PRIEST & ASSOCIATES CONSULTING, LLC

ENGINEERING EVALUATION

Siga WRB's and Hunter Polyiso Foam Insulation in NFPA 285 Assemblies

Project No. 10561B

Prepared for:

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Abstract

Hunter has granted use of their NFPA 285 Engineering Evaluation (and related data) to determine Engineering Extensions of alternate WRB products manufactured by Siga. This evaluation, along with NFPA 285 and cone calorimeter (ASTM E1354) data from Hunter and Siga were used to create a matrix of constructions using various combinations of Hunter/Siga products which could meet NFPA 285 with specific limitations.

The conclusions reached by this evaluation are true and correct, within the bounds of sound engineering practice. All reasoning for our decisions is contained within this document.

Submitted by,

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January 8, 2018

Reviewed and Approved,

Deg Priest
President

January 8, 2018

INTRODUCTION

The purpose of this evaluation is to allow use of Siga WRB products in previously evaluated Hunter NFPA 285 assemblies that can meet the requirements of NFPA 285 (Ref. 1). Cone Calorimeter (Ref. 3) and NFPA 285 data were submitted to compare the flammability of Siga WRB products to various Hunter approved WRB's in EEV 10123 (Ref. 4).

REFERENCED DOCUMENTS

1) *NFPA 285-12 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-loadbearing Wall Assemblies Containing Combustible Components*
2) *Babrauskas, V., Lucas, D., Eisenberg, D., Singla, V., Dedeo, M., & Blum, A. (2012). Flame retardants in building insulation: a case for re-evaluating building codes. Building Research & Information. doi:10.1080/09613218.2012.744533*
3) *Cone Calorimeter and NFPA 285 Data for Siga and Hunter – Data Confidential btw Siga, Hunter and Priest & Associates*
4) *Priest and Associates EEV 10123 – Hunter NFPA 285 Evaluation*
5) *DRJ Engineering TER 1402-01 and 02 Hunter Approved NFPA 285 Assemblies*
6) *Lindholm et al. Cone Calorimeter – a Tool for Measuring Heat Release* *http://www.ffrc.fi/FlameDays_2009/4B/LindholmPaper.pdf*
7) *Babrauskas et al., 10 Years of Heat Release Research NIST Publication* *http://fire.nist.gov/bfrlpubs/fire93/PDF/f93048.pdf*

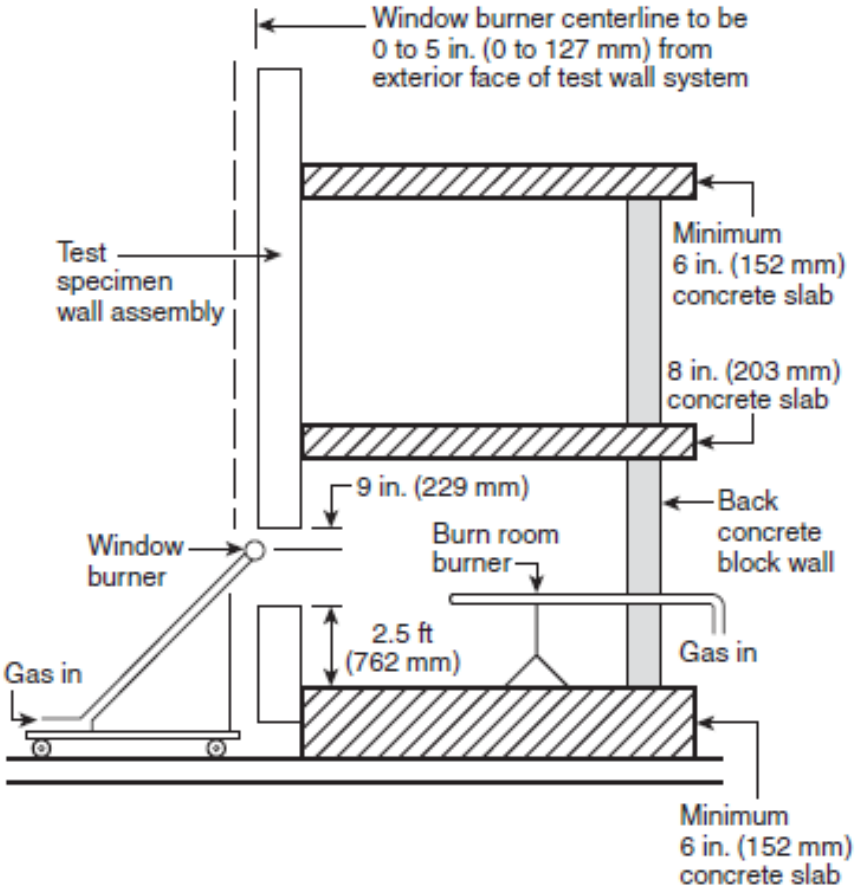
EVALUATION METHOD

NFPA 285 Criteria

The NFPA 285 fire test (Ref. 1) is designed to test the flame spread properties of exterior walls containing combustible components. Two non-combustible rooms are stacked to simulate two stories of a multi-story building. The wall assembly is then attached to the exterior face of the rooms. A typical test wall measures 14 ft x 18 ft with a 30 in. x 78 in. window opening placed on the bottom floor.

During a test, a calibrated fire starts in the bottom room. After 5 minutes, the exterior burner is ignited to produce a specific heat flux/temperature pattern on the exterior of the wall. Both burners remain ignited during the 30 minute test. Personnel monitor flame spread visually during the course of the test. A computer data acquisition system monitors and records the thermocouples temperatures. The criteria for passing (Ref. 1) are as follows (reworded in simple terms for this analysis):

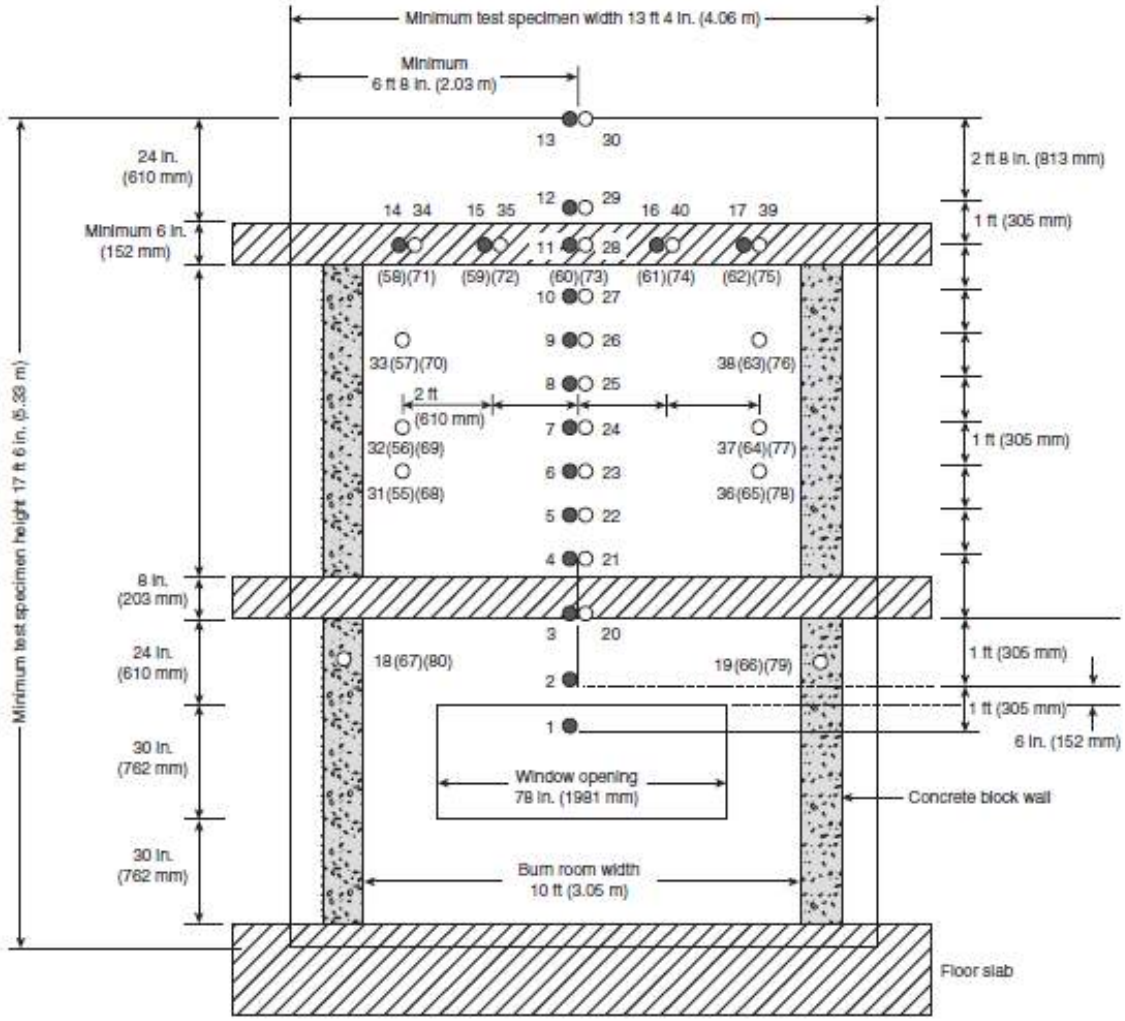
1) Flames shall not spread vertically 10 ft above the window opening as determined visually or by thermocouples located at the 10 ft level. Failure occurs when thermocouples 11 or 14 - 17 exceed 1000°F.
2) Flames shall not spread (visually) horizontally 5 ft on either side of the centerline of the window opening.
3) Flames shall not spread inside the wall cavity as determined by thermocouples placed within the wall cavity insulation and air-gaps if present. Failure occurs when thermocouples 28 or 31 - 40 or 55 - 65 and 68 - 79 exceed 750°F above ambient.
4) Flames shall not spread horizontally within the wall cavity past the interior room dimension as determined by wall cavity thermocouples. Failure occurs when thermocouples 18 - 19, or 66 - 67, or 79 - 80 exceed 750°F above ambient.
5) Flames shall not spread to the second story room as determined by interior wall surface thermocouples. Failure occurs when thermocouples 49 - 54 exceed 500°F above ambient.
6) Flames shall not occur in the second story (visually).
7) Flames shall not escape (visually) from the interior to the exterior at the wall/wall intersection of the bottom story room.



Two burners are ignited to produce a specific time-temperature profile in the room and on the exterior face of the wall.

Thermocouples are placed at strategic locations to monitor temperature as an indicator of flame spread.

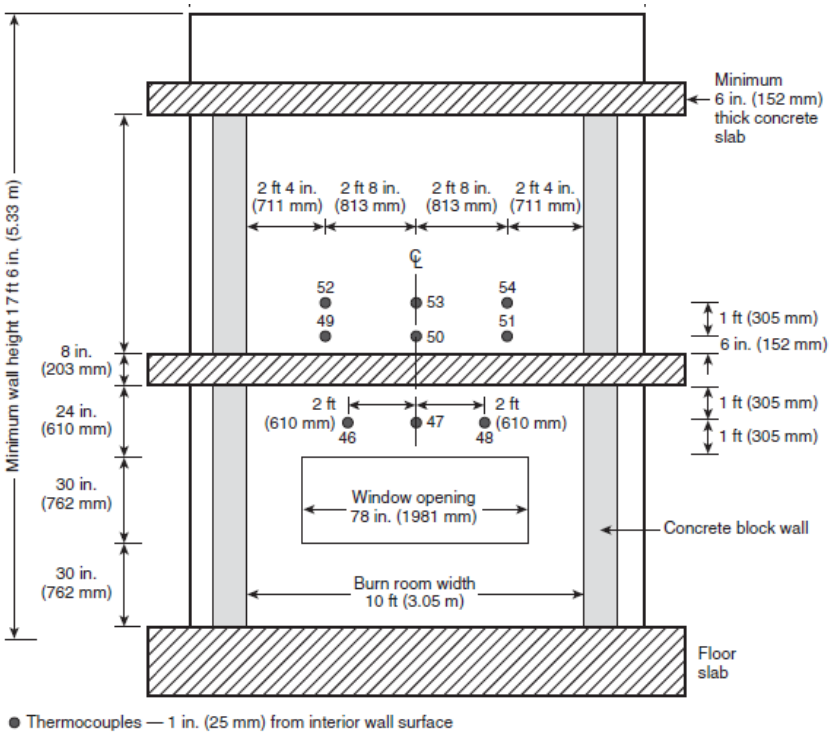
In the depictions below, thermocouples 1 - 10, and 20 - 27 are not used for compliance purposes. The remainders are used to monitor flame spread.



● Thermocouples — 1 in. (25 mm) from exterior wall surface

○ Thermocouples — in the wall cavity air space or the insulation, or both, as shown in Figure 6.1(b) Details A through I.

( ) Thermocouples — Additional thermocouples in the insulation or the stud cavity, or both, where required for the test specimen construction being tested, as shown in Figure 6.1(b) Details C through I.



Constructions Tested

This evaluation is based on Hunter EEV 10123 (Ref. 4) as the basis document. The EEV was based on several NFPA 285 tests deemed as worst case assemblies allowing various component options based on the testing. Each report describes a specific construction tested per NFPA 285. The specific constructions are confidential, but included various combinations of wall components. These include cavity insulation, exterior sheathing, water resistive barrier (WRB), exterior insulation, exterior WRB, air gap, claddings and window details.

Additionally, Cone Calorimeter tests conducted by Siga were used for this analysis.

WRB Analysis

If a new WRB is less flammable than the NFPA 285 tested WRB, it is allowed as an alternate component. Cone calorimeter data (Ref. 3) was submitted to evaluate substitutions of the WRB products.

When analyzing cone calorimeter data, two sets of numbers are typically used. These are: the time to ignition (T_{ign}) at a given heat flux; and, the peak heat release rate (Pk. HRR). Clearly, smaller Peak Heat Release Rate (Pk. HRR) values and longer time to ignition (T_{ign}) values are considered to be improvements (i.e., less flammable) when comparing materials using the Cone Calorimeter. However, some data for a given comparison are conflicting. To resolve these types of discrepancies, researchers (Ref. 7) have used a ranking system to organize cone calorimeter data for flammability comparison.

The expression $Rank = \frac{Pk.HRR}{T_{ign}}$ resolves inconsistencies in relative flammability data when using the Cone Calorimeter. Lower HRR and longer T_{ign} make the rank smaller. So, smaller rank materials are considered less flammable than higher rank materials.

With that understood, it should be noted that the accepted relative error [of the HRR] in cone calorimeters is “approximately 20 - 30% for 1 kW fires, 10% for 3 kW fires and less than 10% for 5 kW fires”. (Ref. 6).

WRB under Foam Insulation
The Siga WRB products listed below are less flammable (peak HRR or improved Rank) than at least one of the WRB's in the EEV (Ref. 4) or TER report (Ref.5) for WRB's used under the exterior insulation (over the base wall surface).

1) Majvest 500 SA

WRBs over Exterior Insulation
Cone Calorimeter data has been analyzed (Ref. 3) for this condition. The WRB products listed above are less flammable than at least one if the WRB's listed for this location (with specific claddings) and may be used over the exterior insulation – only under specific masonry claddings.

WRB Conclusions
The data were analyzed with the following conclusions. Only the claddings in EEV 10123 are allowed as the claddings for this report.

WRB	Allowed Location
Majvest 500 SA	Ok under foam, with all claddings listed
	Ok over foam, Claddings 1 – 6 (heavy masonry)

CONCLUSIONS

Based on the discussion above, the following Table of NFPA 285 Assemblies (Ref. Hunter EEV 10123) shall apply to Siga. We allow Mineral Fiber (Mineral Wool) Insulation to replace the polyiso insulation since mineral wool is noncombustible

Table 1: Xci Foil (Class A) or XCi-286 Exterior Insulation

Wall Component	
Base Wall – Use either 1, 2, or 3	1) Cast Concrete Walls 2) CMU Concrete Walls 3) 25 GA. min. 3⅝" (min.) steel studs spaced 24" OC (max.) a. ⅝" type X Gypsum Wallboard Interior b. Lateral Bracing every 4 ft
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. 2) Solid FRTW fire blocking at floor line in accordance with building code requirements for Type III construction.
Cavity Insulation – Use either: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11. Note: For items 2, 3, 8, 9, 10 and 11 spray foam may not be used in constructions that utilize a foil faced exterior insulation and do not utilize an exterior sheathing. Items 2, 3, 8, 9, 10 and 11 may only be used with exterior sheathing 1.	1) None 2) 1½" (min.) of Covestro EcoBay CC SPF (up to full cavity thickness) 3) 1½" (min.) of BASF Walltite SPF (up to full cavity thickness) 4) Any noncombustible insulation per ASTM E136 5) Any Mineral Fiber (Board type Class A ASTM E84 faced or unfaced) 6) Any Fiberglass (Batt Type Class A ASTM E84 faced or unfaced) 7) Any foam plastic insulation (SPF or board type) which has been tested per ASTM E1354 (at a minimum of 20 kW/m^2 heat flux) and shown by analysis to be less flammable (improved T_{ign}, Pk. HRR) than Covestro EcoBay CC or BASF Walltite 8) NCFI InsulBloc SPF (up to full cavity thickness) 9) Icynene MD-C-200v3 (Proseal) up to 5½ inches (only with ½ in. (min.) exterior gypsum sheathing) 10) SWD Urethane Quik-Shield 112 up to 6 inches in 6 inch (max.) stud cavities with an air gap not exceeding 2½ inches. 11) 1½" (min.) ThermoSeal 2000 (up to full cavity thickness)
Exterior Sheathing – Use either 1, or 2	1) ½" or thicker exterior gypsum sheathing 2) ½" (min.) FRTW structural panels in Type III construction

WRB Over Base Wall Surface	See Table 5
Exterior Insulation – Use 1, 2, 3 or 4 depending on cladding. Note: A construction which utilizes no exterior sheathing may not use spray foam cavity insulation. Item 1 – "None" may only be used with specific claddings It is assumed mineral wool is 2 pcf (min) 1 inch (min.) thickness	1) None (only with Cladding 1 - 6 when WRB #2 is used) 2) 3½" thick (max.) Xci Foil (Class A) or Xci-286 for all claddings 3) 4" thick Xci Foil (Class A) or Xci-286 for claddings 1-6 4) Mineral wool
WRB Over Exterior Insulation	See Table 5
Exterior Cladding - Use either 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,13, 14, 15, 16 or 17. Item 7 may use any tested/approved installation technique. Items 8, 9 or 12 may use any standard installation technique.	1) Brick – Nominal 4" clay or concrete brick or veneer with maximum 2" air gap behind the brick. Brick Ties/Anchors 24" OC (max.) 2) Stucco – minimum ¾" thick exterior cement plaster and lath with an optional secondary water resistive barrier between the exterior insulation and lath. The secondary barrier shall not be full coverage asphalt or self-adhered butyl membrane. 3) Limestone – minimum 2" thick using any standard non-open joint installation technique such as shiplap 4) Natural Stone Veneer – minimum 2" thick using any standard non-open joint installation technique such as grouted/mortared stone 5) Cast Artificial Stone – minimum 1½" thick complying with ICC-ES AC 51 using any standard non-open joint installation technique such as shiplap. 6) Terra Cotta Cladding – minimum 1¼" thick (solid or equivalent by weight) using any standard non-open joint installation technique such as shiplap 7) Any MCM that has successfully passed NFPA 285 8) Uninsulated sheet metal building panels including steel, copper, aluminum or zinc 9) ¼" (min.) uninsulated fiber cement siding, or porcelain or ceramic tile mechanically attached 10) Stone, porcelain, ceramic/aluminum honeycomb composite building panels that have successfully passed NFPA 285 criteria 11) Autoclaved-aerated-concrete (AAC) panels that have successfully passed NFPA 285 criteria 12) Terra Cotta Cladding – Any Rain-screen Terra Cotta (min. ½" thick) with ventilated shiplap 13) ½" Stucco – Any one coat stucco (½" min.) which meets AC11 acceptance criteria or is approved for use in Type I-IV construction or has been tested per NFPA 285 or stays in place when tested per ASTM E119 (stucco exposed to fire) for at least 30 minutes 14) Thin brick/cultured stone set in thin set adhesive and metal lath that has been tested to ASTM E119 (brick exposed to furnace) and remains in place for a minimum of 30 minutes, or has passed an NFPA 285 test. Minimum ¾" with an optional secondary water resistive barrier between

	the exterior insulation and lath. The secondary barrier shall not be full coverage asphalt or self-adhered butyl membrane. 15) Glen Gery Thin Tech Elite Series Masonry Veneer or TABS II Panel System with ½" thick bricks using TABS Wall Adhesive 16) Natural Stone Veneer – minimum 1¼" thick using any standard installation technique 17) FunderMax M.Look Grey Core – minimum ¼ inch thick using any standard installation technique

Table 2: Xci CG or Xci CG (Class A) Exterior Insulation

Wall Component	
Base Wall – Use either 1, 2, or 3	1) Cast Concrete Walls 2) CMU Concrete Walls 3) 25 GA. min. 3⅝" (min.) steel studs spaced 24" OC (max.) a. ⅝" type X Gypsum Wallboard Interior b. Lateral Bracing every 4 ft
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. 2) Solid FRTW fire blocking at floor line in accordance with building code requirements for Type III construction.
Cavity Insulation – Use either: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11 Items, 8, 9, 10 and may only be used with exterior sheathing 2. Note – Use of Xci CG (Class A) with SPF in stud cavity must use exterior sheathing Option 1.	1) None 2) 1½" (min.) of Covestro EcoBay CC SPF (up to full cavity thickness) 3) 1½" (min.) of BASF Walltite SPF (up to full cavity thickness) 4) Any noncombustible insulation per ASTM E136 5) Any Mineral Fiber (Board type Class A ASTM E84 faced or unfaced) 6) Any Fiberglass (Batt Type Class A ASTM E84 faced or unfaced) 7) Any foam plastic insulation (SPF or board type) which has been tested per ASTM E1354 (at a minimum of 20 kW/m^2 heat flux) and shown by analysis to be less flammable (improved T_{ign}, Pk. HRR) than Covestro EcoBay CC or BASF Walltite 8) NCFI InsulBloc SPF (up to full cavity thickness) 9) Icynene MD-C-200v3 (Proseal) up to 5½ inches (only with ½ in. (min.) exterior gypsum sheathing) 10) SWD Urethane Quik-Shield 112 up to 6 inches in 6 inch (max.) stud cavities with an air gap not exceeding 2½ inches. 11) 1½" (min.) ThermoSeal 2000 (up to full cavity thickness)
Exterior Sheathing Use 1 or 2	1) ½" or thicker exterior gypsum sheathing 2) ½″ (min.) FRTW structural panels in Type III construction
WRB on Base Wall	See Table 5
Exterior Insulation – Use 1, 2, 3 or 4 depending on cladding. Item 1 – "None" may only be used with specific claddings It is assumed mineral wool is 2 pcf (min.) 1 inch (min.) thickness	1) None (only with Cladding 1 - 6 when WRB #2 is used) 2) 3½" thick (max.) Xci CG or Xci CG (Class A) for all claddings 3) 4" thick (max.) Xci-CG or Xci-CG (Class A) for claddings 1-6 4) Mineral wool
WRB on Insulation	See Table 5
Exterior Cladding - Use either 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11,	1) Brick – Nominal 4" clay or concrete brick or veneer with maximum 2" air gap behind the brick. Brick Ties/Anchors 24" OC (max.)

12, 13, 14, 15, 16 or 17 Item 7 may use any tested/approved installation technique. Items 8, 9 or 12 may use any standard installation technique	2) Stucco – minimum ¾" thick exterior cement plaster and lath with an optional secondary water resistive barrier between the exterior insulation and lath. The secondary barrier shall not be full coverage asphalt or self-adhered butyl membrane. 3) Limestone – minimum 2" thick using any standard non-open joint installation technique such as shiplap 4) Natural Stone Veneer – minimum 2" thick using any standard non-open joint installation technique such as grouted/mortared stone 5) Cast Artificial Stone – minimum 1½" thick complying with ICC-ES AC 51 using any standard non-open joint installation technique such as shiplap 6) Terra Cotta Cladding – minimum 1¼" thick (solid or equivalent by weight) using any standard non-open joint installation technique such as shiplap 7) Any MCM that has successfully passed NFPA 285 8) Uninsulated sheet metal building panels including steel, copper, aluminum 9) ¼" (min.) uninsulated fiber cement siding or porcelain or ceramic tile mechanically attached 10) Stone, porcelain, ceramic/aluminum honeycomb composite building panels that have successfully passed NFPA 285 criteria 11) Autoclaved-aerated-concrete (AAC) panels that have successfully passed NFPA 285 criteria 12) Terra Cotta Cladding – Any Rain-screen Terra Cotta (min. ½" thick) with ventilated shiplap 13) ½" Stucco – Any one coat stucco (½" min.) which meets AC11 acceptance criteria or is approved for use in Type I-IV construction or has been tested per NFPA 285 or stays in place when tested per ASTM E119 (stucco exposed to fire) for at least 30 minutes 14) Thin brick/cultured stone set in thin set adhesive and metal lath that has been tested to ASTM E119 (brick exposed to furnace) and remains in place for a minimum of 30 minutes, or has passed an NFPA 285 test. Minimum ¾" with an optional secondary water resistive barrier between the exterior insulation and lath. The secondary barrier shall not be full coverage asphalt or self-adhered butyl membrane. 15) Glen Gery Thin Tech Elite Series Masonry Veneer or TABS II Panel System with ½" thick bricks using TABS Wall Adhesive 16) Natural Stone Veneer – minimum 1¼" thick using any standard installation technique 17) FunderMax M.Look Grey Core – minimum ¼ inch thick using any standard installation technique

Table 3: Xci Foil Exterior Insulation

Wall Component	
Base Wall – Use either 1, 2 or 3	1) Cast Concrete Walls 2) CMU Concrete Walls 3) 25 GA. min. 3⅝" (min.) steel studs spaced 24" OC (max.) a. ⅝" type X Gypsum Wallboard Interior b. Lateral Bracing every 4 ft
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. 2) Solid FRTW fire blocking at floor line in accordance with building code requirements for Type III construction.
Cavity Insulation – Use either: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11. Note: For items 2, 3,	1) None 2) 1½" (min.) of Covestro EcoBay CC SPF (up to full cavity thickness) 3) 1½" (min.) of BASF Walltite SPF (up to full cavity thickness) 4) Any noncombustible insulation per ASTM E136

8, 9, 10, 11 spray foam may not be used in constructions that utilize a foil faced exterior insulation and do not utilize an exterior sheathing. Items 2, 3, 8, 9, 10 and 11 may only be used with exterior sheathing 1.	5) Any Mineral Fiber (Board type Class A ASTM E84 faced or unfaced) 6) Any Fiberglass (Batt Type Class A ASTM E84 faced or unfaced) 7) Any foam plastic insulation (SPF or board type) which has been tested per ASTM E1354 (at a minimum of 20 kW/m^2 heat flux) and shown by analysis to be less flammable (improved T_{ign}, Pk. HRR) than Covestro EcoBay CC or BASF Walltite. 8) NCFI InsulBloc SPF (up to full cavity thickness) 9) Icynene MD-C-200v3 (Proseal) up to 5½ inches (only with ½ in. (min.) exterior gypsum sheathing) 10) SWD Urethane Quik-Shield 112 up to 6 inches in 6 inch (max.) stud cavities with an air gap not exceeding 2½ inches. 11) 1½" (min.) ThermoSeal 2000 (up to full cavity thickness)
Exterior Sheathing Use 1 or 2	1) ½" or thicker exterior gypsum sheathing. 2) ½" (min.) FRTW structural panels in Type III construction allowed in place of gypsum sheathing when combustible cavity insulation is not used.
WRB Over Base Wall Surface	See Table 5
Exterior Insulation – Use item 1, 2 or 3 Item 1 – "None" may only be used with specific claddings It is assumed mineral wool is 2 pcf (min.) 1 inch (min.) thickness	1) None (only with Cladding 1 - 6 when WRB #2 is used) 2) 4" thick (max.) Xci Foil 3) Mineral wool
WRB Over Exterior Insulation	See Table 5 Xci-Foil may be used with or without Cavclear drainage matt (Cavclear insulation system)
Exterior Cladding - Use either 1, 2, 3, 4, 5 or 6	1) Brick – Nominal 4" clay or concrete brick or veneer with maximum 2" air gap behind the brick. Brick Ties/Anchors 24" OC (max.) 2) Stucco – minimum ¾" thick exterior cement plaster and lath with an optional secondary water resistive barrier between the exterior insulation and lath. The secondary barrier shall not be full coverage asphalt or self-adhered butyl membrane. 3) Limestone – minimum 2" thick using any standard non-open joint installation technique such as shiplap 4) Natural Stone Veneer – minimum 2" thick using any standard non-open joint installation technique such as grouted/mortared stone 5) Cast Artificial Stone – minimum 1½" thick complying with ICC-ES AC 51 using any standard non-open joint installation technique such as shiplap 6) Terra Cotta Cladding – minimum 1¼" thick (solid or equivalent by weight) using any standard non-open joint installation technique such as shiplap

Table 4: Xci Ply or Xci Ply (Class A) Exterior Insulation

Wall Component	
Base Wall – Use either 1, 2 or 3	1) Cast Concrete Walls 2) CMU Concrete Walls 3) 25 GA. min. 3⅝" (min.) steel studs spaced 24" OC (max.) a. ⅝" type X Gypsum Wallboard Interior b. Lateral Bracing every 4 ft

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. 2) Solid FRTW fire blocking at floor line in accordance with building code requirements for Type III construction.
Cavity Insulation – Use either: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11 Items 3, 8, 9, 10 & 11 may only be used with exterior sheathing 2. Note – Use of Xci Ply (Class A) with SPF in stud cavity must use exterior sheathing Option 1.	1) None 2) 1½" (min.) of Covestro EcoBay CC SPF (up to full cavity thickness) 3) 1½" (min.) of BASF Walltite SPF (up to full cavity thickness) 4) Any noncombustible insulation per ASTM E136 5) Any Mineral Fiber (Board type Class A ASTM E84 faced or unfaced) 6) Any Fiberglass (Batt Type Class A ASTM E84 faced or unfaced) 7) Any foam plastic insulation (SPF or board type) which has been tested per ASTM E1354 (at a minimum of 20 kW/m^2 heat flux) and shown by analysis to be less flammable (improved T_{ign}, Pk. HRR) than Covestro EcoBay CC or BASF Walltite. 8) NCFI InsulBloc SPF (up to full cavity thickness) 9) Icynene MD-C-200v3 (Proseal) up to 5½ inches (only with ½ in. (min.) exterior gypsum sheathing) 10) SWD Urethane Quik-Shield 112 up to 6 inches in 6 inch (max.) stud cavities with an air gap not exceeding 2½ inches. 11) 1½" (min.) ThermoSeal 2000 (up to full cavity thickness)
Exterior Sheathing – Use either 1 or 2	1) ½" or thicker exterior gypsum sheathing 2) ½" (min.) FRTW structural panels in Type III construction.
WRB Over Base Wall Surface	See Table 5
Exterior Insulation – Use 1, 2, 3 or 4 depending on cladding. Item 1 – "None" may only be used with specific claddings It is assumed mineral wool is 2 pcf (min) 1 inch (min.) thickness	1) None (only with Cladding 1 - 6 when WRB #2 is used) 2) 4¼" (max.) Xci Ply or Xci Ply (Class A) (3½" foam max., ¾" FR Plywood max.) with all claddings 3) 4¾" (max.) Xci-Ply or Xci Ply (Class A) (4" foam max., ¾" FR Plywood max.) may be used with claddings 1 - 6 4) Mineral Wool
WRB Over Exterior Insulation	See Table 5
Exterior Cladding - Use either 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 or 17 Item 9 may use any tested/approved installation technique. Items 10, 11 or 14 may use any standard installation technique.	1) Brick – Nominal 4" clay or concrete brick or veneer with maximum 2" air gap behind the brick. Brick Ties/Anchors 24" OC (max.) 2) Stucco – minimum ¾" thick exterior cement plaster and lath with an optional secondary water resistive barrier between the exterior insulation and lath. The secondary barrier shall not be full coverage asphalt or self-adhered butyl membrane. 3) Limestone – minimum 2" thick using any standard non-open joint installation technique such as shiplap 4) Natural Stone Veneer – minimum 2" thick using any standard non-open joint installation technique such as grouted/mortared stone 5) Cast Artificial Stone – minimum 1½" thick complying with ICC-ES AC 51 using any standard non-open joint installation technique such as shiplap. 6) Terra Cotta Cladding – minimum 1¼" thick (solid or equivalent by weight) using any standard non-open joint installation technique such as shiplap 7) Thin brick/cultured stone set in thin set adhesive and metal lath that has been tested to ASTM E119 (brick exposed to furnace) and remains in place for a minimum of 30 minutes, or has passed an NFPA 285 test.

	Minimum ¾" with an optional secondary water resistive barrier between the exterior insulation and lath. The secondary barrier shall not be full coverage asphalt or self-adhered butyl membrane. 8) Glen Gery Thin Tech Elite Series Masonry Veneer or TABS II Panel System with ½" thick bricks using TABS Wall Adhesive 9) Any MCM that has successfully passed NFPA 285 10) Uninsulated sheet metal building panels including steel, copper, aluminum 11) ¼" (min.) uninsulated fiber-cement siding or porcelain or ceramic tile mechanically attached 12) Stone, porcelain, ceramic/aluminum honeycomb composite building panels that have successfully passed NFPA 285 criteria 13) Autoclaved-aerated-concrete (AAC) panels that have successfully passed NFPA 285 criteria 14) Terra Cotta Cladding – Any Rain-screen Terra Cotta (min. ½ " thick) with ventilated shiplap 15) ½" Stucco – Any one coat stucco (½" min.) which meets AC11 acceptance criteria or is approved for use in Type I-IV construction or has been tested per NFPA 285 or stays in place when tested per ASTM E119 (stucco exposed to fire) for at least 30 minutes 16) Natural Stone Veneer – minimum 1¼" thick using any standard installation technique 17) FunderMax M.Look Grey Core – minimum ¼ inch thick using any standard installation technique

Table 5. Allowable WRB's for Tables 1 - 4

WRB Over Base Wall Surface Use 1, 2, 3 or 4	1) None 2) Majvest 500 SA
WRB Over Exterior Insulation Use 1, 2 or 3 Item 2 may only be used with specific claddings	1) None 2) Majvest 500 SA (only with Claddings 1 - 6)

~ End of Report ~