $L/240$  are expected, and
  - At the floor line in wood-frame construction. May not be required where fully engineered framing and floor systems are used.
- Closed cell backer rods should be used at expansion joints so that the low-modulus sealant may be installed as per the sealant manufacturer’s instructions.
- The product must be installed according to the manufacturer’s installation manual (dated no earlier than April 2015), by a trained applicator and possessing a valid manufacturer certificate for the system being installed.
- Wet materials must be applied at temperatures above 4°C and maintained above 4°C for a period not less than 24 hours. The substrate must be maintained above 4°C for a period not less than 24 hours. Cool and humid climatic conditions may extend drying time beyond 24 hours. Temporary protection and heat must be provided during colder conditions. Materials must be stored at temperatures between 5°C and 32°C. Previously frozen materials must not be used.

- Wet finished surfaces must be protected from rain and other moisture sources until sufficiently dry (set and hardened) to prevent wash-off or other moisture related damage.
- The product shall be installed with suitable flashing to drain any incidental water from the drainage cavity to the exterior and to protect the exposed top edge of the cladding. Cap flashing must be installed immediately after completion of the finish coat or temporary protection must be provided.
- Glass-mat gypsum sheathing must be in compliance with the requirements of C1177-11 / C 1177M-11 “Glass Mat Gypsum Substrate for Use as Sheathing”, or have been evaluated by CCMC.
- Specification of surface sealers must be provided by the manufacturer.
- OSB and /or plywood sheathing boards used in conjunction with the systems must comply with the requirements of CSA O86-14, “Engineering Design in Wood”, CSA 0437 SERIES-93 (R2011), “OSB and Waferboard”. Plywood sheathing boards, CSA O121-08 “Douglas Fir Plywood”, CSA O151-M1978, “Canadian Softwood Plywood”, CSA O153-M1980 (R2008), “Poplar Plywood” or CSA O325.0-07, “Construction Sheathing”.
- The OSB and/or plywood sheathing boards must have a minimum thickness of 11.1 mm and 12.7 mm respectively. The boards must have their principal strength-direction across the studs, must be continuously supported by framing, and must be gapped at least 2.0 mm, but not more than 3.0 mm.
- OSB and/or plywood sheathing boards used in conjunction with “Exterior Insulation and Finish System (EIFS) Class PB” must be fastened to the framing in conformance with Article 9.23.3.5., Fasteners for Sheathing or Subflooring of Division B of the NBC 2015.
- The products intended for use over wood shall have the moisture content of lumber and/or wood sheathing not greater than 19% at the time of the application of the water penetration barrier.
- When using notched trowel adhesive ribbons as the drainage mechanism, the application of the ribbons must be conducted in a way as to form clear and parallel drainage paths behind the insulation boards and to avoid the creation of any V-grooves (V-grooves refer to ribbons touching and closing the drainage path). The wet ribbons must be a minimum of 9.0 mm deep, 9.0 mm wide and 38 mm apart.
- The drained airspace behind the insulation boards shall remain unobstructed so as to form a clear drainage cavity behind the insulation board and it shall terminate in such a way as not to obstruct the dissipation of incidental rainwater.

## 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.

### 4.1 Performance Requirements

#### 4.1.1 Ash content

**Table 4.1.1 Results of Testing of Ash Content of the Products**

Property		Unit	Requirement	Result
Ash content	WPB (StoGuard®) Sto Gold Fill Sto Gold Coat®	%	Report Value	75.4
				66.7
				97.2
	WPB (StoFlexyl)			52.2
	WPB (StoWatertight Coat)			95.1
	Adhesive/Base coat (StoBTS® Plus)			95.6
	Adhesive / Base coat (Sto Primer/Adhesive-B)			86.1
	Adhesive / Base coat (Sto Primer/Adhesive)			62.8
	Finish coat (StoLit Lotusan®)			64.2
	Finish coat (StoLit)			64.7
	Finish coat (StoSilco®Lit)			61.8
Finish coat (Sto Essence Finish)				



## 4.1.2 Infrared Analysis

**Table 4.1.2 Results of Infrared Analysis for Documenting Chemical Formulation of the Products**

Property		Requirement	Result
Infrared analysis	WPB (StoGuard) Sto Gold Fill Sto Gold Coat	Report value	Report on File
	WPB (StoFlexyl)		
	WPB (StoWatertight Coat)		
	Adhesive / Base coat (StoBTS® Plus)		
	Adhesive / Base coat (Sto Primer/Adhesive-B)		
	Adhesive / Base coat (Sto Primer/Adhesive)		
	Finish coat (StoLit Lotusan®)		
	Finish coat (StoLit)		
	Finish coat (StoSilco® Lit )		
	Finish coat (Sto Essence Finishes)		

## 4.1.3 Adhesion Bond to WPB to Plywood/OSB

**Table 4.1.3(a) Results of Testing of Adhesion of WPB Plywood/OSB**

Property			Unit	Requirement No detachment at bonding plane @	Result <sup>1</sup>
Adhesion bond	StoGuard to plywood	dry state	MPa	0.25	0.730
		2-h drying		0.08	0.447
		7-d drying		0.25	0.697
	StoGuard to OSB	dry state		0.25	0.509
		2-h drying		0.08	0.111
		7-d drying		0.25	0.289

### Notes to Table 4.1.3:

<sup>1</sup> Failure within the substrate

#### 4.1.4 Adhesion/Cohesion Bond of WPB to Substrate other than Plywood/OSB

Table 4.1.4(a) Results of Testing of Adhesion of WPB to Substrates other than Plywood/OSB

Property			Unit	Requirement No detachment at bonding plane @	Result
Adhesion bond	StoGuard to cement board	dry state	MPa	0.25	0.635
		2-h drying		0.08	0.440
		7-d drying		0.25	0.197
	StoGuard to glass-mat gypsum	dry state		0.25	0.227
		2-h drying		0.08	0.097
		7-d drying		0.25	0.118
	StoFlexyl to cement board	dry state		0.25	0.613
		2-h drying		0.08	0.419
		7-d drying		0.25	0.708
	StoFlexyl to glass-mat gypsum	dry state		0.25	0.397
		2-h drying		0.08	0.125
		7-d drying		0.25	0.215
	Sto Watertight Coat to cement board	dry state		0.25	0.613
		2-h drying		0.08	0.419
		7-d drying		0.25	0.708
Sto Watertight Coat to glass-mat gypsum	dry state	0.25	0.397		
	2-h drying	0.08	0.125		
	7-d drying	0.28	0.215		

Table 4.1.4(b) Results of Testing of Adhesion/Cohesion Bond of WPB to Substrates other than Plywood/OSB

Property			Unit	Requirement No detachment at bonding plane @	Result
Adhesion/ Cohesion bond	StoGuard to concrete	dry state	MPa	0.25	0.455
		2-h drying		0.08	0.551
		7-d drying		0.25	0.475

#### 4.1.5 Adhesion bond of Adhesive to WPB

Table 4.1.5 Results of Testing of Adhesion Bond of Adhesive to WPB

Property			Unit	Requirement No detachment at bonding plane @	Result
Adhesion bond	Sto BTS Plus to StoGuard	dry state	MPa	0.25	0.251
		2-h drying		0.08	0.225
		7-d drying		0.25	0.428
	Sto Primer/Adhesive B to StoGuard	dry state		0.25	0.401
		2-h drying		0.08	0.370
		7-d drying		0.25	0.447
	Sto BTS Plus to StoFlexyl	dry state		0.25	0.3
		2-h drying		0.08	0.1
		7-d drying		0.25	0.3
	Sto Primer/Adhesive B to StoFlexyl	dry state		0.25	0.3
		2-h drying		0.08	0.1
		7-d drying		0.25	0.3
	Sto BTS Plus to Sto Watertight Coat	dry state		0.25	0.3
		2-h drying		0.08	0.1
		7-d drying		0.25	0.3
Sto Primer/Adhesive B to Sto Watertight Coat	dry state	0.25	0.3		
	2-h drying	0.08	0.1		
	7-d drying	0.25	0.3		

#### 4.1.6 Adhesion Bond of Adhesive to Insulation

Table 4.1.6 Results of Testing of Adhesion Bond of Adhesive to Insulation

Property			Unit	Requirement	Result
Adhesion bond	Sto BTS Plus to EPS	dry state	MPa	0.08	0.1
		2-h drying		0.08	0.1
		7-d drying		0.08	0.1
	Sto Primer/Adhesive B to EPS	dry state		0.08	0.1
		2-h drying		0.08	0.1
		7-d drying		0.08	0.1
	Sto Primer/Adhesive to EPS	dry state		0.08	0.1
		2-h drying		0.08	0.1
		7-d drying		0.08	0.1

#### 4.1.7 Lamina Bond Strength

**Table 4.1.7 Results of Testing of Lamina Bond Strength (Base Coat/Finish Coat/Insulation)**

Property		Unit	Requirement	Result	
Adhesion bond	Sto BTS Plus / StoLit to EPS	dry state	MPa	0.1	0.221
		2-h drying		0.1	0.143
		7-d drying		0.1	0.214
	Sto Primer Adhesive / StoLit to EPS	dry state		0.1	0.194
		2-h drying		0.1	0.103
		7-d drying		0.1	0.193

#### 4.1.8 Water Vapour Transmission of WPB

**Table 4.1.8 Results of Testing of Water Vapour Transmission (WVT) of WPB of the Products**

Property		Unit	Requirement	Result
WVT	Sto Guard over OSB	ng/Pa·s·m <sup>2</sup>	Report value	156 <sup>1</sup> 78 <sup>2</sup>
	Sto Guard over Glass Mat Gypsum			321 <sup>1</sup> 232 <sup>2</sup>
	Sto Flexyl over OSB			56 <sup>1</sup> 56 <sup>2</sup>
	Sto Flexyl over Glass Mat Gypsum			187 <sup>1</sup> 94 <sup>2</sup>
	Sto Watertight over OSB			56 <sup>1</sup> 56 <sup>2</sup>
	Sto Watertight over Glass Mat Gypsum			187 <sup>1</sup> 94 <sup>2</sup>

**Notes to Table 4.1.8:**

- 1 WVT rate measured with one coat application
- 2 WVT rate measured with two coat application

#### 4.1.9 Water Vapour Transmission of Lamina

**Table 4.1.9 Results of Testing of Water Vapour Transmission (WVT) of Lamina**

Property		Unit	Requirement	Result
WVT	Sto BTS Plus	ng/Pa·s·m <sup>2</sup>	Report value	524
	Sto Primer/Adhesive B			211.8
	Sto Primer/Adhesive			429

#### 4.1.10 Water Absorption of Base Coat

Table 4.1.10 Results of Testing of Water Absorption of the Base Coat

Property		Unit	Requirement	Result
Water absorption of base coat	Sto BTS Plus	%	≤ 20% of the dry weight	12.28
	Sto Primer/Adhesive			19.37
	Sto Primer/Adhesive B			17.05

#### 4.1.11 Water Absorption Coefficient of WPB

Table 4.1.11 Results of Testing of Water Absorption Coefficient of WPB at 72 hours

Property		Unit	Requirement	Result
Water absorption coefficient of WPB @ 72 hours	Sto Guard	kg/(m <sup>2</sup> ·s <sup>1/2</sup> )	≤ 0.004	0.0003
	Sto Watertight Coat			0.0013
	Sto Flexyl			0.0013

#### 4.1.12 Base Coat Impermeability to Water

Table 4.1.12 Results of Testing of Impermeability to Water of the Base Coat

Property		Unit	Requirement	Result
Impermeability to water of base coat	Sto BTS Plus	h	No water penetration in less than 2 h	Pass
	Sto Primer/Adhesive B			Pass
	Sto Primer/Adhesive			Pass

#### 4.1.13 Mildew and Fungus Resistance

Table 4.1.13 Results of Testing of Mildew and Fungus Resistance

Property	Requirement	Result
Mildew and fungus resistance of finish coat (StoLit & StoSilco® Lit)	No growth	Pass

#### 4.1.14 Accelerated Weathering Resistance

Table 4.1.14 Results of Testing of Accelerated Weathering Resistance

Property	Adhesive Material	Applied Finish	Requirement	Result
Accelerated weathering resistance of Lamina @ 2000 hrs	Sto BTS	StoLit Finish	No cracking, flaking or deleterious effects	Pass

#### 4.1.15 Salt Spray Resistance

Table 4.1.15 Results of Testing of Salt Spray Resistance

Property		Requirement	Result
Salt spray resistance @ 300 hours	Sto BTS Plus/StoLit	No cracking, flaking or deleterious effects	Pass
	Sto Primer/Adhesive/StoLit		Pass

#### 4.1.16 Durability under Environmental Cyclic Conditions

Table 4.1.16 Results of Testing of Durability under Environmental Cyclic Conditions

Property	Unit	Requirement	Result	
Pre-conditioning (drainage evaluation)	L	Report water quantity	introduced	13.5
			drained	12.59
			retained	0.91
Environmental cycling (60 cycles)	–	No cracking, blistering or sagging of base coat and no detachment or crazing of finish coat	pass	
Adhesion bond strength after environmental cycling	MPa	0.1	0.31	

#### 4.1.17 Reinforcing Mesh

Table 4.1.17 Results of Testing of Breaking Strength Resistance of Reinforcement Mesh (142.0 g/m<sup>2</sup> (4.3 oz) – (St. Gobain)

Property		Unit	Requirement	Result	
Ash Content		%	Report value	14.7	
Mass per unit area		g/m <sup>2</sup>	Report value	14	
Breaking Strength Resistance				<b>Weft</b>	<b>Warp</b>
Initial tensile strength		N/mm	≥ 35	37.2	40.3
Loss of tensile strength after	28-day 3 ion soak	%	≤ 60% for adhered EIFS ≤ 50% mechanically fastened EIFS	17.7	7.3
Residual tensile strength after	28-day 3 ion soak	N/mm	≥ 15 N/mm for adhered EIFS ≥ 25 N/mm mechanically fastened EIFS	30.6	37.3
Elongation at break	Initial	%	Report value	3.3	4.1
	after 28 day 3 ion soak			2.8	3.8

#### 4.1.18 Impact Resistance

**Table 4.1.18 Results of Testing of Impact Resistance**

Property			Requirement	Result
Impact resistance	10 joules	Sto BTS Plus	6/10 free-fall drops must show no perforation (broken mesh)	Pass
	3 joules		6/10 free-fall drops must show no cracks	Pass
	10 joules	Sto Primer/Adhesive	6/10 free-fall drops must show no perforation (broken mesh)	Pass
	3 joules		6/10 free-fall drops must show no cracks	Pass
	10 joules	Sto Primer/Adhesive B	6/10 free-fall drops must show no perforation (broken mesh)	Pass
	3 joules		6/10 free-fall drops must show no cracks	Pass

#### 4.1.19 Wind Load Resistance

**Table 4.1.19 Results of Testing of Wind Load Resistance**

Reference Wind Pressure (kPa)	Sustained		Cycling		Gust		Deflection Test		
	P1 , P1' (Pa)		P2 , P2' (Pa)		P3 , P3' (Pa)		Test Pressure (Pa) 3.3 P1 , P1'	Measured Maximum Net Midspan Deflections (mm)	
		Pass		Pass		Pass		Stud Span 3 050 mm	Sheathing Span 406 mm
Q50 ≤ 0.45	±450	Pass	±660	Pass	±980	Pass	+980	5.49	1.76
							-980	-5.59	-2.35
Q50 ≤ 0.55	±550	Pass	±800	Pass	±1 200	Pass	+1 200	6.72	2.16
							-1 200	-6.84	-2.88
Q50 ≤ 0.60	±650	Pass	±950	Pass	±1 410	Pass	+1 410	7.90	2.54
							-1 410	-8.04	-3.38
Q50 ≤ 0.75	±750	Pass	±1 090	Pass	±1 630	Pass	+1 630	9.13	2.93
							-1 630	-9.29	-3.91
Q50 ≤ 0.85	±850	Pass	±1240	Pass	±1850	Pass	+1 850	10.36	3.33
							-1 850	-10.55	-4.44
Q50 ≤ 1.00	±1000	Pass	±1460	Pass	±2180	Pass	+2 180	12.21	3.92
							-2 180	-12.43	-5.23
Maximum test pressure @ L/180 Deflection							+3 073	16.90	-
							-2 990	-16.90	-
Ultimate structural test pressure							+3 640	Passed	
							-3 390	Sheathing separation from steel studs occurred	

#### 4.1.20 Joint Disruption Resistance

**Table 4.1.20 Results of Testing of Joint Disruption Resistance**

Property	Unit	Requirement <sup>2</sup>	Result	
			Joint Width	
			2-mm	4-mm
Joint disruption resistance	–	The WPB at joints on 2 assemblies must show no cracking, delaminating or any other deleterious effects at a transverse bending of L/180	Pass	
Joint extension <sup>2</sup> @ L/170	mm	Report value	0.51	0.73

**Note to Table 4.1.20:**

<sup>2</sup> The system's joint disruption resistance was measured at L/170 which is considered more stringent than the L/180 required in this Report.

#### 4.1.21 Joint Relaxation Resistance

**Table 4.1.21 Results of Testing of Joint Relaxation Resistance**

Property	Unit	Requirement	Sample No.	Result
Joint relaxation resistance	kg/m <sup>2</sup> ·s	Five WPB-coated OSB specimens subject to 1.3-mm extension following exposure to 15 24-h environmental cycles must have a maximum average Water Transmission Rate (WTR) of $2 \times 10^{-7}$ kg/m <sup>2</sup> ·s	1	$1.14 \times 10^{-7}$
			2	$8.55 \times 10^{-8}$
			3	$9.29 \times 10^{-8}$
			<b>Average</b>	$9.74 \times 10^{-8}$

#### 4.1.22 Water Transmission Resistance (over OSB)

**Table 4.1.22 Results of Testing of Water Transmission Resistance (over OSB)**

Property	Unit	Requirement	Sample No.	Result
Water transmission resistance	kg/m <sup>2</sup> ·s	Five WPB-coated OSB specimens subjected to a 25-mm head of water must have a maximum average WTR rate of $2 \times 10^{-7}$ kg/m <sup>2</sup> ·s measured at 10 days	1	<sup>1</sup>
			2	$1.87 \times 10^{-7}$
			3	$9.97 \times 10^{-8}$
			4	$3.25 \times 10^{-8}$
			5	$1.64 \times 10^{-7}$
			<b>Average</b>	$1.21 \times 10^{-7}$

**Note to Table 4.1.22:**

<sup>1</sup> Disregarded specimen



#### 4.1.23 Water Transmission Resistance (over Plywood)

**Table 4.1.23 Results of Testing of Water Transmission Resistance (over Plywood)**

Property	Unit	Requirement	Sample No.	Result
Water transmission resistance	kg/m <sup>2</sup> ·s	Five WPB-coated Plywood specimens subjected to a 25-mm head of water must have a maximum average WTR rate of $2 \times 10^{-7}$ kg/m <sup>2</sup> ·s measured at 10 days	1	‡
			2	$5.64 \times 10^{-7}$
			3	$2.27 \times 10^{-8}$
			4	$1.80 \times 10^{-8}$
			5	$1.11 \times 10^{-7}$
			<b>Average</b>	$1.79 \times 10^{-7}$

**Note to Table 4.1.23:**

‡ Disregarded specimen

#### 4.1.24 Water Vapour Transmission

**Table 4.1.24 Results of Testing of Water Vapour Transmission (WVT)**

Property	Unit	Requirement	Sample No.	Result	
				UnCoated	Coated with Sto Guard
Water vapour transmission	OSB	Report value of the WVT rate of the WPB in combination with the OSB applied at the maximum thickness and the OSB alone	1	84.44	49.44
			2	111.25	44.84
			3	86.74	44.30
			<b>Average</b>	94.14	47.86
	Plywood		1	235.21	137.73
			2	214.22	128.73
			3	226.96	122.48
			<b>Average</b>	225.47	129.65

#### 4.1.25 Accelerated Weathering of WPB

**Table 4.1.25 Results of Testing of Accelerated Weathering of WPB<sup>1</sup>**

Property	Requirement	Sample No.	Result
Accelerated weathering resistance	The WPB applied over OSB must show no cracking, delamination, flaking or any deleterious effects following 250 hours exposure to Xenon arc	1	Pass
		2	Pass
		3	Pass
		4	Pass
		5	Pass
		6	Pass

**Note to Table 4.1.25:**

<sup>1</sup> The tested WVT of the OSB is specific to the product and thickness used in the test. For typical values of WVT rates of OSB, see Table A-9.25.5.1.(1) of Division B of NBC 2015.

## 4.1.26 Drainage Capacity

Table 4.1.26 Results of Testing of Drainage Capacity of the Products

Property		Requirement	Result		
			Retained Water (g) Per unit area (g/m <sup>2</sup> )		Drainage Capacity (%) After 1 h
			1 h	48 h	
Drainage capacity	Panel 1 <sup>1</sup> total (g)	The unit-retained water (based on the projected drainage area) following one hour of drainage period shall not be greater than 30 g/m <sup>2</sup> and	38.2	0.00	99.5
			29.4	0.00	
	Panel 2 <sup>1</sup> total (g)	The unit-retained water following 48 hours of drying period shall not be greater than and 15 g/m <sup>2</sup> for any single test specimen.	35.4	0.00	99.6
	27.2		0.00		
	Panel 3 <sup>1</sup> total (g)	The drainage capacity must not be less than 98% of the water mass delivered into the EIFS wall specimen.	31.8	0.00	99.6
			24.5	0.00	

### Note to Table 4.1.26:

<sup>1</sup> Panel 1, Panel 2, and Panel 3 consisted of the system applied over “Sto Guard WRB” and “Sto BTS Plus” adhesive.

## 4.1.27 Nail Popping Resistance

Table 4.1.27 Results of Testing of Nail Popping Resistance of the Products

Property	Requirement	Sample No.	Result
Nail popping resistance	There must be no cracking or delamination of the WPB following 1-mm nail protrusion from the nails original preset of 1 mm below the surface of the OSB substrate	1	Pass
		2	Pass
		3	Pass
		4	Pass
		5	Pass
		6	Pass

## 4.1.28 Fire Testing

For a detailed description of the compliance of the related systems to the requirements of Article 3.1.5.5. of Division B of the NBC 2015, please refer to Intertek Listing Information of StoTherm ci Lotusan, StoTherm ci Classic, and StoTherm ci Essence and, SPEC ID: STO/WEIFS 25-01 and 25-02. Refer to STO/WEIFS 15-01 for compliance to the requirements of Clause 3.2.3.8.(1)(b).

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