



June 2017

To Whom It May Concern,

Attached is the *Various NFPA 285 Complying Exterior Wall Constructions – Dow Thermax™ With or Without Dow STYROFOAM™ Brand Spray Polyurethane Foam* document.

Refer to pages 3,4,8,9 to find multiple VaproShield WRB/Air Barrier membranes as an acceptable air/water membrane solution in the NFPA 285 assembly tests conducted by Dow.

For further information about VaproShield and NFPA 285 testing, contact your local representative, visit [VaproShield.com](http://VaproShield.com), or call Tech Team support: 866-731-7663 opt. 5.

March 16, 2016

Dow Building Solutions  
The Dow Chemical Company  
1605 Joseph Drive  
Midland, MI 48642

RE: Various NFPA 285 Complying Exterior Wall Constructions – Dow Thermax™ With or Without  
Dow STYROFOAM™ Brand Spray Polyurethane Foam  
Project No. 1JJB05306.011

To Whom It May Concern:

This analysis provides a summary of various exterior wall constructions that incorporate one or more of the following Dow Chemical products and that will meet the requirements of NFPA 285:

- Thermax™ Brand Rigid Insulation;
- STYROFOAM™ Brand Spray Polyurethane Foam CM 2030, STYROFOAM™ Brand Spray Polyurethane Foam CM 2045 or STYROFOAM™ Brand Spray Polyurethane Foam CM 2060. These products are closed cell, nominal 2.0 lb/ft<sup>3</sup> density, spray polyurethane foam plastic insulation.

Section 2603.5.5 of the International Building Code (2006, 2009 and 2012 editions) requires that exterior walls systems that incorporate foam plastic insulation shall meet the requirements of NFPA 285 “Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.”

Dow Chemical has performed several NFPA 285 fire tests on various exterior wall systems that have incorporated Dow Thermax™ Brand Rigid Insulation. These tests include:

1. Brick exterior wall construction – Reported in Southwest Research Institute Final Report No. 01.05805.01.001, dated November, 2002.
2. Brick exterior wall construction – Reported in Southwest Research Institute Final Report No. 01.13104.01.001c, dated September 5, 2008.
3. Metal Composite Panel exterior wall construction – Reported in Southwest Research Institute Final Report No. 01.13104.01.001d, dated September 5, 2008.
4. Brick exterior wall construction – Reported in Southwest Research Institute Final Report No. 01.15210.01.607a [1], dated May 24, 2010
5. Brick exterior wall construction - Reported in Southwest Research Institute Final Report No. 01.15822.01.001, dated September 9, 2010.

Based on the results of these tests and my experience with the NFPA 285 fire test, it is my judgment that the various configurations of exterior walls described in the attached tables will meet the performance requirements of NFPA 285.

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This analysis is based on the specific construction materials installed in the manner described in the referenced test report(s). Changes or modifications to the construction and/or materials used in the tested assembly may result in a different fire performance and may change this analysis.

This analysis does not address performance characteristics such as weatherability, durability, or structural issues.

I hope that this information is of assistance and if you have any questions, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Beitel', with a stylized flourish at the end.

Jesse J. Beitel  
Senior Scientist/Principal

Enclosure

**Table 1 – Base Wall Assemblies**  
**(See Tables 2 and 3 for additional wall components)**

Wall Component	Materials
Base wall system – Use either 1, 2, 3, 4 or 5	1 – Concrete wall 2 – Concrete Masonry wall 3 – Standard clay brick wall 4 – Adobe block wall 5 – Steel studs: minimum 3 $\frac{5}{8}$ -inch depth, minimum 20-gauge at a maximum of 24-inch OC with lateral bracing every 4 ft. vertically with: a) One layer – $\frac{5}{8}$ -inch thick Type X or $\frac{1}{2}$ -inch thick Type X Gypsum wallboard on interior face of studs, or b) W.R. Grace’s Monokote Z-3306 installed at a minimum of 3/8 inch thickness over cavity insulation (Item 2) or Thermax™, or c) Isolatek International’s CAFCO – TB 415 installed at a minimum of 3/8 inch thickness over cavity insulation (Item 2) or Thermax™, or d) International Cellulose Corporation’s Ure-K Thermal Barrier System installed at a minimum of 1.25 inch thickness over cavity insulation (Item 2) or Thermax™. e) Specialty Products, Inc. Flame Seal-TB coating applied at a wet mil thickness of 25 mils (18 mils dry, 65 ft <sup>2</sup> /gal) over cavity insulation (Item 2) f) International Fireproof Technology, Inc. DC 315 applied at an application rate of 18 wet mils applied over 4 mils of primer which is applied over cavity insulation (Item 2)
Floorline Firestopping	4 lb/cu ft. mineral wool (e.g. Thermafiber) in each stud cavity and at each floorline – attached with Z-clips or equivalent
Cavity Insulation – Use either 1, 2, or 3 or combination of 2 & 3	1 – None 2 – Full stud depth or less thickness of DOW STYROFOAM™ Brand Spray Polyurethane CM 2060 or CM 2045 or CM 2030 applied using sheathing or insulation as substrate and covering the width of the cavity and inside the stud flange 3 – Fiberglass batt insulation (faced or unfaced)
Exterior sheathing – Use either 1, 2 or 3	1 – None 2 – $\frac{1}{2}$ -inch thick, exterior type gypsum sheathing 3 – $\frac{5}{8}$ -inch thick, exterior type gypsum sheathing
Weather-resistive barrier applied to exterior sheathing #2 or #3 – Use either 1 or 2	1 – None 2 – Any shown in Table 4
Remainder of wall assembly	See Table 2 or Table 3

**Table 2 – Walls with a Maximum of 4.25-inch Thick Thermax™**

Wall Component	Materials
Exterior insulation – Use either 1, 2, 3, or 4	<p>1 – None (Exterior sheathing must be Item 2 or 3 listed in Table I.</p> <p>2 – Dow Thermax™ Brand Rigid Insulation – Total thickness to be a minimum of 5/8 inch to maximum of 4.25 inches.</p> <p>3 – DOW STYROFOAM™ Brand Spray Polyurethane CM 2060 or CM 2045 or CM 2030 – to a maximum of 3.5 inches thick.</p> <p>4 – Combination of Item 2 and Item 3 – Total thickness of combination not to exceed 4.25 inches and thickness of Item 3 not to exceed 3.5 inches.</p>
Weather-resistive barrier applied to exterior insulation #2 – Use either 1 or 2	<p>1 – None</p> <p>2 – Any shown in Table 5</p>
Flashing	<p>Flash all exterior insulation joints and veneer tie penetrations with one of the following:</p> <p>1 – Dow LIQUIDARMOR™ - CM Flashing and Sealant – max. 60-mil wet thickness, max. 5-inch width</p> <p>2 – Dow WeatherMate™ Flashing – max. 4-inch width</p> <p>3 – Asphalt, acrylic, or butyl-based flashing tape – max. 4-inch width</p> <p>4 – Dow Great Stuff Pro™ - Use on joints that are ≤ 1/4-inch, vertical joints must be staggered &amp; remove significant excess from the face of the Thermax™</p> <p><i>Note: With either 2 or 3, a small amount of spray primer may be used to aid in adhesion; maximum 5-inch width.</i></p>
Exterior Veneer – Use either 1, 2, 3, 4 or 5	<p>1 – Brick</p> <ul style="list-style-type: none"> <li>– Brick veneer anchors – standard types – installed maximum 24 inches OC vertically on each stud</li> <li>– Maximum 2-inch air gap between exterior insulation and brick</li> <li>– Standard nominal 4-inch thick, clay brick</li> </ul> <p>2 – Stucco – Minimum 3/4-inch thick, exterior cement plaster and lath. A secondary water-resistive barrier can be installed between the exterior insulation and the lath. The secondary water-resistive barrier shall not be full-coverage asphalt or butyl-based self-adhered membranes.</p> <p>3 – Minimum 2-inch thick, Limestone or natural stone veneer or minimum 1-1/2 inch thick cast artificial stone veneer. Any standard non-open-joint installation technique such as ship-lap, etc., can be used.</p> <p>4 – Terracotta cladding – Use any terracotta cladding system in which terracotta is minimum 1-1/4 inch thick. Any non-open-joint installation technique such as ship-lap, etc. can be used.</p> <p>5 – Concrete or precast concrete panels – Minimum 1.5-inch thick panel, with a 2-inch maximum air gap between exterior insulation and concrete panel. Any standard non-open-joint installation technique such as ship-lap, etc. can be used</p>
Flashing of window, door, and other exterior wall penetrations.	<p>As an option, flash window, door and other exterior penetrations with either:</p> <p>a) Dow LIQUIDARMOR™ – CM Flashing and Sealant – max. 60-mil wet thickness, max. 12-inch width.</p> <p>b) Limited amounts of acrylic, asphalt or butyl-based flashing tape – max. 12-inch width.</p>

**Table 3 – Walls with a Maximum of 3-inch Thick Thermax™**

Wall Component	Materials
Exterior insulation – Use either 1 or 2	1 – None (Exterior sheathing must be either 2 or 3 listed in Table I) 2 – Dow Thermax™ Brand Rigid Insulation – Total thickness to be a minimum of 5/8 inch to maximum of 3 inches.
Flashing	Flash all exterior insulation joints and veneer tie penetrations with one of the following: 1 – Dow LIQUIDARMOR™ - CM Flashing and Sealant – max. 60-mil wet thickness, max 5-inch width 2 – Dow WeatherMate™ Flashing – max. 4-inch width 3 – Asphalt, acrylic, or butyl-based flashing tape – max. 4-inch width 4 – Dow Great Stuff Pro™ - Use on joints that are ≤ 1/4-inch, vertical joints must be staggered & remove significant excess from the face of the Thermax™ <i>Note: With either 2 or 3, a small amount of spray primer may be used to aid in adhesion; maximum 5-inch width.</i>
Exterior Veneer – Use either 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 or 16	1 – MCM System - Use any Metal Composite Material system that has been successfully tested by the panel manufacturer via the NFPA 285 test method. Any standard installation technique can be used. MCM panel systems such as: <ul style="list-style-type: none"> <li>○ CEI Composites R4000 System using Reynobond® FR ACM or Alpolic® FR ACM.</li> </ul> 2 – Terracotta cladding – Use any terracotta cladding system in which terracotta is minimum 1-1/4 inch thick. Any standard installation technique can be used. 3 – Metal exterior wall coverings such as steel, aluminum, copper, zinc, etc. Any standard installation technique can be used. 4 – Fiber-cement siding – minimum 1/4-inch thick. Any standard installation technique can be used. A maximum 1 1/2-inch air gap allowed behind the fiber-cement siding. 5 – Brick - Standard nominal 4-inch thick, clay brick with brick veneer anchors – standard types – installed maximum 24 inches OC vertically on each stud. Maximum 2-inch air gap between exterior insulation and brick. 6 – Stucco – Minimum 3/4-inch thick, exterior cement plaster and lath. A secondary water-resistive barrier can be installed between the Exterior insulation and the lath. The secondary water-resistive barrier shall not be full-coverage asphalt or butyl-based self-adhered membranes. 7 – Corium™ Thin brick system. 8 – Minimum 1 1/4-inch thick, Limestone or natural stone veneer or minimum 1 1/4 inch thick cast artificial stone veneer. Any standard installation technique such as ship-lap, etc. can be used. 9 – StoneLite natural stone wall panels by Stone Panels, Inc. 10 – Glen-Gery Thin Tech Elite Series – Masonry veneer 11 – Concrete or precast concrete panels – Minimum 1.5-inch thick panel, with a 2-inch maximum air gap between exterior insulation and concrete panel. Any standard installation technique can be used. 12 – Ceramic tile (min. 3/8-in. thick) bonded using noncombustible mortar adhesive to minimum 1/2-in. thick cement board or gypsum sheathing. 13 – Thin brick (min. 3/4-inch thick clay brick) fully adhered with cementitious mortar (standard or polymer modified) to min. 1/2-inch thick cement backer board or gypsum sheathing. A secondary water-resistive barrier can be installed between the board/sheathing and the brick. The secondary water-resistive barrier shall not be full-coverage asphalt or butyl-based self-adhered membranes. 14 – Natural stone or artificial stone (min. 3/4-inch thick clay brick) fully adhered with cementitious mortar (standard or polymer modified) to min. 1/2-inch thick cement backer board or gypsum sheathing. A secondary water-resistive barrier can be installed between the board/sheathing and the stone. The secondary water-resistive barrier shall not be full-coverage asphalt or butyl-based self-adhered membranes 15 – Knight Wall Systems to include: <ul style="list-style-type: none"> <li>○ MCM System - Use any Metal Composite Material system that has been successfully tested by the panel manufacturer via the NFPA 285 test method. Any standard installation technique can be used. MCM panel systems such as:</li> </ul>

Wall Component	Materials
	<ul style="list-style-type: none"> <li>○ CEI Composites R4000 System using Reynobond® FR ACM or Alpollic® FR ACM.</li> <li>○ Terracotta cladding – Use any terracotta cladding system in which terracotta is minimum 1-1/4 inch thick. Any standard installation technique can be used.</li> <li>○ Metal exterior wall panels or coverings such as steel, aluminum, copper, zinc etc. Any standard installation technique can be used.</li> <li>○ Brick - Standard nominal 4-inch thick, clay brick with brick veneer anchors – standard types – installed maximum 24 inches OC vertically on each stud. Maximum 2-inch air gap between exterior insulation and brick.</li> <li>○ Stucco – Minimum 3/4-inch thick, exterior cement plaster and lath attached to minimum 1/2-inch thick backer board. A secondary water-resistive barrier can be installed between the exterior sheathing and the lath. The secondary water-resistive barrier shall not be full-coverage asphalt or butyl-based self-adhered membranes.</li> <li>○ Corium™ Thin brick system.</li> <li>○ Minimum 1 1/4-inch thick, Limestone or natural stone veneer or minimum 1 1/4 inch thick cast artificial stone veneer. Any standard installation technique such as ship-lap, etc. can be used.</li> <li>○ StoneLite natural stone wall panels by Stone Panels, Inc.</li> <li>○ Glen-Gery Thin Tech Elite Series – Masonry veneer</li> <li>○ Concrete or precast concrete panels – Minimum 1.5-inch thick panel, with a 2-inch maximum air gap between exterior insulation and concrete panel. Any standard installation technique can be used.</li> <li>○ Ceramic tile (min. 3/8-in. thick) bonded using noncombustible mortar adhesive to minimum 1/2-in. thick cement board or gypsum sheathing.</li> <li>○ Thin brick (min. 3/4-inch thick clay brick) fully adhered with cementitious mortar (standard or polymer modified) to min. 1/2-inch thick cement backer board or gypsum sheathing. A secondary water-resistive barrier can be installed between the exterior sheathing and the brick. The secondary water-resistive barrier shall not be full-coverage asphalt or butyl-based self-adhered membranes.</li> <li>○ Natural stone or artificial stone (min. 3/4-inch thick clay brick) fully adhered with cementitious mortar (standard or polymer modified) to min. 1/2-inch thick cement backer board or gypsum sheathing. A secondary water-resistive barrier can be installed between the exterior/sheathing and the stone. The secondary water-resistive barrier shall not be full-coverage asphalt or butyl-based self-adhered membranes</li> </ul> <p>16 – NCI Building Group to include:</p> <ul style="list-style-type: none"> <li>● PBR Panel (Exposed fasteners)</li> <li>● PBU Panel (Exposed fasteners)</li> <li>● AVP Panel (Exposed fasteners)</li> <li>● Designer™ Series Panels (Exposed fasteners)</li> <li>● ShadowRib™ Panels (Exposed fasteners)</li> <li>● NuWall® Panels (Exposed fasteners)</li> <li>● MasterLine 16 (Concealed fasteners)</li> </ul>
<p>Flashing of window, door and other exterior wall penetrations.</p>	<p>As an option, flash window, door and other exterior penetrations with either:</p> <p>a) Dow LIQUIDARMOR™ – CM Flashing and Sealant – max. 60-mil wet thickness, max. 12-inch width.</p> <p>b) Limited amounts of acrylic, asphalt or butyl-based flashing tape – max. 12-inch width.</p>

**Table 4. Allowed Water-resistive Barriers Applied Over Sheathing and Under Foam Insulation**

3M™ – 3M™ Self-Adhered Air and Vapor Barrier 3015
BASF – <ul style="list-style-type: none"> <li>• Enershield HP</li> <li>• Enershield I</li> </ul>
Carlisle – <ul style="list-style-type: none"> <li>• CCW-705FR w/ Primers</li> <li>• Barritech™ VP</li> <li>• Barritech™ NP</li> </ul>
Cosella-Dörken – <ul style="list-style-type: none"> <li>• Delta®-Foxy</li> <li>• Delta®-Foxy Plus</li> <li>• Delta®-Fassade S</li> <li>• Delta®-Vent S/Plus</li> <li>• Delta®-Maxx Plus</li> </ul>
Dow Chemical – <ul style="list-style-type: none"> <li>• WeatherMate™</li> <li>• WeatherMate™ Plus</li> </ul>
Dryvit - Backstop® NT
DuPont – <ul style="list-style-type: none"> <li>• DuPont™ Tyvek® CommercialWrap®</li> <li>• DuPont™ Tyvek® CommercialWrap® D</li> <li>• DuPont™ Tyvek® ThermaWrap™</li> <li>• DuPont™ Tyvek® Fluid Applied Weather Barrier – nominal 25 wet mil thickness</li> </ul>
Henry Company – <ul style="list-style-type: none"> <li>• Air-Bloc® 32MR</li> <li>• Air-Bloc® 31MR</li> <li>• Air-Bloc® 33MR</li> <li>• BlueskinVP™ 160</li> <li>• Air-Bloc® 21 FR</li> <li>• Metal Clad™</li> <li>• Foilskin®</li> </ul>
Hohmann & Barnard – <ul style="list-style-type: none"> <li>• Enviro-Barrier™</li> <li>• Enviro-Barrier™ VP</li> </ul>
Momentive Performance Materials – <ul style="list-style-type: none"> <li>• GE SEC2500 SilShield* AWB</li> <li>• GE SEC2600 SilShield* AWB</li> <li>• GE SEC2600-R SilShield* AWB</li> </ul>
Pactiv – <ul style="list-style-type: none"> <li>• Green Guard Max™</li> <li>• C500</li> <li>• C2000</li> <li>• Raindrop® 3D</li> </ul>



<p>Polyguard Products –</p> <ul style="list-style-type: none"> <li>• Airllok Flex® applied at a maximum 40 mils WFT</li> <li>• Airllok Flex® WG applied at a maximum 20 mils WFT</li> <li>• Airllok Flex® VP applied at a maximum 32 mils WFT</li> </ul>
<p>Sto Corp –</p> <ul style="list-style-type: none"> <li>• Sto Gold Coat® with StoGuard Fabric</li> <li>• Sto Emerald Coat® with StoGuard Fabric</li> <li>• Sto ExtraSeal™ w StoGuard Mesh</li> </ul>
<p>STS, Inc. - Wall Guardian™ FW-100A</p>
<p>VaproShield –</p> <ul style="list-style-type: none"> <li>• WallShield®</li> <li>• WrapShield®</li> <li>• RevealShield™</li> <li>• RevealShield SA™</li> </ul>
<p>W.R. Grace –</p> <ul style="list-style-type: none"> <li>• Perm-A-Barrier® Aluminum Wall Membrane</li> <li>• Perm-A-Barrier® VPL</li> <li>• Perma-A-Barrier® VPL LT</li> <li>• Perm-A-Barrier® VPS</li> <li>• Perm-A-Barrier® NPL</li> </ul>
<p>W.R. Meadows –</p> <ul style="list-style-type: none"> <li>• Air-Shield™ LMP (Gray)</li> <li>• Air-Shield™ LMP (Black)</li> <li>• Air-Shield™ TMP</li> <li>• Air-Shield™ LSR</li> </ul>

**Note:** all barriers to be installed at indicated or recommended application rates and per manufacturer's installation instructions. Table as of 06-12-2014

**Table 5. Allowed Water-resistive Barriers  
Installed Over the Foam Insulation**

<p>Dow Chemical –</p> <ul style="list-style-type: none"> <li>• WeatherMate™</li> <li>• WeatherMate™ Plus</li> </ul>
<p>DuPont –</p> <ul style="list-style-type: none"> <li>• Tyvek® CommercialWrap®</li> <li>• DuPont™ Tyvek® CommercialWrap®</li> <li>• DuPont™ Tyvek® CommercialWrap® D</li> <li>• DuPont™ Tyvek® ThermaWrap™</li> </ul>
<p>Pactiv –</p> <ul style="list-style-type: none"> <li>• Green Guard Max™</li> <li>• C500</li> <li>• Raindrop® 3D</li> </ul>
<p><b>VaproShield –</b></p> <ul style="list-style-type: none"> <li>• <b>RevealShield™</b></li> <li>• <b>RevealShield SA™</b></li> </ul>

**Note:** all barriers to be installed at indicated or recommended application rates and per manufacturer's installation instructions.  
Table as of 06-13-2014