

# NFPA 285 Testing and the Use of Engineering Extensions in Wall Assemblies Using Foam Plastic Insulating Sheathing (FPIS)

Design Example



**ABTG**

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# Introduction

- This course assumes that the Building Designer has reviewed the building code requirements and has verified that a NFPA 285 compliant assembly is needed for the project.
- For guidance on determining when a NFPA 285 compliant assembly is required, consult the [NFPA 285 Compliance Decision Tree](#)

# Step 1: Identify the FPIS Product

- To begin the process, the specifier will need to decide on which foam sheathing product they are going to use.
- Because of the proprietary nature of the product, products must qualify individually for use in NFPA 285 assemblies.

# Step 2: Code Evaluation Report

- Locate the foam sheathing manufacturer's code evaluation report showing compliance with NFPA 285.
- Code compliance reports can be obtained from the manufacturer or directly from the code evaluation agency (e.g., DrJ Engineering, IAPMO, ICC-ES, Intertek/ATI, NTA, etc.)

# Step 3: Approved Assemblies

- Locate the manufacturer's approved assemblies.
- These include specifically tested assemblies as well as engineering extensions that are allowed based on the NFPA 285 testing and additional cone calorimeter testing to identify allowable substitutions.
- These may be located in the code evaluation report or directly from the manufacturer.

# Step 4: Design the Assembly

- Some manufacturers provide very specific assemblies that are pre-defined. In this case, simply select the assembly that suits the application.

# Step 4: Design the Assembly

- Many manufacturers publish tables that are used by the specifier to design their own wall assembly.
- This option provides greater flexibility for the designer to build a variety of code compliant assemblies.

# Step 4: Design the Assembly


- Here is an example of a table that might be used.

NFPA 285 Approved Wall Assemblies	
Wall Component	Materials
<b>Base Wall System</b> Use either 1, 2 or 3	1. Cast concrete walls 2. CMU concrete walls 3. 25-gauge min. 3 <sup>5</sup> / <sub>8</sub> " (min.) steel studs spaced 24" o.c. (max.) <ol style="list-style-type: none"> <li>5<sup>5</sup>/<sub>8</sub>" Type X gypsum wallboard interior</li> <li>½" exterior gypsum sheathing</li> <li>Lateral bracing every 4'</li> </ol>
<b>Fire-Stopping at Floor Lines</b>	1. Any approved mineral-fiber-based safing insulation in each stud cavity at floor line. Safing thickness must match stud cavity depth.
<b>Cavity Insulation</b> Use one option 1-4	1. None 2. Any noncombustible insulation per ASTM E136 3. Any mineral fiber (Board type Class A ASTM E84 faced or unfaced) 4. Closed cell SPF.
<b>Exterior Sheathing</b> Use either 1 or 2	1. None. 2. ½" or thicker exterior gypsum sheathing
<b>WRB Over Base Wall Surface</b> Use either 1, 2 or 3	1. None 2. Any of the tested WRB that has been listed (Liquitite 285 and H-barrier 360) may be substituted for each-other over ½" or thicker exterior sheathing. 3. Any WRB that has been tested per ASTM E1354 (at a min. of 20 kW/m <sup>2</sup> heat flux) and shown by analysis to be less flammable (improved T <sub>ign</sub> , PK, HRR) than those listed above.
<b>Exterior Insulation</b>	1. ISO-TITE polyisocyanurate foam sheathing. Note: A construction that utilizes no exterior sheathing and incorporates spray foam cavity insulation may not use ISO-Tite Xci as exterior insulation.
<b>WRB Over Exterior Insulation</b> Use either 1, 2 or 3	1. None 2. Liquitite 285 and H-barrier 360 are applied over the foil or glass facers of exterior insulations. For these systems, the WRB systems referenced may be interchanged. 3. Any WRB that has been tested per ASTM E1354 (at a min. of 20 kW/m <sup>2</sup> heat flux) and shown by analysis to be less flammable (improved T <sub>ign</sub> , PK, HRR) than those listed above.
<b>Exterior Cladding</b> Use either 1, 2 or 3	1. Brick – Nominal 4"-thick, clay or concrete brick or veneer with maximum 2" air gap behind the brick. Brick ties/Anchors 24" o.c. (max.) 2. Stucco – Minimum 3 <sup>3</sup> / <sub>4</sub> "-thick, exterior cement plaster and lath. For systems that require a more durable WRB system, any building wrap or 15# felt that meets <a href="#">WRB Over Exterior Insulation option 3</a> can be used as a slip sheet between the WRB/external insulation and the lath. 3. Limestone – Minimum 2" thick using any standard non-open joint installation technique such as shiplap.
1. The assemblies' combinations created herein and the various substitutions of products are based on testing and professional thermal engineering analysis. 2. Acceptance criteria for ASTM E1354 testing have not been well established in the referenced building codes and foam sheathing related sections. The criteria stated here for substitution of products is based on testing and professional thermal engineering analysis. 3. T <sub>ign</sub> is the time to ignition from the start of the test until the sheathing ignites. PK, HRR is the peak heat release rate during the test.	



# Step 4: Design the Assembly

- The column on the left is the wall component categories.
- Each category represents a layer of the assemblies' cross section.
- To use the table, simply select one item from each of the wall component categories in the right hand column.

NFPA 285 Approved Wall Assemblies	
Wall Component	Materials
Base Wall System Use either 1, 2 or 3	 <ol style="list-style-type: none"><li>1. Cast concrete walls</li><li>2. CMU concrete walls</li><li>3. 25-gauge min. 3<sup>5</sup>/<sub>8</sub>" (min.) steel studs spaced 24" o.c. (max.)<ol style="list-style-type: none"><li>a. 5/8" Type X gypsum wallboard interior</li><li>b. 1/2" exterior gypsum sheathing</li><li>c. Lateral bracing every 4'</li></ol></li></ol>

# Step 5: Verify Compliance

- Be careful to comply with all of the table notes to be sure the full assembly meets all of the requirements for the products chosen.
- Watch for any specific details on how the assembly must be constructed.

Exterior  
Insulation



1. ISO-TITE polyisocyanurate foam sheathing.  
Note: A construction that utilizes no exterior sheathing and incorporates spray foam cavity insulation may not use ISO-Tite Xci as exterior insulation.

# Step 5: Verify Compliance

- Note that some categories have “none” as an option. In these cases, that component is optional in the assembly.



<b>Cavity</b>	<b>1. None</b>
<b>Insulation</b>	<b>2. Any noncombustible insulation per ASTM E136</b>
<b>Use one</b>	<b>3. Any mineral fiber (Board type Class A ASTM E84</b>
<b>option 1-4</b>	<b>faced or unfaced)</b>
	<b>4. Closed cell SPF.</b>

# Step 5: Verify Compliance

- Only one option may be chosen from each category, and all categories must be used.

# Step 5: Verify Compliance

- Note that the category “Fire-Stopping at Floor Lines” only has one option; therefore all assemblies must include this fire-stopping.

## Fire-Stopping at Floor Lines

1. Any approved mineral-fiber-based safing insulation in each stud cavity at floor line. Safing thickness must match stud cavity depth.

# Step 5: Verify Compliance

- Note also that some options can only be used with a specific option from another category.

<b>WRB Over Exterior Insulation</b> Use either 1, 2 or 3	<ol style="list-style-type: none"><li>None</li><li>Liquitite 285 and H-barrier 360 are applied over the foil or glass facers of exterior insulations. For these systems, the WRB systems referenced may be interchanged.</li><li>Any WRB that has been tested per ASTM E1354 (at a min. of 20 kW/m<sup>2</sup> heat flux) and shown by analysis to be less flammable (improved T<sub>ign</sub>, PK. HRR) than those listed above.</li></ol>
<b>Exterior Cladding</b> Use either 1, 2 or 3	<ol style="list-style-type: none"><li>Brick – Nominal 4"-thick, clay or concrete brick or veneer with maximum 2" air gap behind the brick. Brick ties/Anchors 24" o.c. (max.)</li><li>Stucco – Minimum 3/4"-thick, exterior cement plaster and lath. For systems that require a more durable WRB system, any building wrap or 15# felt that meets <a href="#">WRB Over Exterior Insulation option 3</a> can be used as a slip sheet between the WRB/external insulation and the lath.</li><li>Limestone – Minimum 2" thick using any standard non-open joint installation technique such as shiplap.</li></ol>



# Example 1

- First, select the Base Wall System.
- We will select option 3: steel studs.
- Note that this option includes minimum interior and exterior sheathing and bracing requirements.

Wall Component	Materials
Base Wall System Use either 1, 2 or 3	<ol style="list-style-type: none"><li>1. Cast concrete walls</li><li>2. CMU concrete walls</li><li>3. 25-gauge min. 3<sup>5</sup>/<sub>8</sub>" (min.) steel studs spaced 24" o.c. (max.)<ol style="list-style-type: none"><li>a. 5/<sub>8</sub>" Type X gypsum wallboard interior</li><li>b. 1/2" exterior gypsum sheathing</li><li>c. Lateral bracing every 4'</li></ol></li></ol>

# Example 1

- Next, select Fire-Stopping at Floor Lines.
- Any approved mineral-fiber-based safing insulation may be used. Thickness of insulation must match stud cavity depth.

Wall Component	Materials
Fire-Stopping at Floor Lines	1. Any approved mineral-fiber-based safing insulation in each stud cavity at floor line. Safing thickness must match stud cavity depth.



# Example 1

- Next, select Cavity Insulation.
- We will select “None”

Wall Component	Materials
Cavity Insulation Use one option 1-4	<ol style="list-style-type: none"><li>1. None</li><li>2. Any noncombustible insulation per ASTM E136</li><li>3. Any mineral fiber (Board type Class A ASTM E84 faced or unfaced)</li><li>4. Closed cell SPF.</li></ol>

# Example 1

- Next, select Exterior Sheathing.
- We will select “½" or thicker exterior gypsum sheathing”.
- Note that we cannot use “none” since the steel stud base wall system requires the exterior sheathing.

Wall Component	Materials
Exterior Sheathing Use either 1 or 2	<ol style="list-style-type: none"><li>1. None.</li><li>2. ½" or thicker exterior gypsum sheathing</li></ol>

# Example 1

- Next, select WRB Over Base Wall Surface.
- We will select option 2 since we are using ½" or thicker exterior sheathing.

Wall Component	Materials
WRB Over Base Wall Surface Use either 1, 2 or 3	<ol style="list-style-type: none"><li>1. None</li><li>2. Any of the tested WRB that has been listed (Liquitite 285 and H-barrier 360) may be substituted for each-other over ½" or thicker exterior sheathing.</li><li>3. Any WRB that has been tested per ASTM E1354 (at a min. of 20 kW/m<sup>2</sup> heat flux) and shown by analysis to be less flammable (improved T<sub>ign</sub>, PK. HRR) than those listed above.</li></ol>

# Example 1

- Next, select Exterior Insulation.
- We will select ISO-TITE as it is the only option.
- Since we have not used spray-foam cavity insulation, and are using exterior sheathing, it is permitted.

Wall Component	Materials
Exterior Insulation	1. ISO-TITE polyisocyanurate foam sheathing. Note: A construction that utilizes no exterior sheathing and incorporates spray foam cavity insulation may not use ISO-Tite Xci as exterior insulation.

# Example 1

- Next, select WRB Over Exterior Insulation.
- We will select “None” since we already have a WRB selected over the exterior sheathing.

Wall Component	Materials
<b>WRB Over Exterior Insulation</b> Use either 1, 2 or 3	<ol style="list-style-type: none"><li>1. None</li><li>2. Liquitite 285 and H-barrier 360 are applied over the foil or glass facers of exterior insulations. For these systems, the WRB systems referenced may be interchanged.</li><li>3. Any WRB that has been tested per ASTM E1354 (at a min. of 20 kW/m<sup>2</sup> heat flux) and shown by analysis to be less flammable (improved T<sub>ign</sub>, PK. HRR) than those listed above.</li></ol>

# Example 1

- Next, select Exterior Cladding.
- We will select option 1.
- We cannot select option 2 as we did not select WRB option 3.

Wall Component	Materials
Exterior Cladding Use either 1, 2 or 3	<ol style="list-style-type: none"><li>1. Brick – Nominal 4"-thick, clay or concrete brick or veneer with maximum 2" air gap behind the brick. Brick ties/Anchors 24" o.c. (max.)</li><li>2. Stucco – Minimum <math>\frac{3}{4}</math>"-thick, exterior cement plaster and lath. For systems that require a more durable WRB system, any building wrap or 15# felt that meets <a href="#">WRB Over Exterior Insulation option 3</a> can be used as a slip sheet between the WRB/external insulation and the lath.</li><li>3. Limestone – Minimum 2" thick using any standard non-open joint installation technique such as shiplap.</li></ol>

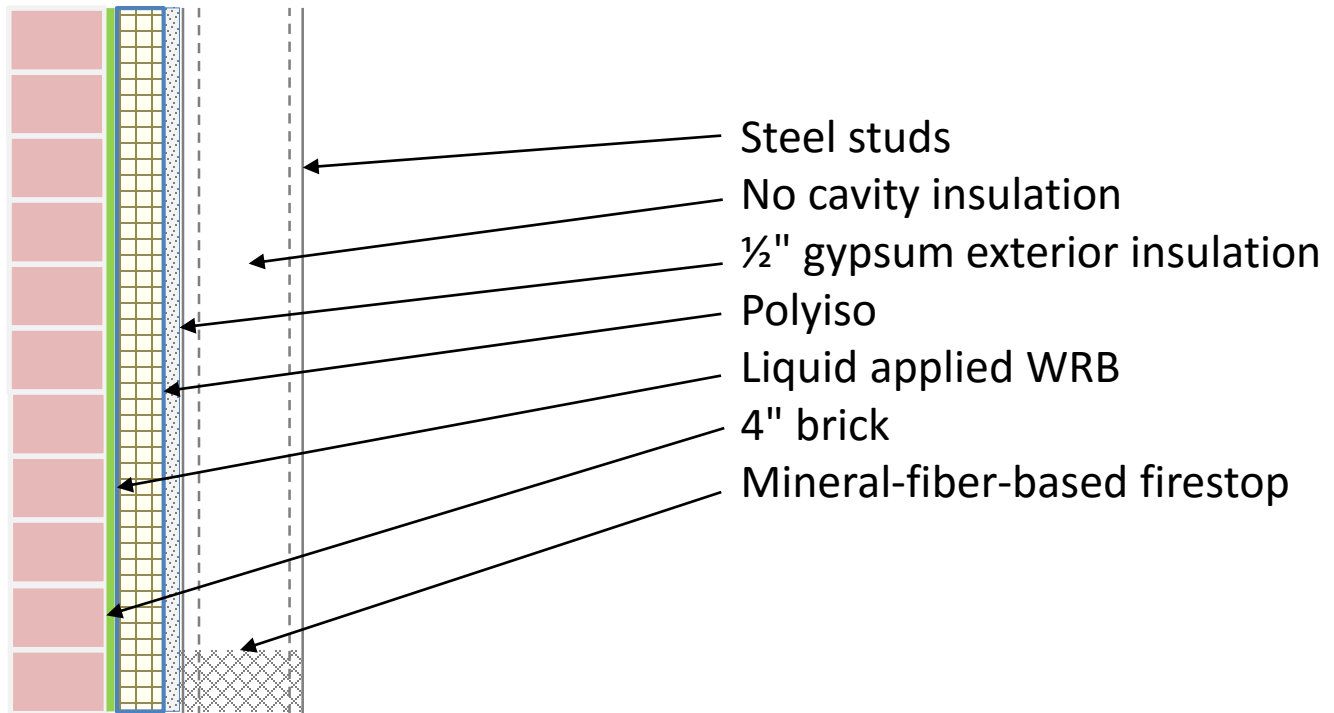
# Example 1

- Next, check for applicable footnotes.
- None of the footnotes will impact our selections.

1. The assemblies' combinations created herein and the various substitutions of products are based on testing and professional thermal engineering analysis.
2. Acceptance criteria for ASTM E1354 testing have not been well established in the referenced building codes and foam sheathing related sections. The criteria stated here for substitution of products is based on testing and professional thermal engineering analysis.
3.  $T_{ign}$  is the time to ignition from the start of the test until the sheathing ignites. Pk. HRR is the peak heat release rate during the test.

# Example 1

- Your wall assembly is code compliant!





# Additional Information

- See [www.drjbestpractices.org](http://www.drjbestpractices.org)